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Revenue Effects of the OECD Corporate Tax Reform - An Updated Impact Assessment of Pillar Two

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Abstract

Pillar Two of the OECD corporate tax reform introduces a minimum corporate tax rate of 15 percent. OECD estimates suggest that participating jurisdictions, 137 overall, can count on an additional \$220 billion in annual tax revenue. Yet, previous impact assessments predate changes to the reform's core provisions. This study provides an updated impact assessment of Pillar Two that draws on new data and reflects its final parameters. Tax revenue gains at the jurisdiction level are disclosed for the first time. The evidence suggests that Pillar Two revenue gains fall in a range between \$68 and \$105 billion but could further increase if the provisions were adjusted. Implementing Pillar Two regulation could reverse 23 percent of the decline in global CIT revenue as a percentage of global GDP since 2005. The distribution of revenue gains is skewed in favor of high-income economies and investment hubs; 82 percent of global revenue gains accrue to 15 jurisdictions if no jurisdiction implements a qualified domestic-minimum top-up tax.

Keywords: Corporate taxation, OECD tax reform, multinational enterprises, tax revenue

JEL Codes: F23, H25, K34

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List of Abbreviations

AMNE	Activity of Multinational Enterprises
BBBA	Build Back Better Act
BEA	US Bureau of Economic Analysis
BEAT	Base Erosion and Anti-Abuse Tax
BEPS	Base Erosion and Profit Shifting
CbCR	Country-by-Country Report
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CFC	Controlled Foreign Company
CIT	Corporate Income Tax
EIA	Economic Impact Assessment
ETR	Effective Tax Rate
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GloBE	Anti-Global Base Erosion
GNI	Gross National Income
GPML	Gamma Pseudo Maximum Likelihood
IFRS	International Financial Reporting Standards
IIR	Income Inclusion Rule
IMF	International Monetary Fund
LDC	Least Developed Country
MNE	Multinational Enterprise
OCI	Other Comprehensive Income
OECD	Organisation for Economic Co-operation and Development
PPML	Poisson Pseudo Maximum Likelihood
QDMTT	Qualified Domestic-Minimum Top-Up Tax
QRTC	Qualified Refundable Tax Credit
SOR	Switch-Over Rule
STTR	Subject To Tax Rule
TCJA	United States Tax Cuts and Job Act of 2017

UPE	Ultimate Parent Entity
US GAAP	United States Generally Accepted Accounting Principles
US GILTI	United States Global Intangible Low-Taxed Income
UTPR	Undertaxed Payments Rule

1. Introduction

Global corporate tax rates have been in decline for decades (Clausing, 2007). Since 1980, the global weighted average statutory tax rate on corporate income has almost halved due to competition for mobile tax bases (Bray, 2021). Corporate tax revenue as a share of GDP has gradually dropped because effective tax rates followed the same downward trend (Dyrenge et al., 2017). This race-to-the bottom puts a strain on government budgets, especially in developing countries where corporate tax revenue plays a more vital role in financing expenditure. As a reaction, 137 jurisdictions signed a two-pillar proposal developed under the auspices of the OECD/G20 Inclusive Framework on Domestic Tax Base Erosion and Profit Shifting in October 2021. Pillar One reallocates taxing rights from the country of residence to countries where multinationals operate and earn revenue while Pillar Two establishes a global minimum corporate tax rate of 15 percent for all multinationals with at least €750 million in consolidated revenues. This reform is widely perceived as an important milestone and an “unexpected reassertion of state power” (Gelepithis & Hearson, 2022).

According to the OECD (2023), Pillar Two will affect government budgets in two ways. Collectively, jurisdictions will be able to boost global tax revenue by \$220 billion annually¹ and developing countries will benefit more than average. However, these statements are not backed up with evidence that is publicly available. To date, two studies have assessed the revenue potential of Pillar Two, and both conclude that new revenues from the reform will be lower. Devereux et al. (2020) estimate a revenue effect of more than \$32 billion while the OECD’s (2020a) own economic impact assessment (EIA) values the tax revenue gain between \$56 and \$102 billion. One plausible explanation for the discrepancy is that the reports rely on assumptions that predate crucial policy changes, for example, the United States Tax Cuts and Job Act (TCJA) of 2017. In addition, central provisions of the reform have been modified since these two studies were published in 2020. The OECD announced an updated assessment that both reflects the latest design changes and relies on more recent data but no more information than the revised total estimate is currently available (OECD, 2023). Policymakers find themselves in a situation in which they are expected to implement a significant change to the taxation of multinationals despite having limited information about its potential revenue effects (Bunn, 2022). These effects deserve to be revisited, not least because the reform arguably marks the most important international agreement since the Paris Climate Accord.

¹ Central estimate (see OECD, 2023, p. 5).

The objective of this study is to assist policymakers in assessing the reform by providing an updated perspective on the tax revenue effects associated with Pillar Two. It builds on Devereux et al. (2020) and the OECD's (2020a) own EIA but evaluates the final Pillar Two Model Rules published in December 2021 (OECD, 2021e), draws on recent data, and discloses jurisdiction level results. Conceptually, the approach consists of three analytical steps. First, I determine the average effective tax rate (ETR) at the jurisdiction level to identify low-taxed profits, i.e., profits of multinationals taxed at a rate below 15 percent. The second step is to compile an overview of the aggregate profits of multinationals at the jurisdiction level, which is an informative by-product. Based on these inputs, I then compute the top-up tax that will be due in each jurisdiction and worldwide. Behavioral reactions of multinationals and governments, and interaction effects with Pillar One, are not part of the computations presented here.

The intention is to advance rather than criticize previous assessments, from which this study differs in five respects. First, it examines the final provisions that policymakers agreed on turning into domestic legislation by 2023². This includes analyzing instruments which have not yet been modeled such as the de minimis exclusion rule and the loss carry-forward mechanism. Both may have depressed the tax revenue gains. Second, this study employs more recent data to enhance the relevance of the result and relies more extensively on 'hard' data sources to increase its robustness. Third, this study addresses methodological limitations like the inconsistent application of the €750 million revenue threshold across data sources in OECD (2020a)³. Fourth, it discloses revenue gains at the jurisdiction level for the first time. Since participating jurisdictions did not permit the OECD to share individual estimates with the public nor with other jurisdictions, it has been impossible to identify the winners of the reform (OECD, 2023). Fifth, the analysis presented here computes the additional revenue potential of Pillar Two and shows how provisions would need to be adjusted to realize it.

I find that introducing a 15 percent minimum corporate tax rate will not yield \$220 billion in additional tax revenue. Estimated revenue gains fall in a range between \$68 billion and \$105 billion, which already reflects the benefits associated with US GILTI legislation that is expected to co-exist with Pillar Two⁴. Provisions that were changed shortly before reaching an agreement

² The implementation of Pillar Two has stalled; it is not clear whether the original timeline can be met (MacLellan, 2022; Reeves, 2022).

³ CbCR reports include only MNE groups with global revenues above €750 million whereas Orbis collects data on firms of any size. To be consistent, one would need to restrict the Orbis sample on firms with €750 million in global revenues. However, OECD (2020a, pp. 234, 278) does not apply such threshold to Orbis data.

⁴ The United States is not expected to implement Pillar Two regulation because it enacted the GILTI regime as part of the 2017 tax reform. The OECD (2020b, p. 21) treats GILTI as a qualified income inclusion rule for

in October 2021 account for a considerable share of the discrepancy, but the largest part of the difference remains to be explained. Furthermore, developing countries will not be the main beneficiaries. High per capita income countries and investment hubs in the Americas, Europe, and Asia can count on more than 80 percent of additional tax revenue. If no-tax and low-tax jurisdictions implement qualified domestic-minimum top-up taxes (QDMTTs), the picture will be more skewed in favor of investment hubs. But there is substantial upside potential. What-if analyses reveal that eliminating the loss carry-forward mechanism, ownership exclusion rules, substance-based carve-outs and implementing Pillar Two regulation in the United States could raise total tax revenue gain to \$184 billion. Overall, the minimum corporate tax rate introduces a floor to international tax competition, but it does generate less revenue than projected.

The remainder of this paper is organized as follows. Section Two reviews the challenges in corporate taxation, explains the Pillar Two Model Rules in detail, and summarizes previous impact assessments. Section Three lays out the methodology to derive revenue gains and shows where this study deviates from previous ones. Section Four presents both the total and jurisdiction level estimates. Section Five discusses the results and examines potential strategies to maximize Pillar Two revenue. The final section concludes and puts the results in perspective.

2. Literature Review

This literature review is split into three parts. It sheds light on the challenges associated with the corporate tax regime, provides detailed information about the OECD corporate tax reform that has been proposed in response, and summarizes two impact assessments of this reform.

2.1. Corporate Taxation, Competition, and Resource Allocation

Tax competition between jurisdictions is the result of unprecedented capital mobility. Before capital controls were removed in the 1980s, labor and capital were immobile factors. Since capital began to move freely between countries, owners of capital could start and expand their businesses where investment conditions were most favorable. Corporate tax rates have soon become an important part of the equation since income taxes directly affect bottom-line profitability. Countries discovered that the tax rate levied on corporate income is a key instrument through which they can attract foreign investment and discourage domestic resources from flowing out of the country. Some jurisdictions have become so successful in competing for foreign capital that tax avoidance practices of multinationals attract substantial criticism even

purposes of the GloBE rules and recognizes the co-existence of the GILTI and the GloBE unless subsequent US regulation would “materially” narrow the GILTI tax base.

though most are legal. One concern is that tax competition distorts investment decisions and leads to a suboptimal factor allocation (Bucovetsky & Wilson, 1991; Gordon, 1986). Others observed that the uncooperative setting of corporate tax rates leads to a race-to-the bottom (Devereux & Loretz, 2013). In the absence of multilateral coordination, the setting of corporate tax rates resembles a prisoner's dilemma. On this view, together jurisdictions would realize a better outcome if tax rates were high. But, given the gains at stake, some jurisdictions defect and become low- or no-tax environments. Others follow and lower the corporate income tax (CIT) rate on their part.

As a result, CIT rates have been declining dramatically (Becker & Fuest, 2011; Clausing, 2007; Overesch & Rincke, 2011). Since 1980, the global weighted average statutory tax rate on corporate income has fallen from 46 percent to 25 percent in 2021 (Bray, 2021). In 2021 alone, 17 jurisdictions lowered their CIT rates with 15 levying no taxes on corporate income at all. This downward trend in statutory tax rates aligns with the observed number of rate decreases. In 78 percent of tax rate changes, governments decide to lower the tax rate on corporate income to restore competitiveness (Kawano & Slemrod, 2016). Firm-level ETRs followed the same pattern and dropped by 0.4 percentage points annually between 1988 and 2012 (Dyregang et al., 2017). Although individual countries cannot resist the urge to cut taxes and to create loopholes, data shows that countries which were high-tax (low-tax) in the 1980s are still high-tax (low-tax) today (Markle & Shackelford, 2012).

Multinationals and their shareholders benefit from CIT rate cuts, but public authorities worry about their effect on tax revenue. In an era of growing demands for public services and pension provisions, reducing CIT bases could be problematic. The Laffer curve, which describes the relationship between the CIT rate and the tax base, takes an inverted U-shape. It suggests that there is a revenue-maximizing statutory CIT rate that depends on country characteristics like size and openness (also see Suárez Serrato & Zidar, 2018). Historically, this tipping point used to be above the 30 percent level on average, but this rate has declined to 26 percent (Brill & Hassett, 2007, p. 11). On the declining segment of the Laffer curve, a decrease in the CIT rate leads to lower tax revenue and an increase in the CIT rate to higher tax revenue. Elasticity analyses that regress corporate taxable income on the CIT rate or the ETR find support for this pattern (Devereux et al., 2014; Gruber & Rauh, 2007). Cross-country studies employing OECD data provide additional evidence and find that corporate tax cuts are associated with strong decreases of tax revenue (Brill & Hassett, 2007; Clausing, 2007; Devereux, 2007). Since CIT rates have fallen below the 30 percent level in most jurisdictions, global corporate tax revenue

as a share of GDP has declined steadily from over two percent forty years ago to just below one percent in 2021. Corporate tax rates have decoupled from countries' revenue needs (Clausing, 2007). The countries on which the race-to-the bottom has the strongest impact are developing countries where corporate tax revenue accounts for over 15 percent of total tax revenue on average (OECD, 2019).

The digitalization of the economy poses an additional challenge for the global CIT system. 'Nexus' rules that determine where corporate taxes should be paid, and 'profit allocation' rules that state the portion of profits to be taxed have been the cornerstones of corporate taxation for decades. They facilitate international trade and cross-border investment by eliminating double taxation, but new business models call into question these rules. Businesses that extract value from intangible assets can serve customers without having a physical presence in these markets. This has opened the door for tax planning schemes through which multinationals shift their profits from the markets in which they accrue to low- or no-tax jurisdictions. Deductible transfer payments like interest or royalties represent another instrument through which taxable profits can be reduced. From the decoupling of market jurisdictions, that are the jurisdictions in which consumers and users are located (OECD, 2022d, p. 2), and tax jurisdictions, multinationals derive a comparative advantage over domestic competitors who cannot exploit tax rate differentials. The OECD (2021b) estimated that base erosion and profit shifting (BEPS) practices account for a \$100-240 billion loss in tax revenue annually.

2.2. OECD Corporate Tax Reform

Growing discontent with the global corporate tax system and its loopholes has led to action on various fronts. In 2013, the OECD and G20 countries agreed to address BEPS to restore the integrity and fairness of the global tax system (OECD, 2013, p. 8). But diverging interests and the limited will to give up sovereignty slowed down this multilateral effort. Frustration about the lack of progress caused some European economies to explore unilateral approaches. One example is the French Digital Services Tax that was implemented as a direct reaction (Thomas, 2020). Unilateral approaches have helped to revive the debate at the international level because they prompted the United States, formerly hesitant to finding a global solution, to return to the negotiation table. The second development that paved the way for greater cooperation was the COVID-19 pandemic. Governments spent more than \$11.9 trillion or 13.6 percent of 2019 world GDP to rebuild their pandemic-ravaged economies (IMF, 2021). After forty years of decline, corporate tax rates seemed like an obvious instrument to restore public finances.

In October 2021, 137 jurisdictions adopted the ‘Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy’ developed by the ‘Inclusive Framework’ (OECD, 2021c). The original objective was to sign a multilateral convention in 2022 and to adjust domestic legislation in the same year to be effective in 2023 but the implementation progress has been slower than planned. Pillar One reallocates taxing rights from the country of residence to countries where multinationals operate and earn revenue. In scope are multinationals with a global turnover over €20 billion and profitability above ten percent. A ‘special purpose’ nexus rule will be introduced to reallocate 25 percent of profits above the ten percent threshold to market jurisdictions in which that multinational earns at least €1 million in revenue. Through Pillar One, the Inclusive Framework strives to redistribute \$132 billion in tax profits annually, and ultimately to remove all national digital services taxes (OECD, 2023, p. 5).

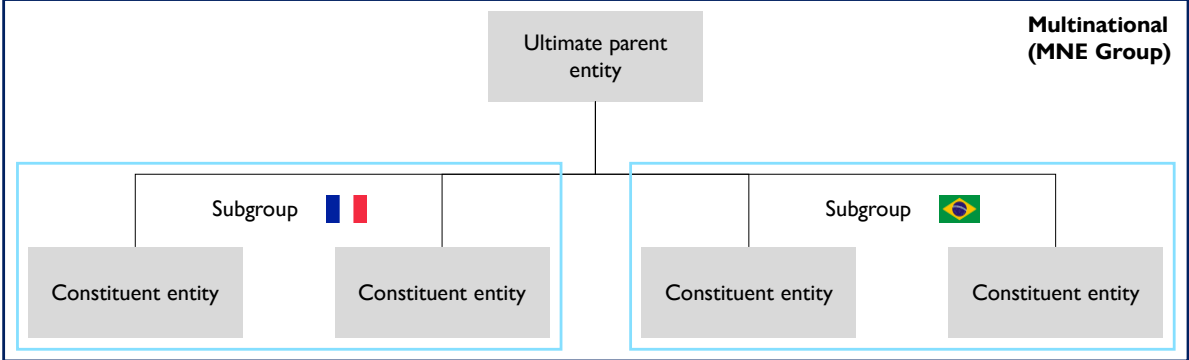
While Pillar One is designed to ensure a fairer distribution of profits, Pillar Two responds to the race-to-the bottom in tax rates on corporate income. From a macroeconomic perspective, it is the reform’s cornerstone because it will affect the pie’s absolute size (corporate tax take) rather than its pieces’ relative size. Pillar Two introduces a global minimum CIT rate of 15 percent to establish a baseline for international tax competition (OECD, 2021e, p. 60). All constituent entities⁵ owned by multinationals with a global turnover above €750 million in at least two of the four fiscal years preceding the tested one will be subject to the ‘Anti Global Base Erosion’ (GloBE) rules. Exemptions exist for government entities (including state-owned enterprises), international organizations, non-profit organizations, and pension, investment, and real estate funds (OECD, 2021e, p. 9). The GloBE rules provide for the constituent entities in scope to pay top-up tax on excess profit that is determined in accordance with Articles 3 and 4 of the Pillar Two Model Rules (OECD, 2021e). The starting point is the so-called GloBE income⁶ that constituent entities compute at the jurisdiction level by adjusting accounting net income for net taxes expense, excluded dividends, international shipping income, and other items on the income statement. From the GloBE income, constituent entities carve out five percent of eligible payroll costs and five percent of the carrying value of eligible tangible assets in each jurisdiction to quantify their excess profits (OECD, 2021e, pp. 30–31). Finally, filing entities may reduce their top-up tax percentage, that is the delta between covered taxes and the minimum rate, thanks to a loss carry-forward mechanism (OECD, 2021e, pp. 25–27). OECD

⁵ A constituent entity consists of a separate business unit that is included in the consolidated financial statements of the ultimate parent entity (see Figure 1).

⁶ In OECD terminology, the term “income” refers to corporate profit.

(2023) reports that global tax revenue will increase by \$220 billion per annum and points to increased tax certainty and transparency as additional benefits arising from Pillar Two.

Figure 1. OECD Terminology



Measuring the impact of Pillar Two differs from previous studies that examine other tax regimes in at least two ways. First, an impact assessment must account for simultaneous tax rate changes in 137 jurisdictions, not just one unilateral rate change. Even if profit shifting and tax avoidance activities of multinationals were ignored, any assessment of Pillar Two would need to allocate new tax revenue to a given jurisdiction. This requires matching information about ownership structures across jurisdictions with assumptions about the implementation of Pillar Two provisions at the jurisdiction level.

Second, previous studies ran mainly backward-looking analyses that estimated the elasticity of corporate tax revenues with respect to the statutory rate ex-post. Projecting the future revenue effects of corporate tax reforms has not been a common approach⁷. There are a small number of CIT rate changes for which ex-ante revenue assessments are available. Devereux & Loretz (2008) evaluated the European Commission’s (2007) proposed consolidation and apportionment rules’ effect on CIT revenues in each Member State. These authors were the first ones to use unconsolidated firm-level accounting and ownership data to construct tax liabilities of corporates under the current system to compare them with the proposed policy intervention. Cobham & Loretz (2014) extended Devereux & Loretz (2008) and simulated the global effect on corporate tax revenue. Two models estimated the tax revenue effect of reducing the statutory CIT rate in the US from 35 to 21 percent, a key provision of the TCJA (Joint Committee on

⁷ Ex-ante tax incidence analyses are more frequent. Building on Harberger’s (1962) two-sector general equilibrium model, these approaches examine if the corporate tax will fall disproportionately on a particular group of individuals, for instance, owners of capital (Auerbach, 2018).

Taxation, 2017; University of Pennsylvania, 2017). These studies did not allow for changes in behavior by multinationals and governments.

2.3. Impact Assessments of the OECD Corporate Tax Reform

To date, two studies have estimated the impact of the corporate tax reform prepared by the OECD/G20 Inclusive Framework on BEPS. Devereux et al. (2020) assessed the OECD documents outlining the GloBE proposal up to the end of December 2019 on behalf of PricewaterhouseCoopers. OECD (2020a) itself analyzed the Pillar One and Pillar Two Blueprint reports from October 2020 to support the case for reform vis-à-vis participating jurisdictions. Both reports concluded that introducing a minimum corporate tax rate will be beneficial for tax authorities. Yet, even the upper bounds on extra tax revenue collected – \$32 billion in Devereux et al. (2020) and \$102 billion in OECD (2020a) – do not support the \$150 billion claim put forward by the OECD in 2021, nor the updated revenue estimate of \$220 billion (OECD, 2021c, 2023).

Devereux et al. (2020) ran a scenario in which all jurisdictions implement an income-inclusion rule (IIR). They assumed that revenue gains are collected by the ultimate parent jurisdictions and used FDI data from the International Monetary Fund (IMF) to allocate new tax revenue raised in the source jurisdictions to those ultimate parent jurisdictions. The undertaxed payments rule (UTPR), switch-over rule (SOR), and subject to tax rule (STTR) were beyond the scope of Devereux et al. (2020). Conceptionally, the authors computed the amount of top-up tax for a ten percent minimum CIT rate. They combined micro (Orbis) and macro (national accounts) data to account for heterogeneity across firms but did not consider behavioral responses of multinationals and governments. The scenario covered all subsidiaries of foreign-owned multinationals regardless of the type of ownership. All profit taxed at an ETR below ten percent was assumed to trigger a top-up tax payment because it was not known at the time of writing that firms benefit from a substance-based income exclusion. New tax revenue from US-owned multinationals was included in the overall estimate of \$32 billion since the US GILTI minimum tax provision was not accounted for.

The OECD's own EIA reflected more closely the final Pillar Two Blueprint report (OECD, 2020b) because it was written almost a year after Devereux et al. (2020). However, various design elements and parameters of Pillar One and Pillar Two were not finalized at the time of writing. The OECD (2020a) assessment comprised four different scenarios. Scenario 1 was a static scenario in which Pillar Two was examined in isolation. Scenario 2 added interaction effects between Pillar One and Pillar Two, scenario 3 allowed for behavioral reactions of

multinationals, and scenario 4 accounted for behavioral responses of jurisdictions. Assuming a 15 percent minimum tax rate and a ten percent carve-out on payroll and tangible asset depreciation, global revenue gains from Pillar Two (excluding US multinationals) was estimated to be about 30 percent higher in scenario 4 than in scenario 1 (OECD, 2020a, p. 118). Reduced profit shifting (scenario 3) and ETR increases in low-tax jurisdictions (scenario 4) were responsible for this increase. Moreover, three caveats identified in Devereux et al. (2020) were addressed. First, OECD (2020) modelled both the IIR and the UTPR to introduce more flexibility concerning jurisdictions' implementation decisions. This affected the allocation of new tax revenue that was not always allocated to ultimate parent jurisdictions anymore. Second, the report illustratively computed a ten percent carve-out on payroll costs and depreciation of tangible assets. The final carve-outs are structured differently but OECD (2020) showed how a substance-based income exclusion can reduce the revenue gains. Third, the simulation considered the €750 million revenue threshold but applied it inconsistently across data sources. In contrast to Devereux et al. (2020), revenue gains from US multinationals were excluded because it was assumed that US GILTI would exist in parallel with Pillar Two. Country-by-Country Reports (CbCRs) complemented the macro data sources used in Devereux et al. (2020). Global tax revenue gains from Pillars One and Two were estimated to be in the range of \$56 – 102 billion.

In January 2023, OECD (2023) provided an updated assessment of the Pillar Two revenue gains that addressed certain design and parameter changes since the publication of the first EIA in October 2020. However, only a revised global estimate and some high-level information has been made available. The revised estimate suggests that jurisdictions can count on \$220 billion in additional CIT revenue per year. The strong increase compared to the EIA from 2020 is driven by two developments. In contrast to the previous EIA, the new assessment draws on new CbCR data to simulate top-up tax payments in 2018, not 2016. Since global corporate profits increased substantially after 2016, it is no surprise that the new revenue estimate is higher. In addition, OECD (2023) incorporates a fresh view on pockets of low-taxed profit in high-tax jurisdictions. There is no conclusive statement on how this affects the central estimate, but one can reasonably assume that these pockets get larger the more transparency is created. The methodology used to estimate the revenue gains seems to remain unchanged except for the allocation of revenue raised from the UTPR. The revised allocation key is based on the value of tangible assets and the number of employees whereas the 2020 EIA relied on economic activity. Finally, OECD (2023) promises that the revised assessment will be published in due course and that it will include results for groups of jurisdictions but not estimates of revenue gains at the

jurisdiction level. Thus, the time seems ripe to offer an assessment that evaluates the final Pillar Two provisions, relies on up-to-date information, and discloses revenue estimates at the jurisdiction level.

3. Empirical Framework

This section illustrates the methodology to estimate Pillar Two tax revenue gains. The underlying logic is the same as in Devereux et al. (2020) and the first scenario of the OECD's EIA (2020a). In line with these analyses, I determine the ETR at the jurisdiction level to derive the top-up tax percentage and collect information about the profits of multinationals from a variety of micro and macro data sources.

Five assumptions and design choices are crucial to point out. Devereux et al. (2020) and the first scenario in OECD (2020a) rely on the very same set of assumptions. This simulation exercise is solely concerned with the static tax revenue effects of introducing a global corporate minimum tax rate of 15 percent. It ignores potential interactions with the changes to profit allocation and nexus rules under Pillar One and assumes that neither multinationals nor governments react to the rate change. Behavioral responses concerning the intensity of profit shifting, the geographical location of economic activity, and the size of the tax base are out of scope. Withholding taxes, controlled foreign company (CFC) rules, and other provisions that already enable jurisdictions to tax profit relevant for Pillar Two are not considered due to data limitations. To ensure the legibility of the section, the subsequent paragraphs focus on methodological facets that are key to understanding the overall approach or go beyond previous contributions. Information about data cleaning and other details are given in the appendix.

Still, this study departs from the sophisticated methodologies in Devereux et al. (2020) and OECD (2020a) in five respects. First, it incorporates key final provisions adopted by the Inclusive Framework in October 2021, specified in the Pillar Two Model Rules in December 2021, and detailed in the Technical Guidance in March 2022 (OECD, 2021c, 2021e, 2022c). The Pillar Two Model Rules from October 2021 were finalized after the publication of the two previous assessments but represent the document that the OECD expects to deliver \$220 billion in new tax revenues (OECD, 2023). It contains the provisions that governments agreed to bring into domestic legislation and that have not yet been evaluated altogether. For example, the loss carry-forward mechanism, that certainly has a depressing effect on the overall gains, has not yet been assessed. The same applies to the de minimis exclusion rule, which exempts smaller entities from paying top-up tax, and the actual levels of the minimum CIT rate and the payroll

and tangible assets carve-outs. Second, this study employs a wider range of data sources with more recent data. The underlying data in Devereux et al. (2020) and OECD (2020a) relates to the years 2015 to 2017 with some data being older than that⁸. Crucial developments like the introduction of the US GILTI minimum tax provision and the implementation of some provisions under the OECD/G20 BEPS project are not reflected because the data is not recent enough. A third reason to revisit the estimates in these assessments is to fix methodological limitations such as the inconsistent application of the €750 million global revenue threshold across data sources in OECD (2020a). Fourth, the reports do not contain estimates across all jurisdictions, which makes it impossible to analyze the distributional effects of Pillar Two. This study is the first one to publish jurisdiction level estimates. Fifth, neither the OECD (2020a) nor Devereux et al. (2020) explores avenues to maximize Pillar Two revenue gains. As a result, the full potential of Pillar Two remains in the dark. In response, I identify five options to further increase Pillar Two revenue gains.

3.1. Estimation Strategy

The global Pillar Two revenue gains in any given year equal the product of the *top – up tax percentage* and the *excess profit* located in jurisdiction i summed over 221 jurisdictions:

$$\sum_{i=1}^{221} (\text{Top – up tax percentage}_i) \times (\text{Excess profit}_i) \quad (1)$$

To make the results comparable, the 221 jurisdictions are the same as in OECD (2020). The *top – up tax percentage* $_i$ can be broken down into two parts:

$$\text{Top – up tax percentage}_i = T_{min} - ETR_i \quad (2)$$

where T_{min} is the global minimum CIT rate of 15 percent and ETR_i is the effective tax rate on all profit realized by multinationals in jurisdiction i . The second term of the equation, *excess profit* $_i$, is a function of

$$\text{Excess profit}_i = \text{GloBE Inc}_i - \text{IncEx}_i \quad (3)$$

where GloBE Inc_i is the profit of all constituent entities located in jurisdiction i determined in accordance with Chapter 3 of the Model Rules (OECD, 2021e), and IncEx_i is the substance-

⁸ For instance, financial statements of subsidiaries of foreign-owned multinationals used by Devereux et al. (2020) are from 2012.

based income exclusion determined under Article 5.3. The computation of both equation terms – *top-up tax percentage_i* and *excess profit_i* – will be specified separately in subsections 3.2.1. to 3.2.4.

Ultimately, revenue gains at the jurisdiction level rest on jurisdictions’ implementation decisions. It is unlikely that all jurisdictions implement Pillar Two regulation because of diverging interests and different tax systems. In line with OECD (2020a), I assume that some jurisdictions turn the provisions of the reform into domestic legislation, but others do not depending on the level of the average ETR. I follow that line of argumentation because the OECD’ assessment “has benefitted from extensive interactions with representatives of Inclusive Framework jurisdictions” (2020a, p. 13). Jurisdictions with an average ETR above 15 percent are assumed to adopt both an IIR and an UTPR. Constituent entities with an ultimate parent in such jurisdiction would face a top-up tax on their low-taxed profit. The top-up tax would close the gap between the ETR in the jurisdiction of the constituent entity and the global minimum tax rate.

In contrast, it is assumed that jurisdictions with a zero ETR do not implement an IIR or UTPR because many do not have a CIT system at all. Without an IIR, these jurisdictions would not levy top-up tax on the low-taxed profit of constituent entities with an ultimate parent in their jurisdiction. This would enable another jurisdiction which hosts the intermediate-level parent ranking highest in the ownership chain of the multinational to charge top-up tax if that jurisdiction introduces an IIR. There are three scenarios in which the UTPR works as a backstop – in the absence of an intermediate-level parent, if none of the intermediate parent jurisdictions introduces an IIR, or if the ultimate parent jurisdiction charges an ETR below the minimum rate. In such cases, any jurisdiction from which intra-group payments originate, and that implements an UTPR could levy a top-up tax. Since modeling these rules would require data that is not available, it is assumed that low-tax profits of multinationals with an ultimate parent in a zero ETR jurisdiction would face top-up tax levied by other jurisdictions proportionally to the amount of economic activity located in these jurisdictions. Turnover sourced from the turnover matrix⁹, a table containing information on the aggregate turnover of multinationals from one jurisdiction in another jurisdiction, serves as a proxy.

The implementation strategy of jurisdictions with an average ETR between zero and 15 percent depends on their willingness to increase the ETR on local profit. The idea is that half of these jurisdictions “may decide that imposing a minimum tax rate on foreign profits could seem

⁹ Also see Figure 2 that explains the profit matrix which shares the same properties.

inconsistent with maintaining an average ETR below this minimum rate on local profit” (OECD, 2020a, p. 96). At the same time, the other half of the jurisdictions may implement an IIR and an UTPR. To be concrete, it is assumed that all jurisdictions with an average ETR between zero and 15 percent apply an IIR and UTPR on 50 percent of the low-taxed profit in their scope of action¹⁰. This simplification accounts for the difficulty of determining which jurisdiction would implement the rules and which ones would not.

However, jurisdictions with an average ETR below the minimum rate clearly have an incentive to implement a QDMTT. A QDMTT would enable the enacting jurisdiction to collect any additional tax revenue incurring in that jurisdiction because of Pillar Two. If there was no QDMTT, the GloBE rules would imply that low-taxed profit would be topped up in foreign jurisdictions. Implementing a QDMTT would not affect the total amount of taxes paid by businesses but change the allocation of tax revenue in favor of the domestic jurisdiction. Next to the revenue upside associated with adopting a QDMTT, it is comparatively easy to design a QDMTT that fulfills the requirements stated in Article 10 of the Pillar Two Model Rules. Many important no-tax and low-tax jurisdictions have already expressed their intention to implement a QDMTT¹¹ while others have already drafted detailed legislation¹². Given these developments, I discuss an alternative scenario in which all jurisdictions with an average ETR below 15 percent implement a QDMTT to capture the additional tax revenue domestically. The effect on global revenue gains will not be modeled separately because the change is expected to be negligible.

3.2. Identification Strategy

At this point, it is essential to clarify the reform’s scope and introduce two definitions. The GloBE rules apply to constituent entities that are owned by consolidated groups with annual global revenue of €750 million or more in at least two of the four fiscal years prior to the tested one. However, a de minimis exclusion exempts small constituent entities from paying top-up tax if the sum of the GloBE revenues of all entities owned by the same ultimate parent entity (UPE) in jurisdiction i is lower than €10 million, and the sum of the GloBE income is less than

¹⁰ OECD (2020a, p. 96) rests on the same assumption. Reducing the adoption rate to 25 percent would reduce global Pillar Two revenue by 18 percent while increasing it to 75 percent would result in 16 percent more global revenue in the base case.

¹¹ For example, African Tax Administration Forum (ATAF), Guernsey, Hong Kong, Ireland, Isle of Man, Jersey, Liechtenstein, Malaysia, Saudi Arabia, Singapore, Thailand, United Arab Emirates, and United Kingdom.

¹² For example, Mauritius, Netherlands, and Switzerland.

€1 million (OECD, 2021e, pp. 32–33)¹³. Companies are classified as ‘multinational’ if they own more than 50 percent of at least one constituent entity that is not located in the jurisdiction of the UPE (see Figure 1). Excluded are all constituent entities that belong to governmental entities, international organizations, non-profit organizations, pension funds, investment funds, and real estate investment vehicles (OECD, 2021e, p. 9). ‘Profit’ is defined as ‘profit before tax’ which represents a necessary simplification compared with the Pillar Two Model Rules¹⁴.

3.2.1. Effective Tax Rates at the Jurisdiction Level – ETR_i

Pillar Two requires multinationals in scope to determine their ETR at the jurisdiction level to gauge if top-up tax needs to be paid on excess profit. Since multinationals do not disclose income taxes paid at the jurisdiction level, ETRs cannot be computed at the firm level. Instead, I assume that all multinationals in a jurisdiction face the same jurisdiction wide ETR. If the ETR is lower than the global corporate minimum tax rate, all multinationals in scope must pay top-up tax up to the level of 15 percent on excess profit. This simplification disregards that some multinationals may face an ETR above 15 percent in low-tax jurisdictions (“pockets of high-taxed profits”) while others may face an ETR below the threshold in higher-tax jurisdictions (“pockets of low-taxed profits”) but is in line with OECD (2020).

The analysis builds on the same three aggregate data sources as OECD (2020a) – CbCRs, an updated version of Tørsløv et al. (2021), and data from the US Bureau of Economic Analysis (BEA) on US multinationals. Due to limitations in the data and to reduce the effect of outliers, I compute the average ETR over 2016 and 2017 before taking the median across all sources. Robustness tests indicate that the magnitude of the results does not change if I exclude any source while averaging the remaining two. Yet, relying on 2016 and 2017 data may lead to a slight underestimation of the global tax revenue effect because ETRs may have decreased since.

The richest source of corporate tax data at the jurisdiction level is the aggregated CbCRs from 35 ultimate parent jurisdictions. These reports allow deriving ETRs for 143 affiliate

¹³ Suppose a UPE from Japan owns three separate constituent entities in Switzerland. Only if the aggregated GloBE revenue of the three constituent entities averaged over the tested fiscal year and the two fiscal years preceding it is less than €10 million and the aggregated GloBE income of the three constituent entities averaged over the tested fiscal year and the two fiscal years preceding it is less than €1 million, Switzerland will be eligible for the de minimis exclusion. Note the difference between GloBE revenue (turnover) and GloBE income (profit) in OECD terminology.

¹⁴ According to the Pillar Two Model Rules, profit in a given fiscal year needs to be adjusted for “net taxes expense; excluded dividends; excluded equity gain or loss; included revaluation method gain or loss; gain or loss from disposition of assets and liabilities excluded under Article 6.3; asymmetric foreign currency gains or losses; policy disallowed expenses; prior period errors and changes in accounting principles; and accrued pension expense” (OECD, 2021e, p. 16).

jurisdictions by dividing income taxes accrued to foreign multinationals by their pre-tax profits. To be included, affiliate jurisdictions must be listed in the reports of at least three ultimate parent jurisdictions. When computing total profit, I focus on profitable entities because loss-making entities do not pay corporate tax. In addition, I winsorize the data at the 95 percent level to remove outliers. However, the ETR estimates may be artificially low given that dividends paid from the affiliate to the UPE are included in the profits reported in CbCRs (OECD, 2021a).

In their Missing Profits project, Tørsløv et al. (2021) estimate the ETRs on the profit of foreign-owned multinationals in 77 jurisdictions. The authors rely on foreign affiliate statistics and national account data but include profit-making and loss-making entities. Deducting the losses of unprofitable entities from total profit may result in an underestimation of the profit subject to top-up tax. Due to this, Tørsløv et al.'s (2021) ETR estimates may be higher which is a caveat. Yet, what distinguishes this source from the others is the focus on no- and low-tax jurisdictions where transparency about the actual burden of taxation is scarce.

The third source of data is the annual report on the worldwide activities of US multinationals compiled by BEA (2018). It contains information on the pre-tax non-financial profits (“profit-type return”) and foreign income tax payments of US affiliates in 55 jurisdictions. This allows building an average ETR for US multinationals in these jurisdictions by dividing foreign income taxes paid by profit-type return. However, I assume that the ETR estimates are representative for all multinationals operating in a given jurisdiction as there is no reason to believe that US multinationals minimize their tax burden more (or less) effectively than multinationals from other ultimate parent jurisdictions. To reduce the impact of outliers, I winsorize the data at the 95 percent level. As in Tørsløv et al. (2021), the ETR estimates may be overestimated due to the combination of data from profit-making and loss-making affiliates.

A major issue in quantifying tax revenue losses due to BEPS is the double-counting of equity income. Blouin and Robinson (2020) point out that the profits of US multinationals are often overstated due to complex chains of ownership. Suppose a US multinational A owns a foreign affiliate B which owns another foreign affiliate C. In line with BEA reporting guidelines, affiliate B will display the income of affiliate C as equity income on its books while affiliate C will also include its income on its income statement. Equity income is only an “accounting construct” that distorts the distribution of worldwide profits and induces upward biased estimates of profit shifting (Blouin & Robinson, 2020, p. 4). The measure of profit used from the BEA database, “profit-type return”, addresses this issue because it is based on value-added.

ETR estimates are available for most jurisdictions (see Table 5). For 157 jurisdictions representing 99 percent of global GDP, at least one ‘hard’ data source is available to compute the ETR. For 42 of them, accounting for 86 percent of GDP, all three data sources are available. This suggests that data coverage is as good as in OECD (2020). Where no source is available to compute the ETR, I take the official statutory corporate income tax rate instead. Although conservative, this assumption only has a marginal effect given that the respective jurisdictions account for less than one percent of world GDP. Table 9 provides an overview of the ETRs at the jurisdiction level.

3.2.2. The GloBE Income of Multinationals – *GloBE Inc_i*

In the next step, I collect data on the profits of multinationals to derive the GloBE income at the jurisdiction level. However, the lack of a sufficiently granular source of accounting data makes mapping profits of multinationals across jurisdictions difficult. Existing data sources provide valuable insights, but their geographic coverage is not comprehensive enough. The OECD (2020a) has developed a new methodology to resolve this limitation. Data from three sources flows into a “profit matrix” that spans 221 affiliate jurisdictions on the vertical axis and the same 221 ultimate parent jurisdictions on the horizontal axis. The result is a square table with 48,620 cells which contain the total profit of foreign-owned constituent entities by ultimate parent jurisdiction. Due to the high level of internal consistency and the unparalleled geographic coverage achieved through this approach, the basic methodology will be replicated here.

Figure 2. Profit Matrix: Approach and Underlying Data Sources

		<i>Jurisdiction of ultimate parent entity (UPE)</i>					
2019, in USD mn		Albania	Austria	Bahamas	China	Isle of Man	United States
<i>Jurisdiction of affiliate</i>	Albania	4.31	0.01	0.00	0.00	0.00	0.01
	Austria	0.00	5170.91	1.06	70.69	0.54	1939.14
	Bahamas	0.00	0.69	42.47	0.32	0.07	1286.87
	China	0.00	305.97	43.33	839014.89	6.95	32944.81
	Isle of Man	0.00	0.13	0.04	0.56	34.99	5.48
	United States	0.00	453.91	27.56	2277.78	8.37	1407140.04

- Aggregate country-by-country reporting data: available for 35 jurisdictions
- Orbis unconsolidated financial account data: available for 35 jurisdictions
- Aggregate profits of multinationals from the Isle of Man in the United States

Note: Three sources are used to fill the profit matrix that spans 221 ultimate parent jurisdictions on the horizontal axis and 221 affiliate jurisdictions on the vertical axis. The columns are filled with CbCR data that is available for 35 jurisdictions. ORBIS unconsolidated account data, available for 35 jurisdictions, is used to fill the rows, e.g., the profits of multinationals in China. The remaining matrix cells depend on extrapolations based on macroeconomic data such as FDI data.

Although much of the approach is compelling, an update of the data is needed. While Devreux et al. (2020) and the OECD (2020a) take 2016 as reference year, I focus on 2019, the last year without any COVID-induced distortions in the data. One drawback of this decision is that 2019 data is not always available due to reporting lags. If profit data for 2019 is unavailable, I take the value from the previous year and multiply it with the GDP growth rate of the jurisdiction in which the constituent entity is located. The underlying assumption is that the development of a constituent entity's profit on average coincides with the affiliate jurisdiction's GDP growth (decline). Subgroups of multinationals – the sum of constituent entities owned by a multinational in a jurisdiction – that report an overall loss at the jurisdiction level are ignored given only positive profits cause tax obligations. A subgroup owned by the same multinational yet operating in another jurisdiction and reporting positive profits will still be considered.

The profit matrix draws on two largely complementary sources of data to ensure that as many cells as possible can be filled with 'hard' data. Aggregate CbCR data is the preferred data source to populate the columns because multinationals must report their foreign economic activities country-by-country to the tax authorities in their ultimate parent jurisdiction. For instance, Microsoft Inc. needs to report to US authorities. This obligation was introduced in 2015 to address BEPS on a global scale (OECD, 2022a). Using this recently published dataset has three advantages. No adjustment is needed because both the GloBE rules and the obligation to report profits under CbCR apply to multinationals with at least €750 million in global revenue. On top of that, subgroups with negative profits can be isolated from the profitable entities in focus. The most valuable feature of CbCR data is its coverage of profits that multinationals from reporting jurisdictions realize in no- and low-tax jurisdictions. I therefore fill the matrix columns with the "Profit (Loss) before Income Tax" for all "Sub-groups with positive profits" from Table I. (OECD, 2021a). While the CbCR data used for the impact assessment of the OECD (2020a) stems from 2016, I draw upon 2017 data for two reasons. On the one hand, the data is more recent and, thus, arguably more representative. On the other hand, the coverage of the data increased from 26 reporting jurisdictions in 2016 to 35 in 2017. As a result, 1,563 additional CbCRs shed light on the profits of multinationals abroad.

The second source of data used to fill the profit matrix is Orbis, the largest cross-country database for firm-level data. Orbis provides consolidated and unconsolidated accounting data for publicly listed and privately owned firms. At the unconsolidated level, Orbis contains financial data on both domestic firms and entities that belong to multinationals. Ownership information allows us to connect these entities with their ultimate parents in any jurisdiction even

if data quality in that jurisdiction is poor. Hence, unconsolidated accounting data from Orbis can be used to populate the rows corresponding to the affiliate jurisdictions in the profit matrix. The data item used is “Profit and Loss before tax” which is consistent with the profit variable from CbCR. Only subgroups with positive profits are considered. Ownership is defined as controlling over 50 percent of an entity, which is in line with the Pillar Two Model Rules (OECD, 2021e). Furthermore, I eliminate all entities belonging to multinationals with less than €750 million in global revenue to be consistent with CbCR data. This contrasts sharply with the OECD’s own assessment in which all MNE profits are considered.

As Orbis data is not collected for statistical purposes in the first place, I apply an extensive cleaning procedure¹⁵ based on the experiences described by the OECD (2020a, p. 256). Since the coverage of unconsolidated financial data varies substantially across jurisdictions even after cleaning the data, I follow OECD (2020a, p. 255) and define jurisdictions with good coverage based on two conditions. Jurisdictions must have at least 750 firm observations in 2019, and the aggregated revenues in that jurisdiction cannot be less than 70 percent of what is indicated through CbCR. Overall, 35 jurisdictions meet these criteria whereas OECD (2020a) draws on 24 jurisdictions. One remaining caveat is that accounting practices vary across countries, sometimes to the detriment of comparability.

3.2.3. The Loss Carry-Forward Mechanism

Articles 4.4 and 4.5 of the GloBE rules establish a deferred tax accounting approach to reconcile accounting profit with taxable income (OECD, 2021e, pp. 25–27). Subgroups of multinationals who realize net GloBE losses at the jurisdiction level may carry them forward to subsequent years. The goal is to offset ‘artificial’ top-up tax liabilities that arise where income or expense is deductible in a different period, thus, reducing the ETR in the current period. To date, the loss carry-forward mechanism has not been formally assessed despite its potentially depressing effect on tax revenue. Given the first-time nature of this exercise, I will explain the modeling approach and the underlying assumptions in detail.

Filing entities can choose between applying the modified deferred tax rules provided in Article 4.4. and calculating a GloBE Loss Deferred Tax Asset as described in Article 4.5. The decision is taken at jurisdiction level and depends on the local corporate tax system. Article 4.5 is intended as a simplification in no- and low-tax jurisdictions where multinationals would not benefit from a deferred tax accounting system. Since this approach can be applied universally,

¹⁵ The entire procedure is described step-by-step in Section 8.3. in the appendix.

I choose to analyze if multinationals can carry forward a GloBE Loss Deferred Tax Asset to subsequent fiscal years in accordance with Article 4.5. If carried forward, it can be added to the Covered Taxes paid in the jurisdiction to increase the subgroup's ETR. As a result, multinationals that carry forward deferred tax assets pay less top-up tax in subsequent years.

The first step in modeling the effect of the loss carry-forward mechanism is to compute the size of the deferred tax asset. Following the GloBE rules (OECD, 2021e, p. 26), it is defined as the net GloBE loss in a jurisdiction in a given fiscal year multiplied by the 15 percent minimum rate. Data on the profits (losses) of multinationals for 28 jurisdictions with comprehensive firm-level coverage is taken from Orbis (see Table 4). Although multinationals can carry forward a deferred tax asset indefinitely, there is no practical reason to withhold it forever. Assuming a deferred tax asset gets used in the following year, I extract profitability data for 2018 to estimate by how much multinationals may reduce corporate taxes in 2019¹⁶.

For the 28 affiliate jurisdictions with good Orbis coverage, I build a deferred tax asset to profit ratio at the jurisdiction level. The intuition is straightforward. I sum up the average loss of subgroups operating in each affiliate jurisdiction, multiply it by the 15 percent minimum rate, and divide it by their combined profits as reported in Orbis. Foreign-owned subgroups operating in France, for instance, build a \$7 deferred tax asset per \$1,000 profit on average. For the other jurisdictions, I assume that the deferred tax asset to profit ratio equals the average of the 28 jurisdictions covered in the sample. Multiplying the deferred tax asset to profit ratio with the jurisdiction wide profits from the profit matrix (see Table 11) returns the final deferred tax asset per jurisdiction. The result shows the size of deferred tax assets that multinationals may use to increase their Covered Taxes jurisdiction by jurisdiction.

A critical prerequisite to considering deferred tax assets is establishing a baseline of Covered Taxes for each jurisdiction. I use the jurisdiction wide profits from the profit matrix and multiply them with the ETR computed above to obtain an estimate of the Covered Taxes. Once this baseline is established, I add the deferred tax asset calculated before. Finally, dividing the sum of Covered Taxes and deferred tax asset by jurisdiction wide profits results in the new ETR at the jurisdiction level. This information can be used to compute the top-up tax amount, and, in turn, the tax revenue gains from the corporate tax reform.

Yet, the approach depicted here is highly conservative for two reasons. First and foremost, the loss carry-forward mechanism diminishes 2019 tax revenue gains only slightly because

¹⁶ Given that businesses switch from loss-making to being profitable frequently, profitability data spans 2016-2018 (three-year average) to eliminate potential outliers.

multinationals recorded unusually high profits between 2016 and 2018. Less than one out of ten subgroups reported a negative profit at the jurisdiction level. The effect could be more substantial when economies and multinationals recover from crises during which they have realized losses they may use to offset future tax liabilities. For example, the drop in corporate profits during COVID-19 may still impact tax revenue gains in 2023 and onwards. Secondly, the approach rests on the assumption that multinationals only use their deferred tax asset accumulated in 2018 to offset tax liabilities in 2019. In practice, deferred tax assets can be carried on forever. A subgroup that has not exhausted a prior deferred tax asset, for instance, because it reported losses in consecutive years, may also apply it in 2019. I account for such cases by increasing the size of the average deferred tax asset by ten percent¹⁷.

3.2.4. The Substance-Based Income Exclusion – *IncEx_i*

The substance-based carve-outs allow multinationals to reduce their local GloBE income by five percent of eligible payroll costs and five percent of the carrying value of eligible tangible assets in each jurisdiction (OECD, 2020a, pp. 30–31). Thus, a subgroup of a multinational only pays top-up tax if its profit exceeds five percent of the sum of payroll costs and the carrying value of tangible assets. Payroll costs refer to employee benefits including salaries, pension fund contributions and related taxes of employees that perform activities for the multinational in the respective jurisdiction. Tangible assets include plant, property, equipment, land use rights and land measured at carrying value. The purpose of the substance-based income exclusion is to ensure that the global minimum tax applies on excess profit like the profit extracted from intangible assets. Another benefit is that jurisdictions can still promote labor and capital-intensive industries without triggering GloBE top-up tax. Over the first ten years after the implementation of the reform, the effect on tax revenue will be more substantial because decision-makers agreed on a ten-year transition period to recognize the impact of the reform on existing investment. During this period, the payroll carve-out declines from initially ten percent to five percent and the tangible assets carve-out from eight percent to five percent in 2033. However, the final carve-out percentages are used in this study to estimate the long-run effect of Pillar Two.

The impact of the substance-based exclusion depends on the share of aggregate profit carved out at the level of each subgroup. To model the share of carved-out profit with accuracy, one

¹⁷ Increasing the size of the average deferred tax asset by five or twenty percent would not cause noteworthy changes in global Pillar Two revenue.

would need to analyze firm-level data on tangible assets and payroll costs across all jurisdictions. However, such detailed firm-level information is scarce. Tangible assets data from Orbis is available with good coverage for 35 jurisdictions while payroll data is sufficiently available for 22 jurisdictions (see Table 4). This implies an increase in the availability of ‘hard’ data in the order of 30 percent compared to OECD (2020a, p. 255). The share of carved-out profit in these jurisdictions is computed with precision by dividing tangible assets (or payroll costs) by profit at the level of each subgroup.

In the jurisdictions where this type of firm-level data is not available, the approach employs aggregate data to estimate the share of carved-out profit based on the statistical relationship between firm-level and aggregate data. The first step is to construct two matrices that are very similar to the profit matrix except that they contain aggregate data on tangible assets and payroll. Both combine two ‘hard’ data sources each to minimize the number of cells that needs to be extrapolated.

The tangible assets matrix draws on unconsolidated Orbis data and CbCR data. Orbis data on tangible assets, proxied through the variable ‘tangible fixed assets’, is available for all 35 jurisdictions for which Orbis data is used to fill the turnover matrix (see Table 4 in the Appendix). However, the coverage of tangible assets across these jurisdictions is generally weaker than the coverage of turnover. Data on tangible assets is missing for six percent¹⁸ of aggregated turnover on average but the gaps in coverage are jurisdiction specific. To make the data consistent with other sources, tangible assets data from Orbis is scaled up by the gap in coverage estimated for a given jurisdiction. If tangible assets data is missing for five percent of constituent entities in a jurisdiction, aggregate tangible assets are multiplied by $\frac{1}{1-5\%} = 1.05$. The second data source used to fill the tangible assets matrix is CbCRs. Given that the latest reports are from 2017, values taken from CbCRs are multiplied by the 2018 and 2019 GDP growth rates of the affiliate jurisdiction. For instance, if Slovenian multinationals report a total of \$10 million in tangible assets for the United States, the 2019 value is estimated at $\$10 \text{ million} \times (1 + 3.00\%) \times (1 + 2.16\%) = \10.52 million . One issue is that the tangible assets variable in CbCR data includes inventories on top of property, plant and equipment. To make the data consistent with Pillar Two and other data sources, it is scaled down by 24 percent to focus on property, plant and equipment. This is the share of inventories in the tangible assets of US multinationals computed by the OECD (2020a, p. 279) based on data on the activity of

¹⁸ Tangible assets data is missing for 16 percent of the total turnover in OECD (2020a).

multinationals (BEA, 2022, Table II.B 1-2). Without comparable data from other national statistics agencies, I assume the data is representative for other jurisdictions.

The payroll matrix combines unconsolidated Orbis data and AMNE data. Compared to tangible assets, data on payroll in Orbis, proxied through the variable “cost of employees”, is less often available. The coverage of payroll is deemed sufficient in 22 jurisdictions¹⁹ against 18 jurisdictions in OECD (2020a, p. 255). On average, payroll data is missing for 14 percent of aggregated turnover across these jurisdictions²⁰. To account for this partial coverage, payroll data is scaled up by the estimated rate of partial coverage in each jurisdiction. OECD AMNE (2017) data proves to be another valuable source of information on payroll costs even though the data does not always represent the entire economy. The OECD (2020a), inspired by Tørsløv et al. (2019), proposes a simple adjustment to resolve this caveat. This approach is also applied here. Payroll data taken from the AMNE database is multiplied by the ratio of turnover in the entire economy, obtained from the respective cell in the turnover matrix, to the turnover figure in the AMNE database. Suppose payroll costs of Belgian multinationals in Romania are derived from the AMNE database. In that case, they are rescaled by the turnover of Belgian multinationals in Romania taken from the AMNE database divided by the same datapoint sourced from the turnover matrix. If the coverage of payroll data is the same in both sources, the ratio will be one. A ratio above one indicates that sectoral coverage in the AMNE database is narrower, and that the payroll costs need to be scaled up by that ratio. Here, it is implicitly assumed that the ratio of payroll to turnover is equal across sectors.

With the aggregate data from the tangible assets and payroll matrices, it is possible to compute the share of carved-out profit for the jurisdictions with insufficient coverage of firm-level data. The central idea is to estimate a regression equation to examine if the ratio of aggregate profit to aggregate tangible assets (aggregate profit to aggregate payroll) is a good predictor of the share of carved-out profit in jurisdictions with good Orbis coverage²¹. Indeed, Figures 6 and 7 in the appendix document a stable linear relationship between the aggregate profitability ratio at the jurisdiction level and the share of profit that is carved out. Thus, aggregate data can be used to approximate the share of carved-out profit in jurisdictions with poor ORBIS coverage.

¹⁹ I use payroll data from Orbis for all jurisdictions in which payroll data is available for more than 70 percent of aggregated turnover.

²⁰ Payroll data is missing for 26 percent of the total turnover in the OECD EIA (2020a).

²¹ In principle, coverage of firm-level data in Orbis is deemed sufficiently good for 24 (payroll) to 35 (tangible assets) jurisdictions (see Table 4 in the Appendix). However, Ireland, Luxembourg, Singapore, and the United Kingdom have an unusually high aggregate profit to aggregate tangible assets ratio (aggregate profit to aggregate payroll) and would distort the carve-out shares if they were considered in the regression.

For instance, the following relationship estimates the share of carved-out profit in the case of tangible assets in jurisdiction j with poor Orbis coverage:

$$\left(\frac{\text{Carved out profit}}{\text{Total profit}}\right)_j = \alpha + \beta \left(\frac{\text{Total profit}}{\text{Total tangible assets}}\right)_j \quad (4)$$

Due to the underlying data structure, the tangible assets carve-out and the payroll carve-out are computed separately even though their effects are ultimately combined to reflect the impact of the substance-based income exclusion. The decision to model the carve-outs individually comes with an important caveat. In a few cases, the sum of both carve-outs exceeds the total profit which results in a slight overestimation of the substance-based income exclusion rule. This happens where an individual carve-out, for instance, the payroll carve-out of subgroup X in jurisdiction Y , eats up the total profit of subgroup X before the tangible assets carve-out of this subgroup even gets deducted. Yet, this ‘double counting’ phenomenon tends to be insignificant in OECD (2020, p. 90) and in my analysis.

3.2.5. Preference Order of Data Sources

A careful review of both tax and financial accounting data sources confirms that the sources employed in OECD (2020) have the most extensive coverage and guarantee superior data quality. This paper generally relies on the same data sources ranked in the same order of preference. However, there is one exception. Analytical AMNE data has not been used for the turnover matrix to ensure greater consistency across the matrices, and because the additional benefit would have been less than marginal. Two principles generally guide the filling of the matrices. As multiple sources of data can be available for the same information, it is crucial to select the most reliable source for each data point. This choice relies on the comprehensive benchmarking conducted by OECD (2020a) for cases where data overlap. As a result, anonymized CbCR data is the preferred source because it has the broadest geographic coverage. The variables that are used to fill the profit, turnover, and tangible assets matrices are “Profit (Loss) before Income Tax”, “Total Revenues” and “Tangible Assets other than Cash and Cash Equivalents” (OECD, 2021d). The Orbis variables used in the matrices are “Operating Revenue”, “P/L Before Tax”, “Costs of Employees” and “Tangible Fixed Assets” while the AMNE variables are called “Turnover” and “Personnel Costs” (Bureau van Dijk, 2022; OECD, 2022b). The second principle is that extrapolations are only used where ‘hard’ data is unavailable as they tend to induce greater uncertainty.

Table 1. Preference Order of Data Sources Underlying the Set of Matrices

Preference order	Profit matrix	Turnover matrix	Tangible assets matrix	Payroll matrix
1	CbCR data	CbCR data	CbCR data	Orbis data
2	Orbis data	Orbis data	Orbis data	OECD AMNE data
3	Extrapolations based on macro data	OECD AMNE data	Extrapolations based on turnover matrix	Extrapolations based on turnover matrix
4		Extrapolations based on macro data		

3.2.6. Extrapolations in the Profit, Turnover, Tangible Assets and Payroll Matrices

Even though ‘hard’ data is preferred over extrapolations, some matrix cells need to be extrapolated to fill the matrices. The overall extrapolation methodology strictly follows OECD (2020a) to make the results comparable, and because there are no equally informative data sources to draw from. Thus, this section contains the minimum amount of information necessary to follow the methodology and the estimation results that necessarily differ as I employ more recent data. OECD (2020, pp. 235–242, 258-267) contains a more detailed explanation.

All extrapolations are subject to two basic principles. First, information derived from ‘hard’ data to fill the other matrix cells marks the starting point of any extrapolation to make the data consistent within the matrix. Second, it is crucial that the data from different matrices ‘speak’ with each other. For this reason, missing cells in the tangible assets and payroll matrices rely on data from the turnover matrix. However, the exact approach differs across matrices because the data gaps are different and the possibility to extrapolate the data hinges upon the variable considered. In total, the share of the aggregate sums in the four matrices that needs to be extrapolated gets reduced from 25 percent in OECD (2020a) to just 16 percent²². Nonetheless, the share of extrapolated cells can be higher in low-income jurisdictions and investment hubs.

Table 2. Relative Importance of Data Sources in the Matrices

	Profit matrix		Turnover matrix		Tangible assets matrix		Payroll matrix	
	% of cells	% of profit	% of cells	% of turnover	% of cells	% of tangible assets	% of cells	% of payroll
CbCR data	3%	87%	3%	87%	3%	88%	-	-
ORBIS data	3%	6%	3%	6%	2%	2%	3%	12%
AMNE data	-	-	6%	4%	-	-	1%	43%
Extrapolations	94%	7%	88%	3%	95%	10%	96%	45%
Total	100%	100%	100%	100%	100%	100%	100%	100%

²² It is likely that the revised EIA relies more extensively on hard data sources than the 2020 EIA. For instance, the share of corporate profit covered by CbCRs increases from 63 percent to 86 percent (OECD, 2023).

Populating the missing cells in the profit matrix is a particular concern because multinationals shift profits away from where they are generated. In response, I apply an extrapolation methodology developed by the OECD (2020a) based on Damgaard and Elkjaer (2017) and Casella (2019). It draws on three sorts of macroeconomic data depending on the type of cell. For diagonal cells containing information about the profit of multinationals in their home markets, the profits of domestic-owned multinationals and domestic-owned non-multinationals need to be disentangled. I divide the profits of domestic-owned multinationals in 32 jurisdictions for which ‘hard’ data is available through CbCR or Orbis by the total profit of domestic-owned firms taken from Tørsløv et al. (2021). The result is the share of profit of domestic-owned multinationals which can then be regressed on GDP and GDP per capita. The regression coefficients, in turn, allow estimating the profits of domestic-owned multinationals in 50 additional jurisdictions covered in Tørsløv et al. (2021) but not in CbCR or Orbis. For a third group of jurisdictions, data on the total profit of domestic-owned firms is also not available. Where this is the case, the total profit of domestic-owned multinationals is directly regressed on GDP and GDP per capita.

For cells that display the profit of multinationals abroad, the extrapolation methodology rests on bilateral FDI data and an estimated rate of return on FDI. The methodology consists of four steps. A matrix of bilateral FDI positions marks the starting point of this exercise. FDI statistics from the OECD (2022e) and the IMF (2022a) serve as primary data sources while a gravity equation of the following form is used to close gaps in the data:

$$\Pr(X_{ij} = k | \hat{X}_{ij}) = \frac{e^{-\hat{X}_{ij}} (e^{\hat{X}_{ij}})^k}{k!}, k = 0, 1, 2, \dots \quad (5)$$

In this Poisson pseudo maximum likelihood (PPML) estimation (Santos Silva & Tenreyro, 2006), FDI X from jurisdiction i into jurisdiction j is a function of the independent variables k . These are the distance between i and j , GDP and GDP per capita of the investor and recipient jurisdictions, and the statutory corporate income tax rate of the recipient jurisdiction. Table 6 in the Appendix shows the regression results. The second step is to transform the FDI matrix by immediate investor into a FDI matrix by ultimate investor for the profit matrix is structured by ultimate investor jurisdiction. FDI data by ultimate investor is only available for 18 recipient jurisdictions (OECD, 2022e) but Casella (2019) develops a sophisticated methodology to determine the ultimate investor jurisdiction based on FDI positions by immediate investor. The approach relies on absorbing Markov chains to identify the distribution of ultimate investors in

each jurisdiction based on immediate investor data. At the center of this procedure is the probability that an immediate investor is the ultimate investor, i.e., that an FDI position from a given jurisdiction is not ‘pass-through’.

From the resulting matrix, I eliminate all ‘passthrough FDI’ to avoid double counting FDI positions. The issue is that an investment channeled through two immediate investor jurisdictions before it reaches its final destination, is counted three times even after applying Casella’s (2019) probabilistic procedure. FDI positions in a given jurisdiction are therefore scaled down according to its pass-through probability. The fourth step is to multiply the bilateral FDI positions with a rate of return on FDI. I compute this rate in two steps. From the cells filled with ‘hard’ data, I derive a global average return rate by computing the median ratio of profit to FDI. This rate is 7.5 percent. Finally, I adjust the standard rate of return on FDI to account for variation in investment conditions across investing and receiving jurisdictions:

$$\text{Rate of Return on FDI}_{AB} = S\text{RoR} + (\text{RoR}_A - S\text{RoR}) + (\text{RoR}_B - S\text{RoR}) \quad (6)$$

where the *Rate of Return on FDI* from jurisdiction *A* into jurisdiction *B* is a function of the standard rate of return *SRoR*, the delta expressing the difference between the average rate of return on FDI of the investing jurisdiction *RoR_A* and the *SRoR*, and the delta expressing the difference between the average rate of return on FDI of the receiving jurisdiction *RoR_B* and the *SRoR*. Both deltas are averaged over the 2016 to 2019 period and capped at ± 5 percentage points to reduce the noise.

As in the profit matrix, extrapolations in the turnover matrix depend on the cell type. If missing, aggregate turnover in non-diagonal cells is estimated using a Gamma pseudo maximum likelihood estimation (GPML) (Head & Mayer, 2014; Santos Silva & Tenreyro, 2006). It is very similar to the PPML estimation in Equation 6²³ except that a PPML estimation could suffer from dependent variable bias in this case because many observations are censored (Gómez-Herrera, 2013, p. 1093). The GPML equation used to estimate the turnover of MNE groups from jurisdiction *i* in jurisdiction *j* draws on five independent variables, precisely distance, GDP, and GDP per capita of the investor and recipient jurisdictions. CEPII (Mayer & Zignago, 2012) is the data source. Table 7 shows the regression results. Missing data in diagonal cells is extrapolated following the same intuition as in the profit matrix. I run a regression with the ratio of turnover of domestic-owned multinationals to GDP across 46 diagonal matrix cells

²³ OECD (2020a, p. 280) finds that global turnover would be 0.6 percent lower if a PPML instead of a GPML equation were used.

filled with ‘hard’ data from CbCR, Orbis and the AMNE database as the dependent variable, and GDP and GDP per capita as independent variables. Missing diagonal cells can be extrapolated through the regression coefficients.

The final turnover matrix is key to filling the tangible assets and payroll matrices. The fact that the production of goods and services usually depends on tangible assets and employees makes a good argument to assume that tangible assets (payroll costs) and turnover correlate. An extrapolation in the tangible assets (payroll) matrix therefore starts with the estimation of a global average ratio of tangible assets (payroll) to turnover. In the case of tangible assets, this ratio is 36 percent while the ratio of payroll costs to turnover is 16 percent. This global average ratio is adjusted twice to reflect differences in the production of firms, for instance differences in capital intensity, across affiliate jurisdictions (‘delta 1’) and ultimate parent jurisdictions (‘delta 2’). However, the adjustments are capped after each individual adjustment and the final adjustment to prevent extreme values. In the case of tangible assets, the imputed ratio cannot fall below 15 percent or exceed 100 percent whereas the boundaries for the payroll costs to turnover ratio are five percent and 25 percent. The adjusted ratio of tangible assets (payroll) to turnover is then multiplied with the cell in the turnover matrix corresponding to the cell in the tangible assets (payroll) matrix that is to be extrapolated.

3.2.7. Limitations

Despite a comprehensive review of alternative data sources and methodological approaches, six caveats remain. The first three described below may lead to an overestimation of the revenue gains while three are assumed to have the opposite effect. How behavioral responses of multinationals and governments may affect Pillar Two revenue is difficult to anticipate because many variables are unknown. The estimated revenue impact of Pillar Two derived in this study should therefore be interpreted as an indication rather than a point estimate.

First, jurisdictions may already use withholding taxes, CFC rules, and other instruments to reduce the amount of low-taxed profit. However, data is not sufficiently available to analyze these instruments. Second, this study does not consider any interaction effects between Pillar One and Pillar Two. Since governments must levy the minimum tax after profits have been reallocated under Pillar One, the total amount of low-taxed profit may be smaller. Third, international shipping income shall be excluded from the computation of the GloBE income according to Article 3.3. of the Pillar Two Model Rules (OECD, 2021e). Data that makes the exclusion computable is currently not available.

Conversely, three methodological decisions may imply an underestimation of the revenue gains. Due to the use of aggregate CIT data, I cannot account for all forms of firm-level heterogeneity. This might be an issue in high-tax jurisdictions where some multinationals pay less than 15 percent corporate tax despite the ETR being above that threshold. To account for these “pockets of low-taxed profits”, I augment the upper bound of the uncertainty range surrounding the point estimate by 40 percentage points, which is in line with the analysis of low-taxed profit in OECD (2020a). However, these pockets “may result in higher revenue gains for jurisdictions” than previously assumed (OECD, 2023, p. 32). A second caveat is the use of CbCR data for which there is no alternative. However, it is noteworthy that the information submitted by multinationals is not based on IFRS or US GAAP and deferred taxes are not considered. The OECD provides a list of data limitations like the inconsistent accounting of intra-company dividends (OECD, 2021a). A third caveat relates to the uncertainty surrounding the future of corporate profits. Although the level of corporate profits has been comparatively high in 2019, a quick economic recovery and high inflation rates after the pandemic could enable businesses to realize higher profits than ever before. Thus, Pillar Two revenue could be higher than estimated.

Finally, the behavioral responses of multinationals and governments are disregarded because they are difficult to anticipate. Where profits will be located once Pillar Two has been implemented will depend on modifications of profit-shifting schemes and the setting of CIT rates. Theoretically, there are three different possible behavioral responses which could increase or decrease global tax revenue, or simply offset each other. The OECD (2020a, p. 118) concludes that global revenue gains from Pillar Two will be about 30 percent higher if behavioral reactions of multinationals and governments are included²⁴ but I argue that considerable uncertainty surrounds this estimate²⁵. Introducing a minimum CIT rate of 15 percent will reduce tax rate differentials between jurisdictions. *Ceteris paribus*, incentives for multinationals to shift profits will shrink. To assess the impact of reduced profit shifting intensity on global tax revenue, two separate effects must be considered. On the one hand, a higher share of corporate profits would be taxed in the jurisdictions they originate from. Since multinationals typically face ETRs above 15 percent in these market jurisdictions, global tax revenue could be higher than estimated. On the other hand, less profits would be shifted to jurisdictions with an ETR below the minimum rate. The sum of low-taxed profit and, in turn, the total amount of revenue raised through the

²⁴ Assuming a 15 percent minimum tax rate, a ten percent carve-out on payroll and tangible asset depreciation and excluding US multinationals.

²⁵ There is an ongoing debate in many jurisdictions over whether they should implement QDMTTs.

IIR and UTPR would be smaller. The OECD (2020a, p. 100) estimates that the reduction in profit shifting intensity would generate more tax revenue overall but the underlying assumptions that profit shifting behavior rests entirely on tax rate differentials and that multinationals do not identify alternative tax optimization strategies are rather weak. Another source of uncertainty concerns the loss carry-forward mechanism that is not modelled in OECD (2020a). In future, multinationals could increasingly engage in loss-shifting rather than profit-shifting to offset profits realized in a higher-tax jurisdiction. Moreover, several accounting planning strategies exist that could help multinationals to reduce their exposure to Pillar Two²⁶.

How policy reactions would affect global tax revenue remains equally debatable. If jurisdictions which currently tax corporate profits at a rate below 15 percent decided to raise the ETR to attract a greater share of Pillar Two revenue, the allocation rather than the sum of tax revenue would change in the first place. However, the total size of the pie could still be increased due to the substance-based income exclusion. Pillar Two allows multinationals to carve out five percent of eligible payroll costs and five percent of the carrying value of eligible tangible assets. Yet, multinationals will lose this opportunity if jurisdictions with an ETR below 15 percent increase their ETR. In such case, multinationals would have to pay the new ETR on all profit even if it had been carved out under Pillar Two. Modelling the policy reactions of low-tax jurisdictions with precision would require detailed information on the costs of introducing a CIT system if jurisdictions do not have one yet. Likewise, the reactions of jurisdictions with an ETR above 15 percent are difficult to anticipate. There are no conclusive research findings on how jurisdictions might react to the introduction of a minimum CIT rate simply because the OECD reform is the first of its kind.

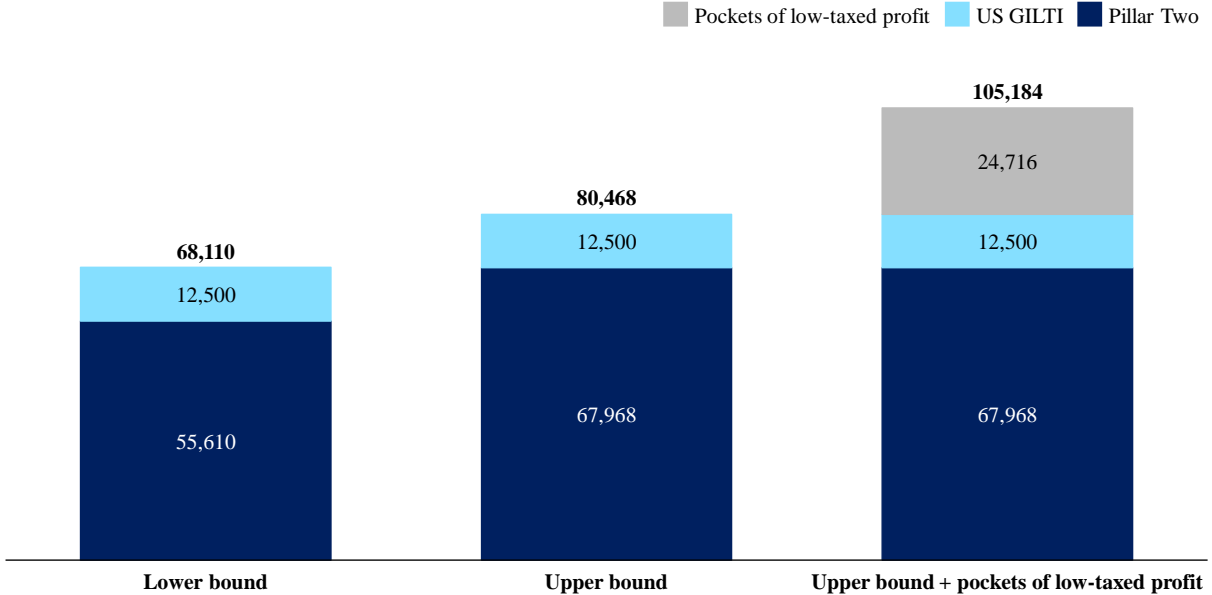
4. Results

Had the reform of corporate taxation been fully implemented in 2019, multinationals would have paid between \$68 billion and \$105 billion more in corporate tax globally (see Figure 3). The estimate does not reflect Pillar Two-related tax liabilities of multinationals based in the United States as it is assumed that US GILTI will coexist with Pillar Two. Instead, the revenue effect of the 10.5 to 13.125 percent minimum CIT rate under US GILTI, an estimated \$12.5 billion in tax revenue, is added for consistency. The upper boundary of the total estimate

²⁶ For instance, multinationals could declare a part of their income as other comprehensive income (OCI), a position that exists under IFRS. Currently, such income is not part of the P&L statement and, therefore, not subject to the minimum tax.

corresponds to up to 4.5 percent of 2019 global CIT revenue estimated at \$2.35 trillion, or 0.5 percent of total tax revenue in the same year²⁷.

Figure 3. Estimated Pillar Two Revenue Gains for 2019, in \$ million



Note: To account for data uncertainty, the results are expressed in ranges – ten percent are deducted from the point estimate for the low estimate, ten percent are added for the high estimate. The latter is increased by an additional 40 percentage points to reflect data scarcity with regards to low-taxed profit in high-tax jurisdictions. These ranges coincide with OECD (2020a). The revenue effect of US GILTI is taken from <https://www.jct.gov/publications.html?func=startdown&id=5053> (section III.B.1).

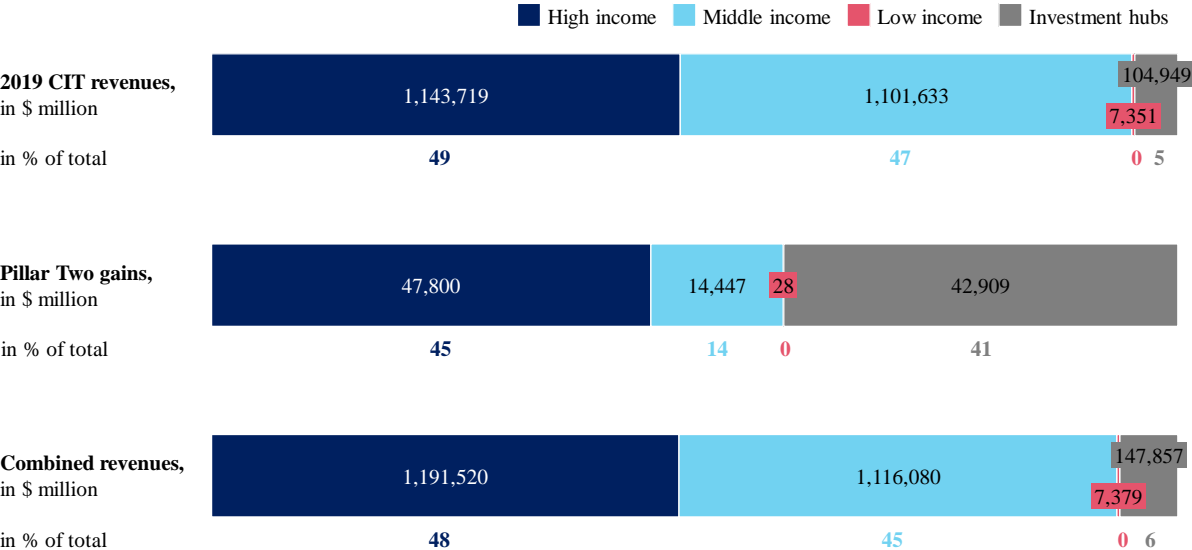
Scaling Pillar Two revenue gains by global CIT revenues implies that the long-term decline in corporate taxation take may not be reversed. Since 2005, global tax revenue as a share of world GDP has remained remarkably constant at around 25 percent while global CIT revenue as a percentage of world GDP has declined from 3.1 to 2.7 percent on average. If estimated revenue gains were added to global CIT revenue collected in 2019, CIT revenue as a share of world GDP would have been 2.8 percent. Thus, successfully implementing Pillar Two regulation may reverse 23 percent or three years of the downward trend.

Under the assumption that jurisdictions do not introduce QDMTTs, additional tax revenue is distributed highly unevenly across jurisdiction groups. High per capita income economies, defined as jurisdictions with a GNI per capita of \$13,205 or more based on the World Bank Atlas method, together gain \$48 billion in new revenue or 45 percent of total Pillar Two gains (see Figure 4). These jurisdictions benefit in line with their 49 percent share in 2019 CIT revenue. Investment hubs, those jurisdictions with a total inward FDI position above 150 percent of GDP, attract a disproportionate amount of Pillar Two revenue. They can count on 41 percent

²⁷ Author’s calculation based on OECD Revenue Statistics (2022f) and IMF Government Finance Statistics (2022b).

of Pillar Two gains despite a negligible share in 2019 CIT revenue (five percent). New revenue of \$43 billion implies that investment hubs may raise their revenue from corporate taxation by 41 percent thanks to the OECD reform. High-income economies and investment hubs together combine more than 80 percent of Pillar Two gains. In contrast, the tax gain of the middle-income economies cannot match their 47 percent share in 2019 CIT revenue. An estimated \$14 billion or 14 percent of Pillar Two revenue falls on jurisdictions with a GNI per capita between \$1,086 and \$13,205. The revenue increase of middle-income economies does not exceed 1.3 percent if the 2019 CIT base is taken as a reference point. With \$28 million in new revenue, low-income economies do not belong to the winners of introducing a minimum CIT rate. Their share in Pillar Two revenue (0.03 percent) is even lower than their share in 2019 CIT revenue (0.3 percent).

Figure 4. Distribution of Estimated Revenue Gains in the Base Case (No QDMTTs)

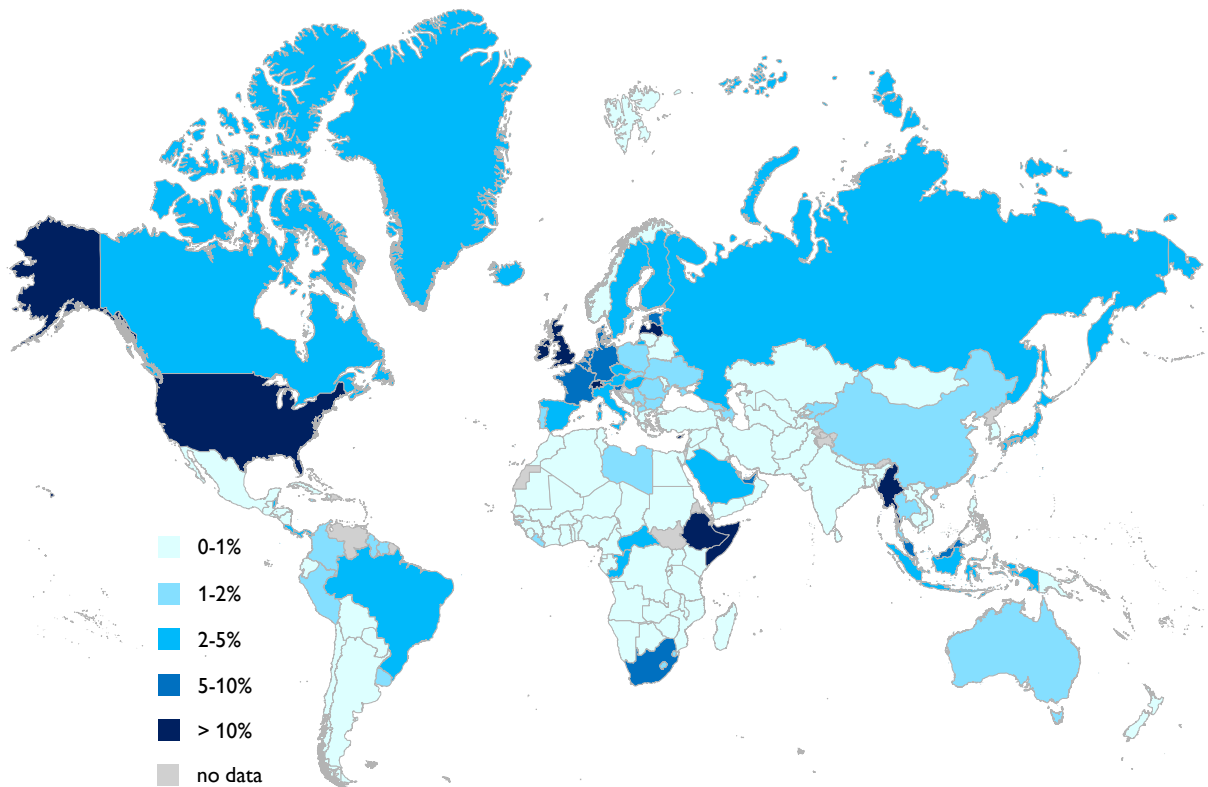


The distribution of Pillar Two revenue remains uneven if jurisdictions are grouped differently. Least developed countries (LDCs) may collect \$65 million in new tax revenue which corresponds to just 0.0006 percent of Pillar Two’s total effect. On average, each of the 46 LDCs may add \$1.4 million or 0.05 percent to their 2019 CIT base. Non-LDCs may boost their 2019 CIT revenue by 10.3 percent on average. Geographical disparities are equally pronounced. For instance, jurisdictions in Sub-Saharan Africa may count on \$1.24 billion in additional revenue. Given they collected 2.1 percent of global 2019 CIT revenue, a 1.2 percent share in Pillar Two revenue seems to be proportionate at first glance. However, this share would decrease to 0.001 percent if South Africa, one of the key beneficiaries among the middle-income economies, were considered separately.

Another region with comparatively small Pillar Two revenue is South America where the jurisdictions may expand their 2019 CIT bases by 1.5 percent. Given the total effect of Pillar Two is estimated at 4.5 percent of 2019 global CIT revenue, the benefits of South American jurisdictions are below average. With revenue gains worth \$1.8 billion, they capture 1.7 percent of new CIT revenue even though they collected 5.0 percent of global CIT revenue in 2019. The Pillar Two revenue gains of South American jurisdictions excluding Brazil amount to \$0.6 billion or 0.5 percent of the total gains. A similar picture emerges for the Middle East, although the disparity is not quite as pronounced. The evidence suggests that 1.1 percent of Pillar Two revenue falls on jurisdictions in the Middle East who expand their CIT base by 2.0 percent.

The two regions that benefit the most are the Caribbean and continental Europe. The 33 jurisdictions in the Caribbean, mostly small island states, account for 0.8 percent of 2019 CIT revenue but attract 1.9 percent of Pillar Two gains. The data shows that these jurisdictions may increase their CIT base by 10.1 percent thanks to Pillar Two. European tax authorities collected 24.0 percent of global CIT revenue in 2019 but can hope for as much as 40.0 percent of new revenue associated with the OECD reform. Associated with this, European jurisdictions may increase their CIT base by 7.4 percent.

Figure 5. Estimated Revenue Gains Relative to 2019 CIT Revenue (No QDMTTs)



One structural and one methodological assumption explain why certain jurisdictions seem to benefit from Pillar Two a lot more than others. The IIR, the principal rule under Pillar Two, requires multinationals to pay top-up tax on low-taxed profits anywhere in the world at the level of the UPE. Jurisdiction level gains from Pillar Two therefore depend on the presence of multinationals in the first place. Jurisdictions in which more multinationals are headquartered benefit disproportionately because the right to tax works its way down the ownership chain. However, the allocation of Pillar Two revenue gains will depend on the behavioral responses of multinationals and governments. It can be expected that at least some jurisdictions introduce QDMTTs to retain a more substantial share of tax revenues. The methodological assumption that not all jurisdictions are going to implement a qualified IIR explains that investment hubs may benefit above average²⁸. Investment hubs currently host substantial profits of multinationals that can be taxed if they are not brought back to market jurisdictions under Pillar One.

However, the allocation of Pillar Two gains is not consistent even within regions or country groups. At the jurisdiction level, the winners of the reform tend to be high per capita income countries like the United Kingdom, China, Germany, and Japan. They are expected to gain 7.7 percent, 5.6 percent, 5.0 percent, and 4.1 percent of the total new revenue respectively. These jurisdictions are surpassed only by Singapore that could generate \$23.2 billion in additional revenue alone. With 170.6 percent CIT revenue growth, Singapore is also a major beneficiary in relative terms. This pattern applies to most investment hubs. Bermuda may expand its CIT base by the factor 4.7 thanks to revenue gains in the amount of \$1.1 billion. Australia, a jurisdiction with a CIT base 286 times larger than Bermuda, is expected to collect less Pillar Two revenue. However, some smaller economies may expand their revenue bases, too. Among the low-income economies, Ethiopia and Somalia stand out. The data shows that Ethiopia may count on Pillar Two revenue worth 73.3 percent of its 2019 CIT revenue while Somalia may add another 42.6 percent to its CIT base. Yet, these examples are exceptions. Finally, few jurisdictions are expected to attract no additional CIT revenue although they host corporate profits taxed at a rate below 15 percent. Traditional tax havens like the Cayman Islands and the Marshall Islands have not established a CIT system because their tax regime goes without corporate income taxes. There is no sign that these jurisdictions revoke their stance on taxation and build a CIT system from scratch. A comprehensive overview of jurisdiction level gains is available

²⁸ For a detailed discussion of the modelling assumptions see Section 3.1.

in the Appendix (see Table 14) while an explanation of the modeling assumptions can be found in Section 3.1.

5. Discussion

My results show that Pillar Two of the corporate tax reform will generate less new tax revenue than the OECD and participating jurisdictions envisage. Estimates suggest that jurisdictions can count on \$68 billion and \$105 billion in additional tax revenue if revenues from the GILTI regime under the US TCJA are considered (see Figure 3). However, it is even debatable if this range will be attained any time soon. One reason is that CIT revenue is a function of reported corporate profit levels that, in turn, reached a historical high in 2019, the reference year for my simulation. In 2019, multinationals realized \$7.4 trillion in profits (see Table 11 in the appendix), which represents a 17.3 percent increase compared to 2016, the base year in OECD (2020a). But a growth in profit and tax revenue cannot be assured. Global corporate profit dropped dramatically during the COVID-19 pandemic, and many businesses still grapple with supply chain disruptions such as semiconductor chip shortages and high energy prices. At the same time, price inflation appears to be more persistent than central banks had thought. In such an environment, there are no guarantees that global corporate profit will reach pre-pandemic levels soon. For the time being, the simulated corporate gains with 2019 data represent an optimistic outcome.

The results of this study and the global tax revenue effect estimated in OECD (2020a) look surprisingly similar at first glance. In its impact assessment, the OECD (2020a) values the reform at \$56 – 102 billion²⁹ while this update concludes that tax revenue gains fall in the range of \$68 – 105 billion. This might seem surprising because one would expect this study's baseline result to exceed the previous estimate for two reasons. First, it is worth noting that global corporate profits were 17.3 percent smaller in 2016 than in 2019³⁰. *Ceteris paribus*, corporate tax liabilities in 2019 would have been higher due to the strong increase in corporate profits. In addition, I model a hypothetical scenario in which there is no Pillar One. If the interaction of Pillar One and Pillar Two were considered, as in OECD (2020a), the revenue gains would be smaller because profits would need to be reallocated first. Thus, revenue estimates would exceed the OECD assessment if the same methodology were applied. However, two methodological improvements over the previous analysis offset both the increase in corporate profit and

²⁹ Combined revenue gains of Pillar One and Pillar Two and the US GILTI regime.

³⁰ Comparing the profit matrices in OECD (2020a, p. 53) and in the Appendix (Table 11).

the independent modeling of Pillar Two, thus, driving down the tax gain estimates. In contrast to OECD (2020a), I consistently apply the €750 million threshold across data sources, i.e., to Orbis data. This reduces the number of subsidiaries in the data set and, in turn, corporate profit at the jurisdiction level. The first-time consideration of the loss carry-forward mechanism further reduces revenue gains because firms may use deferred tax assets to offset future tax liabilities. As a result of these opposing effects, estimated tax revenue gains are of the same magnitude as in OECD (2020a).

A second claim the OECD makes concerning the reform is that “developing country revenue gains are expected to be greater than those in more advanced economies, as a proportion of existing revenues” (OECD, 2021c). From the perspective of some national policymakers and civil society, this distribution of tax revenue gains deserves as much attention as the total size of the pie. However, the OECD has not published and is not going to publish its estimates of jurisdiction level gains due to a lack of consensus among participating jurisdictions (OECD, 2020a, p. 122, 2023, p. 5). Any given jurisdiction may inquire information about its potential gains but comparing the individual estimate with other jurisdictions has not been possible thus far. Nonetheless, transparency about the distribution of incremental revenue is fundamental to understand if the current reform proposal is balanced, or if it reinforces disparities between high- and low-income economies. This study, the first that discloses tax revenue gains across all jurisdictions, clearly shows that low-income economies only benefit at the margins. High-income economies and investment hubs are expected to secure the lion’s share of Pillar Two gains if no jurisdiction implements a QDMTT. In sum, the reform of corporate taxation will not grow the tax base of developing economies, even if it nudges local tax authorities to build up the capacity to track the activities of multinationals more closely.

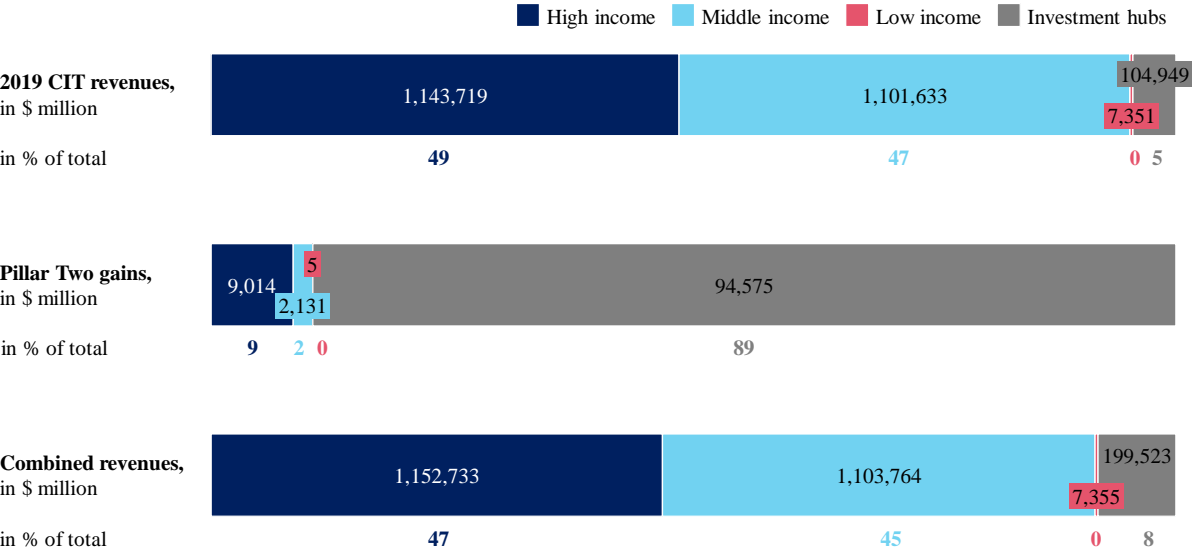
However, the distribution of revenue gains is not carved in stone. In the likely scenario that no-tax and low-tax jurisdictions implement QDMTTs to capture the additional revenue domestically, investment hubs would retain \$95 billion or 89 percent of total revenue gains (see Figure 6)³¹. High income countries would attract nine percent of the total revenue increase whereas middle income and low-income countries would gain almost nothing from the reform³². The

³¹ Total revenue gains would be \$1.6 billion higher compared to the scenario without QDMTTs. The upside reflects the revenue not collected by no-tax jurisdictions. Low-taxed profit from these jurisdictions is assumed to be collected at intermediate parent level or UTPR based on economic activity. If no corporate tax is levied at this superior level either, revenue is assumed to be lost. This is in line with (OECD, 2023, pp. 95–97). In contrast, implementing QDMTTs would enable all no-tax and low-tax jurisdictions to collect the additional tax revenue themselves.

³² Some high-income countries with an average ETR below 15 percent, e.g., Germany, have announced to implement a QDMTT to address pockets of low-taxed profit. However, these pockets are difficult to size.

reason is that most low-taxed profit is located in investment hubs today. If all investment hubs implemented a QDMTT, revenue gains associated with taxing low-taxed profit at a higher rate would fall on the same jurisdictions. However, this picture would most likely not represent a steady state. Multinationals would lack the incentive to shift profits from market jurisdictions to no-tax and low-tax jurisdictions if these profits were taxed at the same rate anyway. Many capital-importing jurisdictions would re-evaluate their existing incentive toolkits to prevent multinationals from bringing back profits to the jurisdictions where they originate from.

Figure 6. Distribution of Estimated Revenue Gains in the Base Case (With QDMTTs)



Investment hubs could theoretically draw on two sorts of instruments to remain attractive. On the one hand, jurisdictions could replace existing tax incentive schemes such as concessionary tax rates or tax holidays into grants and qualified refundable tax credits (QRTCs) defined in Article 10 of the Pillar Two Model Rules (2021e, p. 64). Grants and QRTCs are more attractive for multinationals because they are treated as GloBE income of the recipient entity whereas a non-qualifying tax credit gets deducted from the tax liability. On the other hand, several jurisdictions have already announced to implement non-tax incentive schemes³³. The possibilities to return potential tax revenue gains to multinationals include subsidies, interest-free loans, discounted or free land, and other non-fiscal incentives such as relaxing land or company ownership (Tan, 2022).

Replacing tax incentive schemes with subsidies might reduce the global gains from Pillar Two dramatically. It is not clear yet how many jurisdictions are going to implement QDMTTs

³³ Among them Singapore, Switzerland, and Vietnam.

and how many of these jurisdictions are going to revise their incentive toolkit, but the approach could reduce global gains to zero. In fact, Pillar Two could even have a negative net effect if the race-to-the bottom in corporate taxation turns into a subsidy race.

However, it is evident that jurisdictions could in principle generate more revenue if there were a political consensus to make the reform far-reaching. At least four design choices pare the revenue potential of Pillar Two. First, the rules introduce the possibility of claiming a GloBE loss deferred tax asset and carrying it forward to subsequent fiscal years. Under the assumptions highlighted in Section 3.2.3., I find that the loss carry-forward mechanism offers multinationals the chance to reduce corporate tax payments substantially. Figure 5 highlights that the total tax revenue effect could be ten percent higher if this mechanism were not introduced. But the depressing effect on tax revenues may be even larger than estimated. It is important to note that the estimate is derived from historical data such as the average size of negative accounting profit between 2016 and 2019. Corporate losses in 2020 cast a shadow on future Pillar Two revenue³⁴. On top of that, not all tax systems allow businesses to carry forward losses to subsequent years. Thus, many businesses were not incentivized to optimize their loss accounting in the past. This may change with the new provisions under the global corporate tax reform.

Second, jurisdictions could collect an additional \$1.6 billion in tax revenue if fewer types of ownership were excluded. Most notably, the reform considers entities owned by governments or investment funds to be out of scope. They will not be subject to the minimum corporate tax rate in future. Suppose one ignores for a moment that this approach distorts investment decisions because it only increases the tax burden of most privately-owned multinationals, thereby giving state-owned entities a competitive edge. It is puzzling that investment funds are excluded from the reform. Private equity funds, for instance, grow much faster than the overall economy but entities under their control will not pay 15 percent corporate tax in the future (Bain & Company, 2022). Excluding these entities may even lower Pillar Two revenue estimates if the pressure to pool assets in investment entities to circumvent Pillar Two regulation increases. Still, extending the scope of Pillar Two to state-owned entities and investment funds is already associated with comparatively small increases in Pillar Two revenue. The reason is that state-owned entities are highly unprofitable on average.

The third design feature that reduces potential revenue is the substance-based income exclusion that allows subgroups to deduct five percent of eligible payroll costs and five percent of

³⁴ BEA (2022a) data shows that corporate profits of US multinationals shrunk by 5.9 percent. This suggests that more firms realized losses than in previous years.

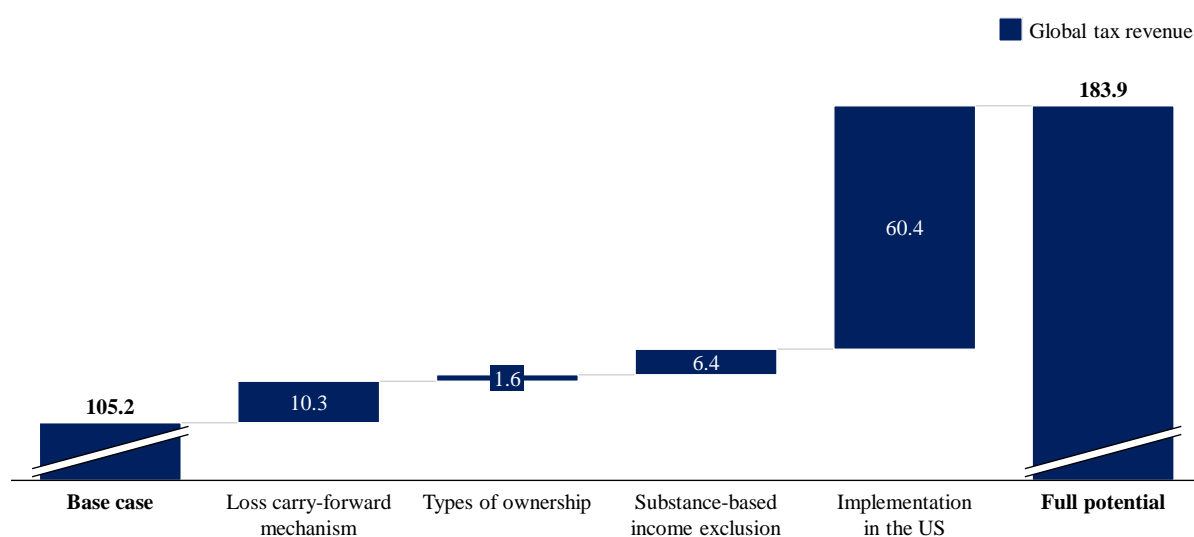
the carrying value of eligible tangible assets from the net GloBE income. Without this carve-out, excess profits would be \$1.3 trillion higher, and jurisdictions would be able to collect \$6.4 billion more. Individual subgroups may greatly reduce their tax burden, but the total effect of the carve-outs is not as substantial as one might think. The reason is that the local ETR is derived from the net GloBE income from which the carve-outs are subtracted to determine the excess profit. Multinationals may reduce this excess profit on which they eventually pay top-up tax, but the ETR used to compute the top-up tax stays the same regardless of the substance-based income exclusion. Tax authorities in high-income economies would benefit the most if the carve-outs were abandoned because the operations of businesses there tend to be more capital intensive. Unlike the loss carry-forward mechanism and the exclusion of frequent ownership types, the substance-based income exclusion follows a certain political economy logic. Enabling multinationals to carve out smaller parts of payroll costs and tangible assets represents an incentive to invest in productive assets like labor and machinery. Yet, this sort of preferential tax treatment might also incentivize multinationals to relocate economic activity to jurisdictions with more advantageous tax regimes. The substance-based exclusion of income has already been identified as a new cause of tax competition for US GILTI, and there is no compelling argument why the dynamic should be different for Pillar Two (Clausing et al., 2021). Finally, even though the intuition is backed up by investment theory, it remains debatable whether it is necessary to diminish the effect of a landmark tax reform to promote investment. Tinbergen's Rule (1952) states that the number of policy goals should always equal the number of policy instruments. The idea that a corporate tax reform could both stop the race-to-the bottom in corporate taxation and promote investment violates this principle. Therefore, one can argue that the substance-based income exclusion is a provision worth revisiting.

By far, the most substantial tax revenue increase would be generated if the United States implemented GloBE rules instead of US GILTI. But it is generally assumed that the US global intangible low-taxed income (GILTI) regime, introduced through TCJA, and Pillar Two will coexist (OECD, 2020b, p. 21). Tax authorities in the US will not apply a qualified IIR but tax the globally blended low-taxed foreign profit of US multinationals through GILTI. Both regimes impose a minimum CIT rate on the foreign profit of US multinationals but differ in other characteristics (Blanchard, 2022). These include the definition of the tax base and Covered Taxes, the exact minimum tax level, and the design of the substance-based income exclusion. Initial estimates indicate that US multinationals paid \$12.5 billion more in corporate tax in 2019 due to GILTI in its original design (Joint Committee on Taxation, 2017). This stands in sharp

contrast with the hypothetical tax revenue gains under GloBE. This study concludes that tax authorities would have collected \$72.9 billion in corporate taxes, had Pillar Two been fully implemented in the US in 2019.

Although the Biden Administration remains committed to bringing GILTI in conformity with the OECD GloBE regime (Watson, 2022), it seems unlikely that the revenue upside is going to be realized any time soon. The House-passed Build Back Better Act (BBBA) would have increased the CIT rate on foreign profits to 15.8 percent for companies that make more than \$1 billion a year, would have replaced the global blending of foreign profit with jurisdictional blending, would have reduced the tangible assets carve-out from ten to five percent, and would have replaced the Base Erosion and Anti-Abuse Tax (BEAT) with a UTPR (Pomerleau, 2022). However, the BBBA failed in the Senate and essentially all changes in the corporate tax regime were set aside by the time the Inflation Reduction Act was signed into law (Watson, 2022; Wilhelm, 2022). The Joint Committee on Taxation (2022) estimates that just the implementation of the UTPR would have generated \$23 billion in 2024 and \$46 billion in 2025 suggesting that US tax revenue gains will increase the more its international taxation rules mirror Pillar Two. Although a thorough analysis of US corporate tax policy and estimating the gains from GILTI is outside the scope of this study, I confirm the view that implementing Pillar Two-like rules in the United States could boost tax revenues by \$72.9 billion in total or \$60.4 billion on top of GILTI.

Figure 5. Effect of Selected Adjustments on Potential Global Tax Revenue, in \$ billion



Note: The base case refers to the high estimate including low-taxed profit in high-tax jurisdictions. The four hypothetical adjustments show that the full potential of the reform is 75 percent higher. The adjustments build on each other, for instance, the third what-if scenario estimates the global tax revenue gains if there were no loss carry-forward mechanism, no ownership restriction, and no substance-based income exclusion. If Pillar Two was implemented in the US, tax authorities could collect a total of \$72.9 billion, of which \$60.4 billion come on top of the estimated \$12.5 billion revenue gains through GILTI that are included in the base case.

Finally, additional revenue potential could be unlocked if the de minimis exclusion rule and the €750 million threshold were lowered or abandoned. The de minimis exclusion provides for the top-up tax to be zero for a fiscal year if the average GloBE revenue of a constituent entity is less than €10 million and its average GloBE income is less than €1 million (OECD, 2021e, pp. 32–33). The revenue threshold exempts all multinationals with a global revenue below €750 million from the obligations under Pillar Two (OECD, 2021e, p. 8). Lowering or lifting these provisions would clearly extend the scope of the reform to a larger number of constituent entities. However, the purpose of these provisions is to reduce the administrative burden for smaller entities which is rooted in the belief that it must be as easy as possible to run a business. Future research could examine if lowering the revenue threshold to €500 million or €250 million outweighs the potential economic cost. Other avenues for further research concern the sensitivities of higher minimum CIT rates, for instance 17.5 percent or 20.0 percent, and the behavioral reactions of multinationals and governments.

6. Concluding Remarks

For tax authorities, implementing Pillar Two of the global corporate tax reform will be less lucrative than expected. I find that corporate tax revenue gains will fall in a range between \$68 billion and \$105 billion in the base case where US tax authorities raised \$12.5 billion through GILTI. The evidence casts doubt on the OECD's \$220 billion revenue claim because the

interaction between Pillar One and Pillar Two would further reduce global tax revenue compared to the scenario modeled here. A considerable part of the discrepancy can be explained by recently changed provisions that were not reflected in previous analyses like the OECD's EIA (2020a). For instance, the first systematic evaluation of the loss carry-forward mechanism and the consistent application of the €750 million revenue threshold across data sources drove down the potential revenue gain. Had global profits in the reference year 2019 not substantially exceeded 2016 profits, the year which OECD (2020a) uses as a reference point, the revenue estimate would be even lower. From this I draw the conclusion that the reform can only do so much to reduce government fiscal deficits after the crisis. Nevertheless, the global corporate tax reform can be considered a milestone as, for the first time, 137 jurisdictions agreed to adopt measures to counter the race-to-the bottom in cross-border taxation. Pillar Two creates a level playing field for participating jurisdictions and works as a safeguard against unilateral tax measures becoming more distortive.

Four What-If analyses reveal that adjusting the GloBE rules and implementing Pillar Two in the US could increase tax revenue gains by another 75 percent. I show that the loss carry-forward mechanism is an effective instrument through which multinationals may minimize corporate tax payments. The exclusion of frequent types of ownership and the substance-based income exclusion lowers global Pillar Two revenue. At the same time, US tax authorities could collect more than four times the revenue US GILTI yields if the United States implements an IIR and a UTPR in line with Pillar Two. In the current setup with US GILTI running in parallel, US multinationals benefit from a 4.5 percentage point corporate tax advantage over non-US firms falling under the OECD rules³⁵.

Finally, this paper offers the first tally of tax revenue gains by jurisdiction. The results are twofold. First, gains at the jurisdiction level will be distributed highly unevenly although the exact estimates depend on implementation decisions at the jurisdiction level. If no jurisdiction implements a QDMTT, high per capita income countries in the Americas, Europe, and Asia can count on the lion's share of incremental tax revenue and investment hubs are expected to be better off. In contrast, middle- and low-income countries gain less than \$15 billion. Some jurisdictions are going to go away almost empty-handed; 133 out of 221 jurisdictions (60 percent) are estimated to gain less than \$10 million in CIT revenue each as a result of implementing Pillar Two. If no-tax and low-tax jurisdictions implement QDMTTs, investment hubs might

³⁵ The 10.5 effective US tax rate on GILTI is supposed to increase to 13.125 percent in 2026 (Internal Revenue Service, 2021).

collect 89 percent of additional revenue. To remain attractive, capital importing countries might invent new strategies to return the collected revenues to multinationals. This could cause a subsidy race. In sum, one is inclined to conclude that Pillar Two will benefit investment hubs and some high-income economies whereas nothing might change for poorer jurisdictions.

The consequences for multilateralism and international cooperation of this global corporate tax initiative may be far-reaching. If this landmark deal fails to satisfy a broad range of jurisdictions, decision-makers may be less willing to strive for multilateral solutions in the future. How quickly governments translate Pillar Two provisions into national legislation that is then implemented may be a first indicator of national policymakers' true assessment of this initiative.

7. Literature Review

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8. Appendix

In this appendix, I discuss issues related to the construction of my data set and provide deeper insight into the computation of the revenue gains both at the global and the jurisdiction level.

8.1. Definition of the Variables

The definitions of the variables considered in the four matrices are in line with OECD (2020) and the Pillar Two Model Rules (OECD, 2021) released in December 2021. Financial accounting data builds the backbone of all four variables. Limitations in the underlying data make it necessary to deviate from the ‘targets’ presented below at times. For instance, the turnover variable in CbCR data does not exclude intra-group dividends while the tangible assets variable in the same data source includes inventories. Another deviation the author is aware of concerns subcontracted labor expenses. They are included in Orbis payroll data from time to time but should not be part of payroll costs as defined in Article 5.3.

Table 3. Definition of the Variables Considered in the Four Matrices

Variable	Definition
Profit	Profit before tax, excluding dividends received from affiliates
Turnover	Revenues from sales to third-party and intra-group entities
Tangible assets	Property, plant and equipment, net of depreciation
Payroll	Expenditures for salaries and wages, including bonuses, social contributions, and other employee benefits

8.2. Data Sources

Table 4. Jurisdictions Covered by the Main Data Sources

Number of jurisdictions	Anonymized and aggregated CbCR data		ORBIS unconsolidated account data	
	Reitz (2022)	OECD (2020)	Reitz (2022)	OECD (2020)
1	Argentina	Australia	Australia	Australia
2	Australia	Austria	Austria	Belgium
3	Belgium	Belgium	Belgium	Bulgaria*
4	Bermuda	Bermuda	Bulgaria	China*
5	Brazil	Canada	China*	Croatia
6	Canada	Chile	Colombia	Czech Republic
7	Chile	Denmark	Croatia	Denmark
8	China	Finland	Czech Republic	Estonia
9	Denmark	France	Denmark*	Finland
10	Finland	India	Estonia	France
11	France	Indonesia	Finland*	Greece
12	Germany	Ireland	France	Italy
13	Greece	Italy	Germany*	Korea
14	India	Japan	Greece*	Latvia
15	Indonesia	Korea	Hungary	Lithuania

16	Ireland	Luxembourg	Iceland	Norway
17	Isle of Man	Mexico	Ireland	Poland
18	Italy	Netherlands	Italy	Portugal
19	Japan	Norway	Latvia	Russian Federation
20	Korea	Poland	Lithuania	Slovakia
21	Luxembourg	Singapore	Luxembourg	Slovenia
22	Malaysia	Slovenia	Norway*	Spain
23	Mexico	South Africa	Philippines	Sweden
24	Netherlands	Sweden	Poland	United Kingdom
25	Norway	United States	Portugal	
26	Peru		Romania	
27	Romania		Russian Federation	
28	Singapore		Serbia	
29	Slovenia		Singapore	
30	South Africa		Slovakia	
31	Spain		Slovenia	
32	Sweden		Spain	
33	Switzerland		Sweden*	
34	United Kingdom		Ukraine	
35	United States		United Kingdom	

Note: The quality of Orbis coverage for each affiliate jurisdiction has been assessed based on two criteria. To be considered, jurisdictions must have at least 750 firm observations in 2019, and aggregated revenue cannot be less than 70 percent of what is indicated through CbCR data. For some jurisdictions (*), Orbis coverage is deemed sufficiently good only for foreign-owned entities. Orbis data has not been used to derive payroll cost of affiliates based in China, Colombia, Greece, Latvia, Lithuania, the Philippines, the Russian Federation, and Singapore because of insufficient coverage (less than 70 percent of aggregated turnover covered).

Table 5. Coverage of Data Sources on Effective Tax Rates

Number of sources available	Number of jurisdictions		Share of world GDP		Share of global profit	
	Reitz (2022)	OECD (2020)	Reitz (2022)	OECD (2020)	Reitz (2022)	OECD (2020)
3 sources	42	42	86%	86%	92%	90%
1 or 2 sources	115	99	13%	12%	8%	10%
No source	64	81	1%	1%	0%	0%
Total	221	222	100%	100%	100%	100%

8.3. Treatment of Orbis Data

The rows corresponding to the affiliate jurisdictions in the profit, turnover, tangible assets, and payroll matrices are populated with unconsolidated accounting data from Orbis. The key advantage of this data source is extensive ownership information that allows to identify the ultimate parent jurisdiction of constituent entities belonging to multinationals. One disadvantage is that coverage of unconsolidated account data is highly uneven across jurisdictions. In OECD (2020a), data on no more than 24 reporting (affiliate) jurisdictions is considered good

enough to fill the matrices³⁶. However, data availability may have changed since. Kalemli-Ozcan et al. (2015) identify three reasons for this hypothesis. First, there is a reporting lag of up to two years, depending on the country. Second, Orbis continuously improves its data collection efforts over time as do the national statistics agencies that collect the data in the first place. Third, the Orbis web interface imposes a download cap that may result in missing data. Furthermore, I study 2019 data whereas 2016 is the base year in OECD (2020a).

For these reasons, I run a preliminary analysis that aims at identifying the jurisdictions for which the coverage of the focus variables could potentially be extensive enough to meet two criteria. To be considered, there must be at least 750 firm observations for a given jurisdiction, and the aggregated revenue in that jurisdiction must exceed 70 percent of the revenue figure in the CbCRs. This first step yields a total of 629,437 firms in 45 jurisdictions³⁷. Second, I apply the various cleaning steps explained in OECD (2020a, pp. 256–257) and filter for entities owned by industrial companies, banks, financial companies, insurance companies, employees & managers & directors, or one or more named individuals or families. Third, I eliminate all observations for which the operating turnover variable is unavailable for 2019. To reduce the number of observations dropping out of the sample, I use 2017 and 2018 data to extrapolate the 2019 turnover figure if possible. For instance, if turnover data is available for 2017 but not 2019, I multiply the 2017 value with the 2018 and 2019 GDP growth rates of the affiliate jurisdiction. I apply the same procedure to the profit / loss before tax, tangible fixed assets, and costs of employees variables. These steps reduce the sample size to 473,094 constituent entities in 35 jurisdictions listed in Table 4.

Eliminating all entities that are not part of a multinational further reduces the sample to 214,373 observations belonging to 15,125 different multinationals. Only observations that meet the criterion in Article 1.2 of the Pillar Two Model Rules (2021e, p. 8) – to have “at least one Entity or Permanent Establishment that is not located in the jurisdiction of the Ultimate Parent Entity” – remain in the sample. A 50 percent ownership threshold applies, which is in line with CbCR data. Constituent entities owned by multinationals with less than \$800 million in global revenue are dropped next. In contrast to OECD (2020a), this operation reflects the €750 million revenue threshold if an exchange rate of 1.067 is applied. From the remaining 134,419

³⁶ The coverage of payroll in Orbis unconsolidated account data is less extensive such that Orbis data on just 18 jurisdictions was used to fill the payroll matrix.

³⁷ Australia, Austria, Belgium, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech Republic, Denmark, Estonia, Germany, Greece, Finland, France, Hungary, Iceland, India, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Romania, Russia, Serbia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States

subsidiaries and 2,937 multinationals, I remove all subgroups with negative profits in 2019 to be consistent with CbCR data. Finally, I conduct a plausibility check on all subsidiaries with more than \$1 billion in total revenue in 2019. This additional procedure would not be necessary if I had not decided against implementing two steps from the rigorous cleaning process described in OECD (2020a, pp. 256–257). On the one hand, I do not winsorize the data based on the EBIT (profit before tax, tangible assets, payroll) to turnover ratios precisely because the extraordinary ratios are at the center of the reform. For instance, Microsoft Inc.’s Irish subsidiary Microsoft Round Island One recorded operating revenue of \$9,5 billion in 2019 despite employing just a few directors. On the other hand, I do not eliminate observations if the turnover variable gets multiplied (or divided) by more than the factor five in one year over 2017 to 2019 given that multinationals often restructure their operations to become more efficient. Among others, a major subsidiary of Mercedes-Benz Group AG would have fallen through the cracks after Daimler Financial Services AG was rebranded to Daimler Mobility AG in 2019. The final sample comprises 110,705 subsidiaries and 2,900 multinationals.

8.4. Computation

Figure 6. Tangible Assets Carve-Out in Jurisdictions With Good Orbis Coverage

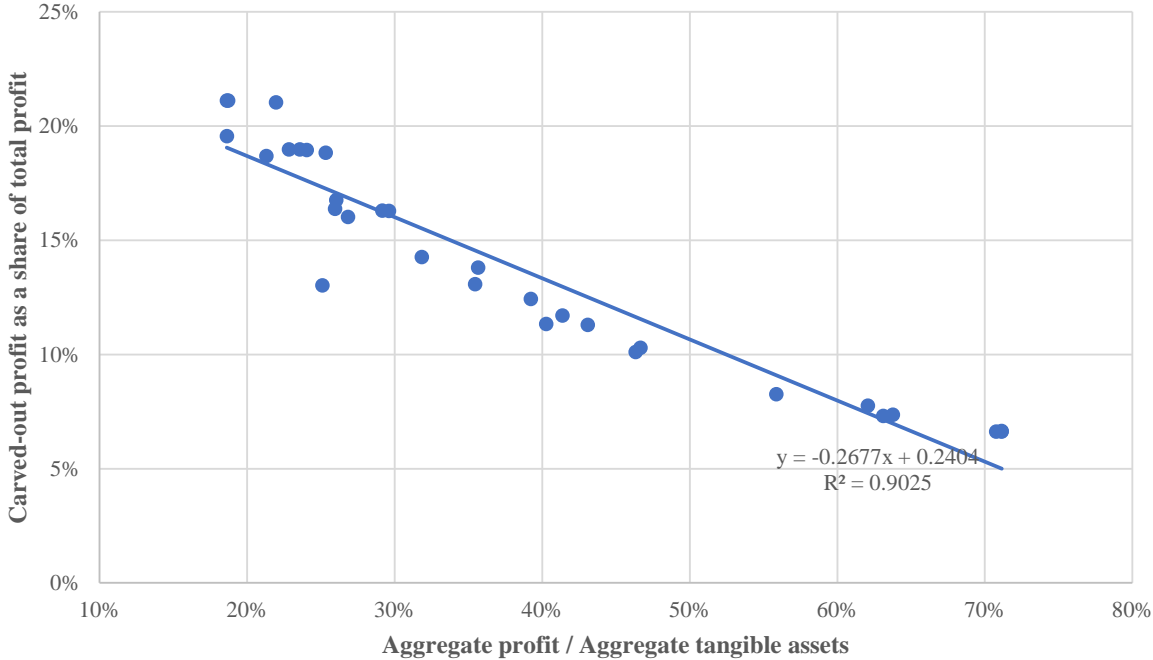


Figure 7. Payroll Carve-Out in Jurisdictions with Good Orbis Coverage

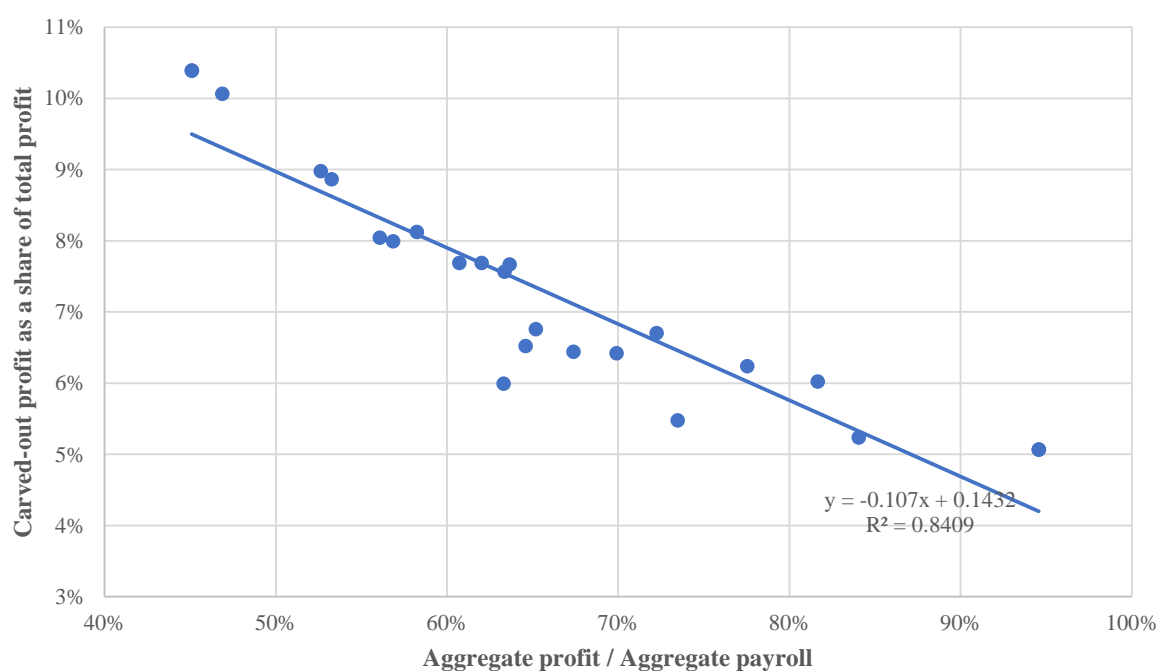


Table 6. Gravity Equation to Extrapolate Bilateral FDI Positions

	Bilateral FDI position
Distance, log	-0.401*** (0.036)
GDP of investor, log	0.414*** (0.022)
GDP of recipient, log	0.480*** (0.026)
GDP per capita of investor, log	1.321*** (0.070)
GDP per capita of recipient, log	0.822*** (0.056)
Statutory CIT rate of recipient	-0.033*** (0.007)
Constant	-15.05*** (1.602)
N	36123

Note: This table presents the regression results of the Poisson pseudo-maximum-likelihood estimation used to extrapolate bilateral FDI positions. Standard errors are reported in parentheses. Results are reported at the one percent (***), five percent (**), and ten percent (*) significance levels.

Table 7. Gravity Equation for Extrapolations in the Turnover Matrix

	Bilateral turnover of multinationals
Distance, log	-0.092 (0.087)
GDP of investor, log	0.406***

	(0.068)
GDP of recipient, log	0.494***
	(0.057)
GDP per capita of investor, log	0.511***
	(0.074)
GDP per capita of recipient, log	0.447***
	(0.091)
Constant	-6.273***
	(1.409)
N	5794

Note: This table presents the regression results of the Gamma pseudo-maximum-likelihood estimation used for extrapolations in the turnover matrix. Standard errors are reported in parentheses. Results are reported at the one percent (***), five percent (**), and ten percent (*) significance levels.

8.5. Results

Table 8. Jurisdiction Groups in the Aggregated Matrices

Panel A						
Americas - High income	Europe & Central Asia - High income	East Asia & Pacific - High income	Middle East & North Africa - High income	Latin Am. & Caribbean - Middle and low income	Europe & Central Asia - Middle and low income	East Asia & Pacific - Middle and low income
Antigua and Barbuda	Andorra	Australia	Bahrain	Argentina	Albania	American Samoa
Aruba	Austria	Brunei Darussalam	Israel	Belize	Armenia	Cambodia
Bonaire	Belgium	Cook Islands	Kuwait	Bolivia	Azerbaijan	China
Canada	Croatia	French Polynesia	Oman	Brazil	Belarus	Fiji
Chile	Czech Republic	Guam	Qatar	Colombia	Bosnia and Herzegovina	Indonesia
Curaçao	Denmark	Japan	Saudi Arabia	Costa Rica	Bulgaria	Kiribati
Montserrat	Estonia	Korea	United Arab Emirates	Cuba	Georgia	DPRK
Panama	Faroe Islands	Macao		Dominica	Kazakhstan	Lao PDR
Puerto Rico	Finland	New Caledonia		Dominican Republic	Kyrgyzstan	Malaysia
St. Kitts and Nevis	France	New Zealand		Ecuador	North Macedonia	Micronesia
Sint Maarten	Germany	Northern Mariana Islands		El Salvador	Moldova	Mongolia
Trinidad and Tobago	Greece	Palau		Grenada	Montenegro	Myanmar
United States	Greenland	Chinese Taipei		Guatemala	Romania	Nauru
Uruguay	Iceland			Guyana	Russian Federation	Papua New Guinea
Virgin Islands, U.S.	Italy			Haiti	Serbia	Philippines
	Latvia			Honduras	Tajikistan	Samoa
	Liechtenstein			Jamaica	Turkey	Solomon Islands
	Lithuania			Mexico	Turkmenistan	Thailand

	Monaco Norway Poland Portugal San Marino Slovakia Slovenia Spain Sweden United Kingdom			Nicaragua Paraguay Peru St. Lucia St. Vincent and the Gren. Suriname Venezuela	Ukraine Uzbekistan	Timor-Leste Tonga Tuvalu Vanuatu Viet Nam
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Panel B

Middle East & North Africa - Middle and low income	South Asia - Middle and low income	Sub-Saharan - High and middle income	Sub-Saharan - Low income	Americas investment hubs	European investment hubs	Other investment hubs
Algeria	Afghanistan	Angola	Benin	Anguilla	Cyprus	Hong Kong
Djibouti	Bangladesh	Botswana	Burkina Faso	Bahamas	Gibraltar	Liberia
Egypt	Bhutan	Cameroon	Burundi	Barbados	Guernsey	Malta
Iran	India	Cape Verde	Central African Republic	Bermuda	Hungary	Marshall Islands
Iraq	Maldives	Comoros	Chad	Cayman Islands	Ireland	Mauritius
Jordan	Nepal	Congo	DRC	Turks and Caicos Islands	Isle of Man	Mozambique
Lebanon	Pakistan	Côte d'Ivoire	Eritrea	Virgin Islands, British	Jersey	Singapore
Libya	Sri Lanka	Equatorial Guinea	Ethiopia		Luxembourg	
Morocco		Gabon	Gambia		Netherlands	
Palestinian Authority		Ghana	Guinea		Switzerland	
Syria		Kenya	Guinea-Bissau			
Tunisia		Lesotho	Madagascar			
Yemen		Mauritania	Malawi			
		Namibia	Mali			
		Nigeria	Niger			
		Sao Tome and Principe	Rwanda			
		Senegal	Sierra Leone			
		Seychelles	Somalia			
		South Africa	South Sudan			
		Sudan	Tanzania			
		Eswatini	Togo			
		Zambia	Uganda			
		Zimbabwe				

Note: The groups are the same as in OECD (2020a) and follow the World Bank classification of jurisdictions by income levels and geographic regions. Investment hubs are jurisdictions with a total inward FDI position above 150% of GDP.

Table 9. Effective Tax Rates, in Percent

0 - 5 percent		5 -10 percent		10 - 15 percent		15 -20 percent		20 - 25 percent		25 -30 percent		30 - 50 percent	
DZA	0.4	ABW	5.1	ALB	15.0	AFG	20.0	BES	25.0	AUS	27.0	AGO	32.8
ASM	1.5	BIH	6.6	CRI	12.1	ARM	20	BWA	21.2	BTN	30.0	ARG	31.9
AND	5.0	BGR	7.0	CYP	10.8	AUT	18.7	CPV	25.0	BDI	30.0	BGD	32.8
AIA	5.0	BFA	8.7	DOM	12.9	AZE	16.6	COG	24.1	CAF	30.0	CMR	32.8
ATG	2.6	HRV	7.8	DEU	13.5	BLR	18.8	DJI	25.0	CIV	26.7	TCD	35.0
BHS	0.2	EST	8.2	GHA	14.5	BEL	18.2	DMA	25.0	ERI	30.0	COL	31.4
BHR	2.6	GTM	8.1	HKG	13.3	BRA	16.3	EGY	21.1	FRA	27.7	COM	50.0
BRB	2.0	HUN	8.5	LVA	10.6	KHM	18.2	SLV	21.3	PYF	28.0	COD	35.0
BLZ	2.1	IRN	9.0	LTU	14.8	CAN	19.7	ETH	24.6	GAB	25.2	CUB	35.0
BEN	0.4	IRL	6.7	MKD	12.8	CHL	15.5	GNB	25.0	GMB	30.0	GNQ	35.0
BMU	1.9	JOR	7.5	MYS	14.3	CHN	19.6	HND	23.5	GUY	27.5	GRL	31.8
BOL	0.4	KWT	6.9	MDV	15.0	COK	20.0	JAM	25.0	HTI	30.0	GUM	35.0
BRN	1.6	KGZ	10.0	MDA	12.0	CZE	18.0	JPN	22.2	ISL	25.4	GIN	35.0
CYM	0.4	LAO	9.5	NLD	11.0	DNK	18.2	KOR	21.0	IND	26.6	KEN	31.1
CUW	3.6	LIE	6.1	PSE	15.0	ECU	19.7	LSO	25.0	IDN	28.1	KIR	35.0
GEO	2.8	LUX	6.0	QAT	11.3	FRO	18.0	LBR	25.0	MLI	30.0	PRK	32.5
GIB	2.7	MAC	6.3	ROU	13.1	FJI	17.3	MDG	20.3	MEX	27.1	MCO	33.1
GRD	4.8	MNE	9.9	SEN	13.4	FIN	15.9	MWI	21.2	MSR	30.0	NGA	32.8
GGY	2.5	MMR	8.2	SVN	14.5	GRC	19.4	MRT	25.0	NIC	26.8	MNP	35.0
IMN	2.8	PAN	8.3	SOM	12.3	IRQ	17.1	FSM	21.0	NER	30.0	OMN	32.8
JEY	3.4	PNG	9.5	LKA	10.7	ISR	16.6	MNG	20.1	WSM	27.0	PAK	32.1
KAZ	0.4	PRY	6.4	UKR	13.6	ITA	15.4	MAR	23.8	SLE	30.0	PER	34.8
MHL	5.0	SAU	9.8	URY	11.1	LBN	17.6	MOZ	21.1	SLB	30.0	RWA	32.8
MUS	3.3	SRB	9.2	VNM	14.9	LBY	20.0	NPL	25.0	ZAF	27.7	SDN	35.0
PLW	4.0	SGP	5.8	YEM	14.5	MLT	16.6	NCL	23.4	SYR	28.0	SUR	36.0
PRI	1.4	CHE	8.0			NAM	17.0	NOR	23.5	TGO	29.0	ARE	31.2
KNA	4.4	TLS	6.8			NRU	20.0	STP	25.0	TTO	27.9	VIR	38.5
LCA	3.2	TUN	6.5			NZL	19.5	SYC	21.7	TUV	30.0		
VCT	4.6	TKM	8.0			PHL	19.4	SVK	22.8	ZMB	26.5		
SXM	5.0	UZB	7.5			POL	15.1	SSD	25.0	ZWE	25.8		
TCA	5.0					PRT	17.5	SWZ	21.0				
VUT	0.0					RUS	19.3	TJK	23.0				
VGB	1.8					SMR	17.0	TZA	21.8				
						ESP	15.5	TON	25.0				
						SWE	19.6	TUR	20.2				
						TWN	15.6	UGA	23.2				
						THA	16.1						
						GBR	19.0						
						USA	19.2						
						VEN	19.8						

Note: The statutory CIT rate is used as a proxy if the ETR cannot be derived from any 'hard' data source.

Table 10. Turnover Matrix Aggregated by Broad Income Groups and Regions

In \$ billion	Americas - High income	Europe & Central Asia - High income	East Asia & Pacific - High income	Middle East & North Africa - High income	Latin Am. & Caribbean - Middle and low income	Europe & Central Asia - Middle and low income	East Asia & Pacific - Middle and low income	Middle East & North Africa - Middle and low income	South Asia - Middle and low income	Sub-Saharan - High and middle income	Sub-Saharan - Low income	Americas investment hubs	European investment hubs	Other investment hubs	Total
Americas - High income	14,934	1,868	1,308	74	136	7	48	2	57	45	1	71	832	41	19,424
Europe & Central Asia - High income	1,609	9,718	625	12	52	43	193	2	58	138	2	85	1,013	29	13,580
East Asia & Pacific - High income	516	503	8,642	1	9	1	84	1	11	26	1	18	75	21	9,909
Middle East & North Africa - High income	72	65	19	733	1	1	14	1	16	3	1	5	24	2	957
Latin Am. & Caribbean - Middle and low income	476	460	115	1	1,485	2	39	1	5	10	1	11	101	2	2,710
Europe & Central Asia - Middle and low income	110	278	73	2	3	560	20	1	4	9	1	8	94	6	1,168
East Asia & Pacific - Middle and low income	583	484	1,069	1	4	2	7,809	1	16	5	1	283	126	220	10,604
Middle East & North Africa - Middle and low income	18	55	4	1	1	1	4	74	1	1	1	0	6	0	169
South Asia - Middle and low income	102	95	64	0	1	1	13	0	713	1	0	9	25	4	1,028
Sub-Saharan - High and middle income	52	132	23	1	2	2	12	1	4	181	1	1	18	1	431
Sub-Saharan - Low income	2	13	2	1	1	1	3	1	2	4	9	0	1	0	42
Americas investment hubs	189	4	27	0	29	1	18	0	1	2	0	40	25	87	422
European investment hubs	1,160	770	173	2	47	2	24	1	8	92	1	42	1,101	11	3,433
Other investment hubs	727	531	484	0	5	20	652	0	16	42	0	69	118	482	3,145
Total	20,550	14,977	12,628	829	1,779	643	8,933	86	911	559	21	641	3,559	907	67,022

Table 11. Profit Matrix Aggregated by Broad Income Groups and Regions

In \$ billion	Americas - High income	Europe & Central Asia - High income	East Asia & Pacific - High income	Middle East & North Africa - High income	Latin Am. & Caribbean - Middle and low income	Europe & Central Asia - Middle and low income	East Asia & Pacific - Middle and low income	Middle East & North Africa - Middle and low	South Asia - Middle and low income	Sub-Saharan - High and middle income	Sub-Saharan - Low income	Americas investment hubs	European investment hubs	Other investment hubs	Total
Americas - High income	1,724	123	86	2	11	1	3	0	3	2	0	6	39	2	2,001
Europe & Central Asia - High income	169	1,177	39	5	8	1	7	0	3	4	0	10	85	2	1,510
East Asia & Pacific - High income	63	48	701	1	1	0	8	0	0	8	0	4	8	7	849
Middle East & North Africa - High income	15	11	6	20	0	1	3	0	1	3	0	0	6	1	66
Latin Am. & Caribbean - Middle and low income	49	51	8	0	130	0	4	0	0	2	0	2	11	1	261
Europe & Central Asia - Middle and low income	10	28	6	1	0	78	2	0	0	1	0	0	15	1	144
East Asia & Pacific - Middle and low income	57	54	76	1	0	0	904	0	2	0	0	45	10	19	1,168
Middle East & North Africa - Middle and low income	3	5	1	1	0	0	1	1	0	0	0	0	1	0	12
South Asia - Middle and low income	17	8	6	0	0	0	1	0	83	0	0	1	3	1	121
Sub-Saharan - High and middle income	8	5	2	0	0	0	1	0	0	33	0	0	1	0	50
Sub-Saharan - Low income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Americas investment hubs	113	9	6	1	4	1	5	0	1	1	0	8	26	95	270
European investment hubs	262	136	22	3	6	8	4	0	1	10	0	4	189	3	649
Other investment hubs	80	49	26	1	3	3	43	0	2	2	0	25	13	127	373
Total	2,571	1,702	985	36	163	95	986	2	98	67	0	106	408	259	7,476

Table 12. Tangible Assets Matrix Aggregated by Broad Income Groups and Regions

In \$ billion	Americas - High income	Europe & Central Asia - High income	East Asia & Pacific - High income	Middle East & North Africa - High income	Latin Am. & Caribbean - Middle and low income	Europe & Central Asia - Middle and low income	East Asia & Pacific - Middle and low income	Middle East & North Africa - Middle and low	South Asia - Middle and low income	Sub-Saharan - High and middle income	Sub-Saharan - Low income	Americas investment hubs	European investment hubs	Other investment hubs	Total
Americas - High income	4,824	463	282	23	56	2	14	1	19	9	0	31	227	8	5,959
Europe & Central Asia - High income	335	3,312	91	7	22	11	29	1	15	18	1	54	194	18	4,108
East Asia & Pacific - High income	201	172	2,396	0	3	0	37	0	6	20	0	18	18	17	2,890
Middle East & North Africa - High income	26	11	3	204	0	0	7	0	12	0	0	0	5	0	270
Latin Am. & Caribbean - Middle and low income	135	130	28	0	691	1	18	1	1	6	1	5	38	2	1,055
Europe & Central Asia - Middle and low income	35	66	20	0	1	177	13	0	1	6	0	6	37	5	367
East Asia & Pacific - Middle and low income	131	115	209	0	2	1	5,243	0	4	3	0	158	37	70	5,974
Middle East & North Africa - Middle and low income	6	13	1	0	0	0	2	20	0	0	0	0	2	0	46
South Asia - Middle and low income	23	19	14	0	1	0	7	0	738	0	0	1	12	1	817
Sub-Saharan - High and middle income	40	32	8	0	1	1	11	0	2	115	0	0	6	0	219
Sub-Saharan - Low income	1	4	1	0	1	0	1	0	1	1	3	0	0	0	14
Americas investment hubs	31	1	2	0	7	0	22	0	1	0	0	31	2	1	98
European investment hubs	285	149	42	1	64	1	30	0	1	12	0	15	345	5	951
Other investment hubs	66	73	41	0	0	5	221	0	6	3	0	26	13	155	609
Total	6,139	4,559	3,137	237	849	200	5,656	25	808	194	8	346	936	282	23,376

Table 13. Payroll Matrix Aggregated by Broad Income Groups and Regions

In \$ billion	Americas - High income	Europe & Central Asia - High income	East Asia & Pacific - High income	Middle East & North Africa - High income	Latin Am. & Caribbean - Middle and low income	Europe & Central Asia - Middle and low income	East Asia & Pacific - Middle and low income	Middle East & North Africa - Middle and low	South Asia - Middle and low income	Sub-Saharan - High and middle income	Sub-Saharan - Low income	Americas investment hubs	European investment hubs	Other investment hubs	Total
Americas - High income	4,125	296	121	5	17	1	8	0	12	4	0	8	137	5	4,739
Europe & Central Asia - High income	674	1,028	49	1	6	3	11	0	4	4	0	13	254	5	2,053
East Asia & Pacific - High income	59	78	753	0	2	0	9	0	3	1	0	2	16	1	923
Middle East & North Africa - High income	13	7	1	115	0	0	2	0	4	0	0	1	4	0	147
Latin Am. & Caribbean - Middle and low income	55	43	9	0	179	0	5	0	1	1	0	3	14	0	310
Europe & Central Asia - Middle and low income	12	25	7	0	0	45	3	0	1	1	0	2	8	1	106
East Asia & Pacific - Middle and low income	51	48	105	0	1	0	991	0	4	0	0	51	23	36	1,311
Middle East & North Africa - Middle and low income	2	6	0	0	0	0	1	12	0	0	0	0	1	0	22
South Asia - Middle and low income	24	12	5	0	0	0	2	0	176	0	0	2	4	1	226
Sub-Saharan - High and middle income	6	14	2	0	0	0	2	0	1	15	0	0	3	0	43
Sub-Saharan - Low income	0	1	0	0	0	0	0	0	0	0	1	0	0	0	5
Americas investment hubs	15	0	2	0	3	0	2	0	0	0	0	9	6	11	49
European investment hubs	55	65	12	0	4	0	2	0	2	5	0	9	138	1	294
Other investment hubs	36	58	49	0	1	1	81	0	4	2	0	14	15	80	342
Total	5,127	1,681	1,116	122	213	52	1,118	14	212	35	3	114	623	141	10,571

Table 14. Jurisdiction Level Estimates Without QDMTTs, in \$ million

Jurisdiction	Low	High	Jurisdiction	Low	High	Jurisdiction	Low	High
Americas - High income			Japan	2,585.3	4,308.9	Viet Nam	59.0	98.3
Antigua and Barbuda	1.0	1.6	Korea	388.1	646.8	Total	5,120.5	8,534.2
Aruba	1.4	2.4	Macao	103.9	173.1	Europe & Central Asia - High income		
Bonaire	0.2	0.3	New Caledonia	1.0	1.7	Andorra	3.6	6.0
Canada	1,432.1	2,386.8	New Zealand	46.2	77.0	Austria	234.4	390.6
Chile	48.8	81.4	Northern Mariana Islands	1.1	1.8	Belgium	942.6	1,571.0
Curaçao	13.8	23.0	Palau	1.1	1.8	Croatia	9.5	15.9
Montserrat	0.2	0.3	Chinese Taipei	168.0	280.0	Czech Republic	109.8	183.1
Panama	23.8	39.7	Total	3,954.3	6,590.5	Denmark	355.1	591.8
Puerto Rico	333.8	556.4	East Asia & Pacific - Middle and low income			Estonia	5.8	9.7
St. Kitts and Nevis	1.7	2.9	American Samoa	1.8	3.1	Faroe Islands	1.6	2.6
Sint Maarten	0.5	0.9	Cambodia	1.7	2.8	Finland	193.4	322.4
Trinidad and Tobago	1.5	2.5	China	3,541.8	5,903.1	France	2,468.3	4,113.8
United States	38,089.0	63,481.7	Fiji	0.7	1.2	Germany	3,176.3	5,293.9
Uruguay	15.9	26.6	Indonesia	600.0	999.9	Greece	25.8	42.9
Virgin Islands, U.S.	2.0	3.3	Kiribati	0.6	1.1	Greenland	1.8	3.1
Total	39,965.8	66,609.7	DPRK	0.7	1.2	Iceland	14.9	24.8
Americas investment hubs			Lao PDR	0.8	1.3	Italy	692.1	1,153.4
Anguilla	1.5	2.5	Malaysia	673.2	1,122.0	Latvia	7.2	11.9
Bahamas	-	-	Micronesia	0.4	0.6	Liechtenstein	148.3	247.2
Barbados	5.7	9.5	Mongolia	0.8	1.3	Lithuania	4.8	8.1
Bermuda	656.0	1,093.3	Myanmar	6.7	11.2	Monaco	0.8	1.4
Cayman Islands	-	-	Nauru	0.5	0.9	Norway	97.9	163.2
Turks and Caicos Islands	1.1	1.8	Papua New Guinea	0.8	1.4	Poland	124.2	207.0
Virgin Islands, British	100.1	166.8	Philippines	69.7	116.2	Portugal	50.5	84.2
Total	764.4	1,274.0	Samoa	4.0	6.7	San Marino	1.1	1.8
East Asia & Pacific - High income			Solomon Islands	0.5	0.9	Slovakia	34.5	57.5
Australia	623.1	1,038.5	Thailand	155.3	258.9	Slovenia	14.0	23.4
Brunei Darussalam	10.1	16.9	Timor-Leste	0.5	0.9	Spain	667.3	1,112.1
Cook Islands	24.8	41.3	Tonga	0.5	0.8	Sweden	376.8	627.9
French Polynesia	1.2	1.9	Tuvalu	0.2	0.4	United Kingdom	4,861.4	8,102.3
Guam	0.5	0.8	Vanuatu	-	-	Total	14,623.9	24,373.1

Jurisdiction	Low	High	Jurisdiction	Low	High	Jurisdiction	Low	High
Europe & Central Asia - Middle and low income			Latin Am. & Caribbean - Middle and low income			UAE		
Albania	0.8	1.4	Argentina	42.3	70.6	Total	162.3	270.6
Armenia	1.1	1.8	Belize	1.5	2.5	Middle East & North Africa - Middle and low income		
Azerbaijan	13.3	22.2	Bolivia	-	-	Algeria	-	-
Belarus	2.9	4.9	Brazil	719.7	1,199.6	Djibouti	0.7	1.2
Bosnia and Herzegovina	2.0	3.4	Colombia	117.6	196.0	Egypt	9.5	15.9
Bulgaria	14.9	24.8	Costa Rica	40.4	67.3	Iran	4.4	7.3
Georgia	1.8	3.1	Cuba	2.7	4.5	Iraq	1.7	2.9
Kazakhstan	-	-	Dominica	0.7	1.2	Jordan	2.0	3.3
Kyrgyzstan	0.6	1.0	Dominican Republic	3.1	5.2	Lebanon	3.5	5.9
North Macedonia	1.3	2.1	Ecuador	8.4	14.1	Libya	24.4	40.6
Moldova	1.0	1.6	El Salvador	1.5	2.5	Morocco	4.8	8.0
Montenegro	1.1	1.9	Grenada	0.9	1.4	Palestinian Authority	1.7	2.8
Romania	49.7	82.8	Guatemala	6.9	11.5	Syria	1.0	1.6
Russian Federation	943.5	1,572.5	Guyana	2.7	4.5	Tunisia	2.5	4.2
Serbia	13.1	21.8	Haiti	0.7	1.1	Yemen	0.8	1.3
Tajikistan	0.6	1.0	Honduras	1.9	3.1	Total	56.9	94.9
Turkey	63.1	105.1	Jamaica	3.2	5.3	Other investment hubs		
Turkmenistan	1.5	2.4	Mexico	178.1	296.8	Hong Kong	1,471.6	2,452.7
Ukraine	34.6	57.7	Nicaragua	1.4	2.4	Liberia	0.8	1.3
Uzbekistan	1.3	2.2	Paraguay	1.1	1.9	Malta	13.2	21.9
Total	1,148.2	1,913.7	Peru	95.0	158.3	Marshall Islands	2.4	4.0
European investment hubs			Saint Lucia	0.9	1.5	Mauritius	59.2	98.7
Cyprus	112.8	188.0	St. Vincent and the Gren.	1.2	1.9	Mozambique	0.8	1.3
Gibraltar	5.7	9.5	Suriname	0.8	1.4	Singapore	13,911.1	23,185.1
Guernsey	23.9	39.8	Venezuela	5.9	9.9	Total	15,459.0	25,765.0
Hungary	107.2	178.7	Total	1,238.6	2,064.4	South Asia - Middle and low income		
Ireland	2,504.6	4,174.4	Middle East & North Africa - High income			Afghanistan	0.6	1.0
Isle of Man	30.8	51.3	Bahrain	87.7	146.1	Bangladesh	2.4	4.0
Jersey	93.3	155.5	Israel	155.3	258.9	Bhutan	0.6	1.0
Luxembourg	999.3	1,665.4	Kuwait	106.9	178.1	India	410.8	684.6
Netherlands	1,943.6	3,239.3	Oman	8.5	14.2	Maldives	0.8	1.3
Switzerland	3,700.7	6,167.9	Qatar	33.4	55.7	Nepal	0.8	1.3
Total	9,521.8	15,869.7	Saudi Arabia	114.5	190.8	Pakistan	13.1	21.8

Jurisdiction	Low	High	Jurisdiction	Low	High
Sri Lanka	2.9	4.9	Chad	0.6	1.0
Total	431.8	719.7	DRC	0.8	1.3
Sub-Saharan - High and middle income			Eritrea	0.5	0.9
Angola	1.1	1.8	Ethiopia	1.2	2.0
Botswana	1.0	1.6	Gambia	0.4	0.7
Cameroon	1.0	1.6	Guinea	0.7	1.2
Cape Verde	0.6	1.0	Guinea-Bissau	0.4	0.6
Comoros	0.4	0.7	Madagascar	0.9	1.6
Congo	1.0	1.7	Malawi	0.8	1.4
Côte d'Ivoire	3.7	6.2	Mali	0.7	1.1
Equatorial Guinea	0.9	1.4	Niger	0.6	1.0
Gabon	1.1	1.9	Rwanda	0.6	1.0
Ghana	1.7	2.8	Sierra Leone	0.5	0.8
Kenya	6.0	10.0	Somalia	0.5	0.8
Lesotho	0.5	0.8	South Sudan	0.3	0.5
Mauritania	1.2	1.9	Tanzania	1.4	2.3
Namibia	1.6	2.7	Togo	0.7	1.1
Nigeria	9.5	15.9	Uganda	0.8	1.3
Sao Tome and Principe	0.3	0.6	Total	13.9	23.1
Senegal	0.8	1.4			
Seychelles	7.5	12.4			
South Africa	688.0	1,146.6			
Sudan	0.7	1.2			
Eswatini	1.0	1.7			
Zambia	0.8	1.3			
Zimbabwe	1.1	1.8			
Total	731.5	1,219.1			
Sub-Saharan - Low income					
Benin	-	-			
Burkina Faso	0.7	1.1			
Burundi	0.3	0.5			
Central African Republic	0.4	0.7			

Table 15. Jurisdiction Level Estimates With QDMTTs, in \$ million

Jurisdiction	Low	High	Jurisdiction	Low	High	Jurisdiction	Low	High
Americas - High income			Japan	-	-	Viet Nam	-	-
Antigua and Barbuda	0.4	0.6	Korea	-	-	Total	159.5	239.2
Aruba	4.0	6.6	Macao	345.0	517.5	Europe & Central Asia - High income		
Bonaire	-	-	New Caledonia	-	-	Andorra	4.9	7.4
Canada	-	-	New Zealand	-	-	Austria	-	-
Chile	-	-	Northern Mariana Islands	-	-	Belgium	-	-
Curaçao	44.7	74.6	Palau	1.9	2.8	Croatia	80.3	120.5
Montserrat	-	-	Chinese Taipei	-	-	Czech Republic	-	-
Panama	136.3	227.2	Total	365.8	548.7	Denmark	-	-
Puerto Rico	4,729.7	7,882.8	East Asia & Pacific - Middle and low income			Estonia	27.6	41.4
St. Kitts and Nevis	4.9	8.1	American Samoa	5.0	7.4	Faroe Islands	-	-
Sint Maarten	2.4	3.9	Cambodia	-	-	Finland	-	-
Trinidad and Tobago	-	-	China	-	-	France	-	-
United States	-	-	Fiji	-	-	Germany	2,204.0	3,305.9
Uruguay	54.6	90.9	Indonesia	-	-	Greece	-	-
Virgin Islands, U.S.	-	-	Kiribati	-	-	Greenland	-	-
Total	4,976.8	8,294.7	DPRK	-	-	Iceland	-	-
Americas investment hubs			Lao PDR	7.6	11.4	Italy	-	-
Anguilla	6.7	10.0	Malaysia	30.3	45.5	Latvia	15.7	23.6
Bahamas	370.9	556.4	Micronesia	-	-	Liechtenstein	88.9	133.4
Barbados	100.4	150.6	Mongolia	-	-	Lithuania	-	-
Bermuda	11,327.8	16,991.7	Myanmar	69.7	104.6	Monaco	-	-
Cayman Islands	23,706.6	35,560.0	Nauru	-	-	Norway	-	-
Turks and Caicos Islands	0.6	0.8	Papua New Guinea	45.4	68.2	Poland	-	-
Virgin Islands, British	558.2	837.3	Philippines	-	-	Portugal	-	-
Total	36,071.2	54,106.9	Samoa	-	-	San Marino	-	-
East Asia & Pacific - High income			Solomon Islands	-	-	Slovakia	-	-
Australia	-	-	Thailand	-	-	Slovenia	3.1	4.6
Brunei Darussalam	18.9	28.4	Timor-Leste	0.5	0.7	Spain	-	-
Cook Islands	-	-	Tonga	-	-	Sweden	-	-
French Polynesia	-	-	Tuvalu	-	-	United Kingdom	-	-
Guam	-	-	Vanuatu	0.9	1.4	Total	2,424.6	3,636.8

Jurisdiction	Low	High	Jurisdiction	Low	High	Jurisdiction	Low	High
Europe & Central Asia - Middle and low income			Latin Am. & Caribbean - Middle and low income			UAE		
Albania	-	-	Argentina	-	-	Total	-	-
Armenia	-	-	Belize	3.4	5.1	Middle East & North Africa - Middle and low income		
Azerbaijan	-	-	Bolivia	172.7	259.1	Algeria	194.0	291.0
Belarus	-	-	Brazil	-	-	Djibouti	-	-
Bosnia and Herzegovina	6.2	9.3	Colombia	-	-	Egypt	-	-
Bulgaria	101.6	152.4	Costa Rica	90.6	135.9	Iran	15.7	23.6
Georgia	65.9	98.8	Cuba	-	-	Iraq	-	-
Kazakhstan	1,101.6	1,652.4	Dominica	-	-	Jordan	6.1	9.2
Kyrgyzstan	0.0	0.0	Dominican Republic	18.5	27.7	Lebanon	-	-
North Macedonia	0.8	1.2	Ecuador	-	-	Libya	-	-
Moldova	0.2	0.3	El Salvador	-	-	Morocco	-	-
Montenegro	1.1	1.6	Grenada	3.9	5.9	Palestinian Authority	-	-
Romania	71.3	107.0	Guatemala	87.0	130.5	Syria	-	-
Russian Federation	-	-	Guyana	-	-	Tunisia	11.8	17.8
Serbia	45.5	68.2	Haiti	-	-	Yemen	-	-
Tajikistan	-	-	Honduras	-	-	Total	227.7	341.6
Turkey	-	-	Jamaica	-	-	Other investment hubs		
Turkmenistan	1.7	2.6	Mexico	-	-	Hong Kong	1,144.6	1,717.0
Ukraine	-	-	Nicaragua	-	-	Liberia	-	-
Uzbekistan	3.5	5.3	Paraguay	18.0	27.1	Malta	-	-
Total	1,399.5	2,099.2	Peru	-	-	Marshall Islands	4.3	6.4
European investment hubs			Saint Lucia	0.4	0.5	Mauritius	981.2	1,471.8
Cyprus	204.4	306.6	St. Vincent and the Gren.	1.7	2.5	Mozambique	-	-
Gibraltar	12.6	18.9	Suriname	-	-	Singapore	17,795.9	26,693.9
Guernsey	203.4	305.1	Venezuela	-	-	Total	19,926.1	29,889.2
Hungary	539.2	808.8	Total	396.2	594.3	South Asia - Middle and low income		
Ireland	6,094.7	9,142.1	Middle East & North Africa - High income			Afghanistan	-	-
Isle of Man	107.5	161.2	Bahrain	408.0	612.0	Bangladesh	-	-
Jersey	2,394.1	3,591.1	Israel	-	-	Bhutan	-	-
Luxembourg	12,324.5	18,486.7	Kuwait	45.8	68.7	India	-	-
Netherlands	5,951.3	8,927.0	Oman	-	-	Maldives	-	-
Switzerland	10,745.8	16,118.8	Qatar	63.1	94.6	Nepal	-	-
Total	38,577.6	57,866.3	Saudi Arabia	107.5	161.2	Pakistan	-	-

Jurisdiction	Low	High	Jurisdiction	Low	High
Sri Lanka	14.1	21.1	Chad	-	-
Total	14.1	21.1	DRC	-	-
Sub-Saharan - High and middle income			Eritrea	-	-
Angola	-	-	Ethiopia	-	-
Botswana	-	-	Gambia	-	-
Cameroon	-	-	Guinea	-	-
Cape Verde	-	-	Guinea-Bissau	-	-
Comoros	-	-	Madagascar	-	-
Congo	-	-	Malawi	-	-
Côte d'Ivoire	-	-	Mali	-	-
Equatorial Guinea	-	-	Niger	-	-
Gabon	-	-	Rwanda	-	-
Ghana	-	-	Sierra Leone	-	-
Kenya	-	-	Somalia	0.0	0.0
Lesotho	-	-	South Sudan	-	-
Mauritania	-	-	Tanzania	-	-
Namibia	-	-	Togo	-	-
Nigeria	-	-	Uganda	-	-
Sao Tome and Principe	-	-	Total	6.5	9.7
Senegal	1.5	2.3			
Seychelles	-	-			
South Africa	-	-			
Sudan	-	-			
Eswatini	-	-			
Zambia	-	-			
Zimbabwe	-	-			
Total	1.5	2.3			
Sub-Saharan - Low income					
Benin	1.7	2.5			
Burkina Faso	4.8	7.2			
Burundi	-	-			
Central African Republic	-	-			