

How Much Global FDI Is Subject to BEPS Pillar Two?

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March 2023

Abstract

The paper estimates the share of FDI subject to additional tax following the implementation of BEPS Pillar Two. It first considers the scope of the new rules, where both the characteristics of the overall MNE group and its affiliates matter. There are two main findings: (i) large MNEs account for most foreign investment and (ii) low-tax affiliates often hold a disproportionate share of the FDI stock, even in countries where average or statutory tax rates are high. Around one-quarter of FDI is within the scope of the reform for the median country. Large MNE groups subject to Pillar Two explain around 70% of the FDI stock. Therein, 40% of investment is held by low-tax affiliates. Second, this paper develops a scenario for the initial implementation of Pillar Two. The rules take into account the undertaxed profits of all affiliates within an MNE group, including those abroad. Although limited in number, the countries first adopting reform are large global investors. Most of the affected FDI stock is located in offshore financial centers. However, the intersection of the reform’s scope and application implies a large share of the FDI stock in other countries will be subject to additional tax—around 15-20% in the typical case—with two-thirds located in developing countries.

1 Introduction

The BEPS Inclusive Framework is an agreement between 142 countries to apply a consistent set of tax rules to multinational enterprises (MNEs).¹ The model rules are designed around a ‘two pillar’ approach, each pillar targeting a specific issue. Pillar One addresses cross-border digital transactions and related issues with tax collection. It redistributes tax revenue from countries where MNEs operate to where they make sales, with a formula describing the share of earnings taxable in each jurisdiction. Pillar Two institutes a global minimum tax on large MNEs and their affiliates. It aims to reduce profit shifting and puts a floor on tax competition between countries.² The minimum tax may also act on the intensive and extensive margins of FDI. Although many countries are set to implement Pillar Two rules by 2024, the potential effects of the reform are not well understood at this point in time.

Several information gaps are particularly acute. First, the tax distribution of large MNE affiliates and the share subject to additional tax. Second, the international spillover effects of the tax rules, which equally apply to the domestic and foreign affiliates of large MNEs. This paper quantifies (i) the FDI stock within the scope of the reform and (ii) the share potentially subject to additional tax.³ The latter question is time dependent. While the Inclusive Framework includes most countries and accounts for more than 95% of global FDI, actual legislation has lagged. European Union countries, the United States and several others have

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My thanks to Bruno Casella, who provided valuable input, and my advisor Cedric Tille. All views and mistakes are my own.

¹‘BEPS’ refers to the OECD/G20 Inclusive Framework on Base Erosion and Profits Shifting.

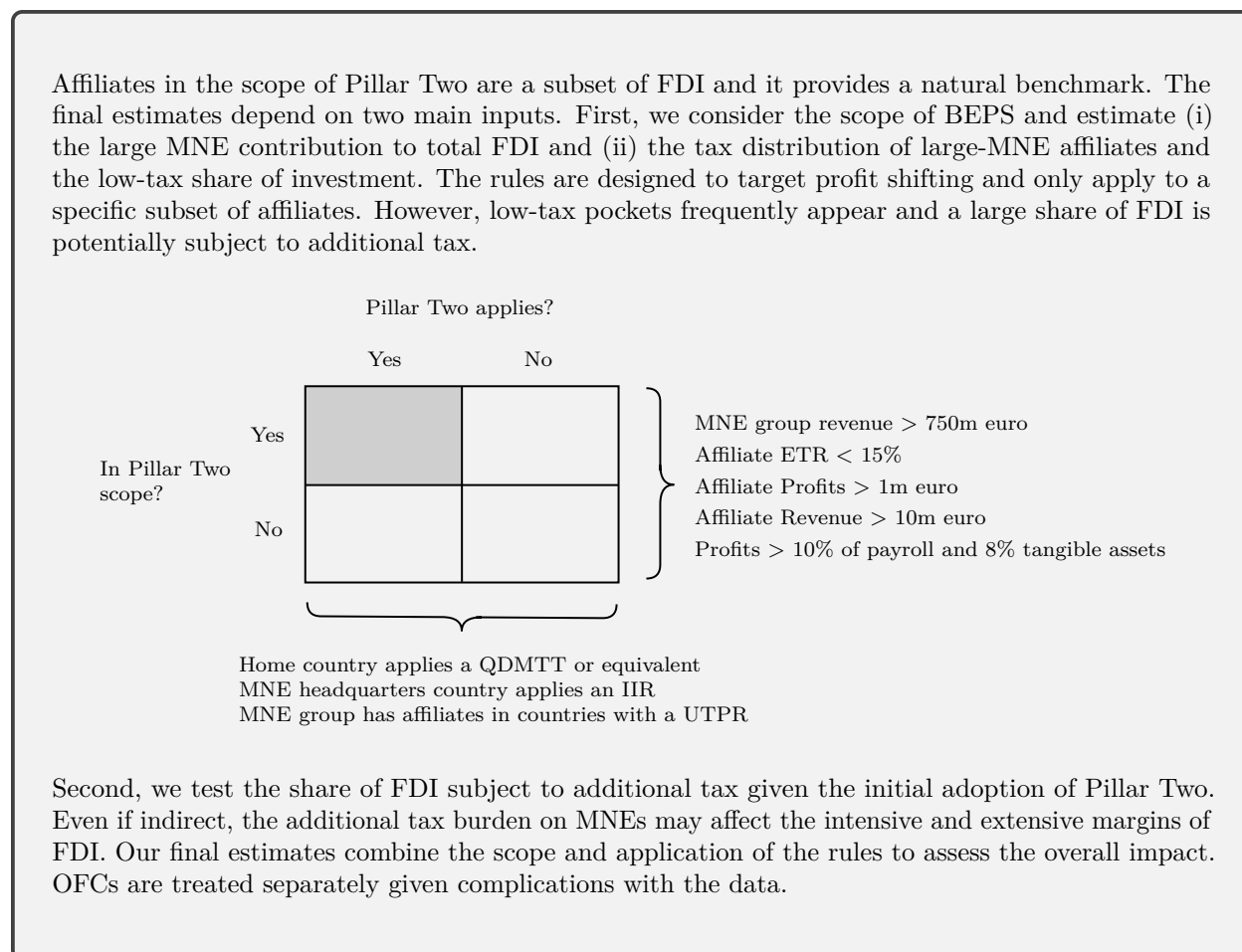
²De Backer and Miroudot (2018) finds multinational groups account for around one-third of global economic activity, highlighting ambitious scope of the reform.

³The OECD collects and publishes aggregated data for MNEs within the scope of the reform, but reporting remains limited and only applies to countries inside the Inclusive Framework.

signaled they will implement the reform by 2024. Although these countries are a small subset of the Inclusive Framework membership, they are among the largest outward investors and the spillover effects could be large. We find low-tax affiliates account for a disproportionate share of total investment, even in countries where statutory or average effective tax rates are high. Existing analyses may understate the impact of the reform for this reason.

The following sections synthesize information on the tax distribution, ownership structures, and investment positions to assess the initial impact of Pillar Two on the FDI stock (see Box 1).⁴ We do not analyze the tax base, but our measures share a close relationship with corporate profits. Our final estimates rely on several imputations. As a result, individual results may be incorrect and we focus on the ‘median’ case as our main unit of analysis. In the baseline scenario, a limited set of countries implement the reform—Canada, European Union members, Japan, South Korea, Switzerland, the United Kingdom, and the United States. These countries have all signaled their intent to implement Pillar Two, although some may not apply Income Inclusion rules.⁵

Box 1: Analytical Framework for Assessing BEPS Pillar Two



⁴A companion paper, Casella and Souillard (2022), looks at profit shifting and changes in the tax rate.

⁵For simplicity, we assume these countries adopt all rules.

1.1 The Mechanics of Pillar Two

Before moving to the estimates, it is helpful to outline the proposed tax rules for clarity. This includes (i) identifying firms in the scope of the reform, (ii) the calculation of their effective tax rate, referred to as the ‘GloBE’ ratio, (iii) the amount of additional tax charged, and (iv) the allocation of the resulting tax revenues among countries.

- (i) **BEPS Pillar Two Scope:** the constituent entity is part of a multinational group with consolidated revenues of at least €750 million.⁶ The parent entity must have a controlling interest in the affiliate, meaning it is required to consolidate its financial statements on a line-by-line basis.⁷ Constituent entities with revenues less than €10 million and profits less than €1 million are not subject to the top-up tax. In addition to the *de minimis* exclusion, there is also a two-year exclusion for newly established affiliates when the MNE group has no other presence in a jurisdiction.
- (ii) **Global anti-base erosion (GloBE) ratio:** this is simply an effective tax rate calculation for in-scope affiliates, defined as the ratio of covered taxes to accounting profit. Covered taxes are essentially any tax charged on income. Along with corporate income taxes, this includes taxes on distributed profits (i.e. dividends) and taxes on income from resource extraction. Taxes related to turnover (e.g. royalties) are excluded, as are withholding taxes. Generally, the sale of assets and subsidiaries are counted as GloBE income while mergers via the exchange of equity are excluded.
- (iii) **Top-up tax:** a tax surcharge (or ‘top-up’) applies whenever the GloBE ratio is less than 15% and the accounting profit of the constituent exceeds the ‘carve-out’ amount. Formally, the carve-out is called *Substance-Based Income Exclusion* and is initially set at 8% of tangible assets and 10% of payroll. Both deductions gradually transition to 5% by 2033. Algebraically, the top-up tax can be written

$$\underbrace{T^* - T}_{\text{top-up tax}} = \left(0.15 - \frac{T}{P}\right) \underbrace{(P - C)}_{\text{excess profit}} \quad \text{given } 0.15 > \frac{T}{P} \quad \text{and } P > C \quad (1)$$

where T^* is the total tax payable, T covered taxes paid, P accounting profit, and C the carve out. Clearly, the carve-out reduces the top-up tax when applicable. Both effective tax rates (ETRs) and the carve-out amount are unknowns at the affiliate level, which motivates a large part of the subsequent analysis.

- (iv) **Tax rights:** three different rules may apply depending on the situation—the Income Inclusion Rule (IIR), the Under-Taxed Payments Rule (UTPR), and the Qualified Domestic Minimum Top-Up Tax (QDMTT). The IIR states the country where the ultimate parent is located can collect the top-up tax on international affiliates below the GloBE ratio. If the MNE ultimate parent resides in a jurisdiction that does not apply Pillar Two, tax rights devolve to countries where the rules are in place and priority follows from the ownership structure of the MNE. If the ownership chain between the MNE parent and low-tax affiliate falls outside Pillar Two, then the UTPR applies as a backstop. Under this regime, countries adopting Pillar Two eliminate tax deductions on intragroup payments for affiliates in their jurisdiction. A formula assigns priority and describes the amount of ‘tax’ each country can collect.

⁶We denote firms meeting this criterion as ‘large MNEs.’ For the formal definition, see the Pillar Two [model rules](#).

⁷The accounting standards of the parent jurisdiction apply. In the case of joint-ventures, a controlling interest is defined by 50% or greater equity stake. We apply the *de minimis* threshold for profits (but not revenues) to affiliates in our sample.

Finally, the QDMTT is a domestic tax structured to match the IIR and fully creditable against it. Countries with a QDMTT regime have first priority and collect and retain all revenue from the top-up tax. Examples of each tax regime are included in box 3.

Countries with low-tax affiliates will forgo revenue whenever the top-up tax is applied elsewhere.⁸ Most are expected to eventually implement a minimum tax. Pillar Two compliance could be achieved by raising statutory tax rates and/or eliminating tax breaks, but such steps may prove cumbersome. Instead, most low-tax countries are expected to implement a QDMTT. Affiliates outside the scope of Pillar Two are not affected in this case, meaning the tax burden for small MNEs and domestic firms remains unchanged. It is also possible many countries will implement a QDMTT alone and not the other tax rules.

Even as tax rates increase for some affiliates, tax differentials between countries will close.⁹ Since profit shifting generates transaction and reputation costs for MNEs, incentives for profit shifting become much weaker with the tax floor. Flows to offshore financial centers (OFCs) will likely decrease, if not stop altogether. Large outflows from OFCs are also possible. Pillar Two greatly reduces the tax advantages from profit shifting and should expand the tax base in many countries, unlike the typical tax increase.¹⁰ Our prior research indicates developing countries could be the largest beneficiaries of the reform given issues with base erosion (UNCTAD 2022).

2 How Much FDI Is in the Scope of BEPS Pillar Two?

As part of BEPS implementation, large MNEs in the scope of Pillar Two are required to report the activity of their foreign affiliates. The OECD collects these ‘country-by-country’ reports (CbCRs) from national authorities and publishes aggregates for each reporter and affiliate location. Since CbCRs only include the subset of affiliates within the scope of Pillar Two, they are an important resource and a primary input in our research. However, CbCRs are not directly comparable with FDI.¹¹

The first part of this section relies on the OECD Activity of Multinational Enterprises (AMNE) and Eurostat Foreign Affiliates Statistics (FATS) databases to find the large MNE share. After data cleaning, the outward AMNE/FATS data covers MNEs based in 12 reporting countries and the activity of majority-owned affiliates in 60 partner countries. Since CbCRs are overlapping, but restricted to MNE groups in the scope of Pillar Two, it is possible to infer the relative contribution of large MNEs.¹² Unfortunately, only sales and employment follow similar definitions when comparing CbCRs and AMNE/FATS indicators. We prefer sales since employment may reflect offshore production. Admittedly, neither is an ideal proxy for FDI, but issues with consolidation make direct comparisons difficult (see box 2). An alternative exercise based on greenfield investment gives similar results.

After determining the large MNE share of FDI, we turn to firm-level data to find the tax distribution across

⁸We define the threshold for a low-tax country or affiliate as an effective tax rate below 15%. High-tax indicates a country or affiliate above this threshold.

⁹If the effective tax rate of an MNE affiliate in a country is below the minimum, a top-up tax is applied to other parts of the group through the income inclusion rule (IIR) and undertaxed payments rule (UTPR). Since MNEs face a minimum tax irrespective of where they report profits, the reform is expected to reduce profit shifting.

¹⁰The revenue impact for each affiliate is $\Delta(\tau B) = B_0\Delta\tau + \tau\Delta B$ where τ is the effective tax rate and B is the tax base. The first identity ($B_0\Delta\tau$) is the initial tax base times the change in tax rate. The second ($\tau\Delta B$) is the new tax rate times the change in tax base. Unlike a typical tax increase, Pillar Two will add to the tax base of many countries by reducing profit shifting.

¹¹The IMF Committee on Balance of Payments Statistics provides a detailed [overview](#) of the differences.

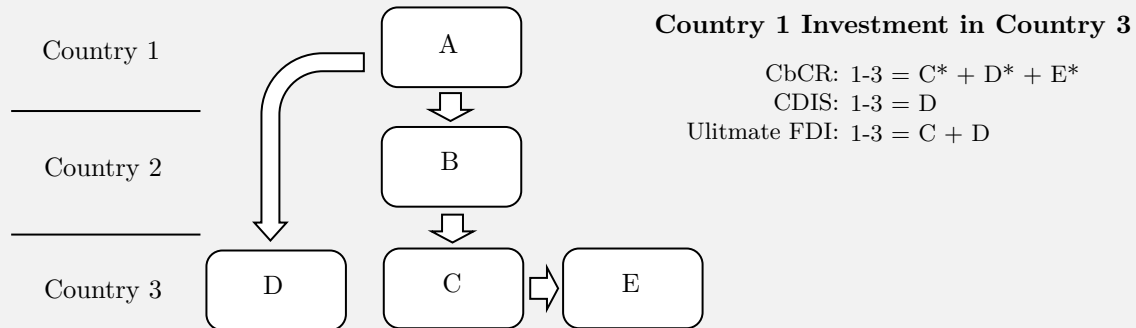
¹²Most CbCRs reflect majority control. They may include minority interests if the relevant accounting standard requires it.

Box 2: The Problem of Consolidation and Complex Ownership Chains

Complex ownership makes it difficult to directly estimate the large MNE share. The closest analogue to FDI in CbCRs, ‘stated capital,’ is not reported on a consolidated basis. For example, if a holding company invests in a subsidiary, which then invests in another subsidiary, each of those investments is added to the total.^a This applies both within and across countries. Meanwhile, bilateral FDI statistics give the consolidated position within a country. Since unconsolidated totals can be significantly inflated, comparing CbCRs to consolidated FDI positions leads to an upward bias. This is observable but difficult to accurately measure.^b

In addition, CbCRs include all affiliates connected to the MNE parent while FDI statistics only capture the first ownership link between an affiliate and parent. MNEs frequently structure investments through offshore intermediaries and this makes comparison difficult. While some countries report the location of ultimate investors, they are a small and non-representative subset.

To illustrate the problem, take that MNEs based in country 1 have ownership structures similar to the diagram below. The parent company (A) has two productive affiliates in country 3. One affiliate (D) is directly held by the parent. The second affiliate (E) is indirectly held via two holding companies. One (B) is offshore and the other (C) is in the same country as the affiliate. This case is fairly typical. Offshore holding structures account for around one-third of total FDI.



The CbCR tables for country 1 include the total capital of all affiliates in country 3 in the scope of Pillar Two (C*, D*, and E*). While some countries report FDI positions by the location of the ultimate owner, most only report for immediate investors. The bias is worse when only immediate investors are included—the FDI position between countries 1 and 3 only captures directly-held affiliates (D). In either case, the holding structure in country 3 is missing from FDI and the bias can be large.

$$\underbrace{\frac{C^* + D^* + E^*}{D}}_{\text{immediate investor}} \geq \underbrace{\frac{C^* + D^* + E^*}{C + D}}_{\text{ultimate investor}} \geq \underbrace{\frac{C^* + D^*}{C + D}}_{\text{desired estimate}}$$

^aStill, it is interesting to note an outsized share of capital from CbCRs (\$9.8 out of \$22.5 trillion) is located in OFCs.

^bAlthough holding companies make up less than 10% of subgroups or constituent entities in the typical country, they may be systematically larger than other affiliates.

affiliates in the second part of this section. The OECD CbCR tables only include parent-recipient dyads if multiple MNE groups are present. The data are aggregated to ensure anonymity and the full tax distribution cannot be observed.¹³ This makes it difficult to estimate the true tax impact of the reform. As an alternative, the Bureau van Dijk Orbis database allows us to trace ownership structures and identify the affiliates of large MNEs. This provides a sufficient basis to infer the tax distribution along with the joint-distribution of tax rates and capital for around 30 countries. There appears a strong relationship between each country’s average tax rate and undertaxed capital. This allows us to impute shares across all countries in our sample.

2.1 The Large MNE Share of FDI

Our baseline comparison for the large MNE share relies on turnover from the outward AMNE/FATS databases and ‘unrelated-party revenue’ from CbCRs. According to the Eurostat compilation guide for FATS, turnover “corresponds to market sales of goods or services supplied to third parties.”¹⁴ Meanwhile, unrelated-party revenues include the sales of products, interest income, dividend income, and other income. In most cases, we expect sales are the dominant component of revenue in CbCRs. Interest and dividend income from unrelated parties appear relatively small. Income statements from Orbis indicate financial revenue is less than 5% of operating revenue across MNE affiliates. However, ‘other income’ may include net capital gains from the sale of assets. This is not captured by turnover and could lead to an upward bias, at least assuming net capital gains are positive in most cases.¹⁵

The set of countries reporting CbCRs expanded over the three year window currently published. AMNE/FATS data are available all years 2016-18.¹⁶ We take the average across all years with complete coverage. The final sample only includes recipient countries with a minimum of five investor countries for balance.¹⁷ In several countries, the number of subgroups reported in CbCRs for each recipient exceeds the number of entities reported in AMNE/FATS.¹⁸ These countries are excluded as well. Results are adjusted for the presence of minority interests in FDI. Details are included in the appendix.

After outliers are removed, we calculate the large MNE share for each recipient country (j) using

$$z_j = \frac{\sum_j x_{ij}}{\sum_j y_{ij}} \quad (2)$$

where z gives the large MNE share and x and y are average sales for each parent-recipient dyad in the CbCR and AMNE/FATS databases, respectively. Our sample is fairly representative. Included dyads account for 37% of FDI in the IMF Coordinated Direct Investment Survey and 40% of inward FDI for the median recipient country. We divide recipient countries into three groups: initial Pillar Two adopters, OFCs, and other countries.¹⁹ Most countries in our sample are those implementing Pillar Two, a convenient overlap. While results are similar for OFCs, a different approach is needed to find the low-tax share of FDI. Separate estimates for these jurisdictions are provided in the final section.

Figure 1a shows the individual values used to calculate the shares. The underlying data are log transformed

¹³The tax distribution from CbCRs cannot be used directly, but helps with some confirmatory analysis.

¹⁴The guide is published on the Eurostat [website](#). The US BEA [mentions](#) its AMNE reporting is fully comparable with other countries. However, sales appear to include related party transactions and we exclude this component.

¹⁵Detailed [income statements](#) for foreign affiliates from the US BEA suggest ‘other income’ is less than 5% of sales typically.

¹⁶In the case of the US, we exclude 2016 since CbCR reporting is incomplete.

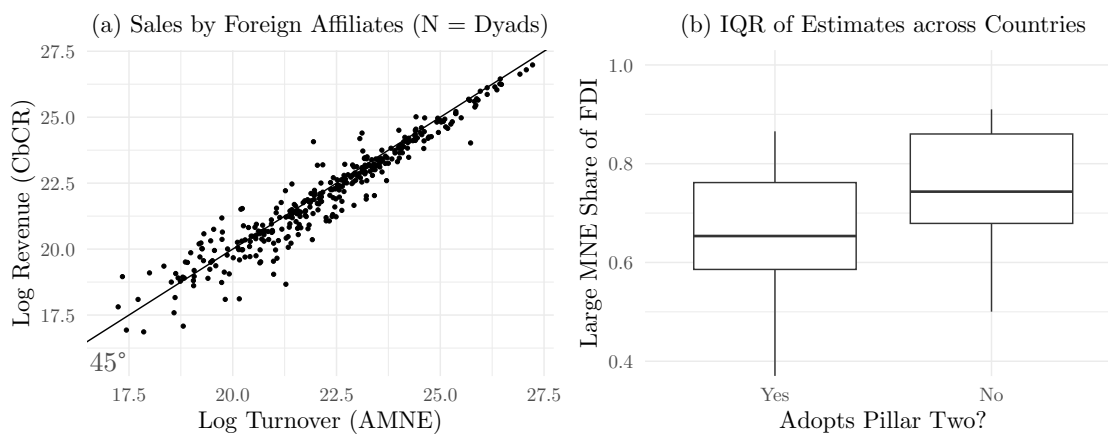
¹⁷Only positive values are included. We remove outliers whenever Cook’s distance is greater than 5. See the appendix.

¹⁸Reporting for the AMNE/FATS databases is sometimes limited to affiliates above a certain revenue threshold.

¹⁹A list of OFCs is in the appendix. Those adopting Pillar Two retain their classification as OFCs.

to aid comparability and the relationship across dyads appears robust. Sales in CbCRs are usually smaller than corresponding values in AMNE/FATS. Still, a number of observations lie above the 45-degree line. These values tend to be small and are more dispersed than larger values. This suggests statistical noise could be an issue.²⁰ After we average by country, the results appear more consistent. Figure 1b gives the interquartile range of the results. The large MNE share falls between 55% and 80% in most countries. The median share appears about 10 percentage points higher for countries outside Pillar Two. This difference is not surprising. Most countries adopting Pillar Two share close economic links—particularly those in the EU. Barriers to market entry are higher elsewhere and may favor large MNEs. We observe the same gap in our alternative estimates using greenfield FDI.

Figure 1: Estimated Large MNE Share of FDI



Source: US BEA, Eurostat FATS, and OECD CbCR and AMNE databases and authors' calculations.

Notes: Excludes OFCs. Panel (a) shows the final sample, with most observations to the right of the 45-degree line.

Panel (b) excludes recipient countries with less than 5 observations and adjusts for minority interests. See appendix for details.

2.2 Which Affiliates Are Undertaxed?

The BEPS Pillar Two minimum tax applies at the affiliate level. The tax impact cannot be fully anticipated since the distribution of tax rates and the tax base across affiliates is largely unknown, at least outside national tax administrations.²¹ Estimates based on averages may be inaccurate. Even when the country average ETR is above the BEPS minimum, pockets of low-tax affiliates may still be present.²² Ideally, the impact would be estimated using a bottom-up approach from the financial statements of individual affiliates in the scope of Pillar Two. More granular data sources are available and it is possible to infer the tax distribution for some countries and MNEs. There are reasons to believe a large of affiliates may be subject to additional tax, even in countries where average tax rates are high.

Two affiliate-level data sources inform the analysis. The EU Tax Observatory (EUTAX) publishes a database

²⁰Large values tend to combine many affiliates together. Small values may reflect reporting by just a few. Accordingly, idiosyncratic errors could be more prominent.

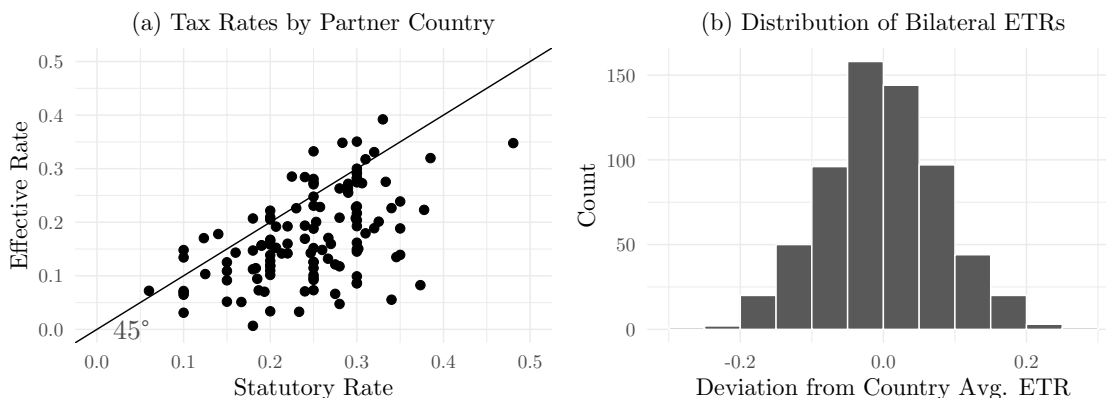
²¹Tax administrations may also lack information on international affiliates. Not all countries in the Inclusive Framework have activated CbCR exchange relationships. The OECD indicates 3300 pairs are active at the time of writing. A total of 9870 bilateral pairs are possible given 141 countries.

²²Take the case of two affiliates, one paying zero tax and the other paying a 30 percent tax. They are otherwise identical and their average tax rate is 15 percent. This is equal to the BEPS Pillar Two minimum, so any estimate using the average would find no top-up tax applies. However, a top-up tax of 15% applies to the low-tax affiliate and the total tax burden increases by 50% once heterogeneity is observed. Also see Baraké et al. (2022) for a useful overview.

combining public CbCRs for MNE groups that have voluntarily disclosed them, around 100 in total. The Bureau van Dijk Orbis database provides unconsolidated financial statements for almost 50,000 foreign affiliates worldwide linked to MNE groups with more than €750 million in revenue. Both these sources have advantages and drawbacks. The EUTAX database directly captures affiliates in the scope of BEPS Pillar Two and reporting conforms with BEPS requirements. Still, the sample is extremely limited and non-random. Orbis is much more extensive, but it is biased toward larger affiliates and accounting rules are not consistent across the sample. We discuss data cleaning and sources in the appendix. Our estimates of the tax impact follow a hybrid approach, using distributional assumptions to fill data gaps when necessary.

The OECD CbCR tables report aggregate taxes paid and profits for some country pairs, which can be used to approximate bilateral and country average ETRs.²³ Even this partial disaggregation of effective tax rates indicates a high amount of dispersion. We compares average effective and statutory tax rates by country in figure 2a. Effective tax rates tend to be lower—much lower in some cases. In part, this is because statutory rates are a summary measure and cannot capture many salient features of the tax code, including deductions, surcharges, deferrals, tax progressivity, etc. Tax incentives also explain some of the observed dispersion. Investments into particular sectors or regions may receive large tax breaks. This makes it extremely difficult to infer the legal tax burden of MNEs, even before tax avoidance is taken into account. Finally, initial guidance by tax administrations for country-by-country reporting varied. In some countries, intracompany dividends were included, which inflated profits and pushed ETRs below their true level.

Figure 2: Affiliate ETRs in the OECD CbCR Tables, Averages 2016-18



Source: OECD Tax Database and CbCR Tables.

Notes: Excludes OFCs. Subgroups with positive profits excluding headquarters countries and ‘stateless’ subgroups. Several additional countries are excluded and are listed in the appendix. The distribution in Panel (b) is given by the difference between bilateral rates and the average ETR for a recipient. For example, a value of 0.05 indicates the ETR for a parent-recipient dyad is 5 percentage points greater than the average ETR.

Figure 2b shows the variation of bilateral ETRs around country averages. As might be expected, they appear normally distributed.²⁴ The standard deviation is around 10 percentage points. Assuming normality, the 90% confidence interval is quite large with a 33 percentage point range—meaning that affiliate ETRs are quite heterogeneous. In Orbis, the standard deviation is 12 percentage points within the median country. Given

²³More specifically, the GloBE ratio. The OECD disclaimer cautions against using ETRs from the CbCR tables given various issues with the data and we do so only for comparison. We employ some judgement about whether to use taxes paid or accrued taxes when calculating tax rates. Taxes paid are the default. Accrued taxes are used when estimates are above the statutory rate or substantially deviate from ETRs published in alternative sources.

²⁴The ETR for each dyad represents a sample mean and the central limit theorem applies.

the variance is typically quite high, we expect low-tax affiliates are present in many countries even when the average tax rate is well above the Pillar Two minimum rate. Existing estimates of the tax revenue impact of Pillar Two are probably quite accurate in the case of OFCs and low-tax jurisdictions where the vast majority of firms pay little or no tax. Estimates are probably downward biased in other countries, particularly when average tax rates are relatively high.

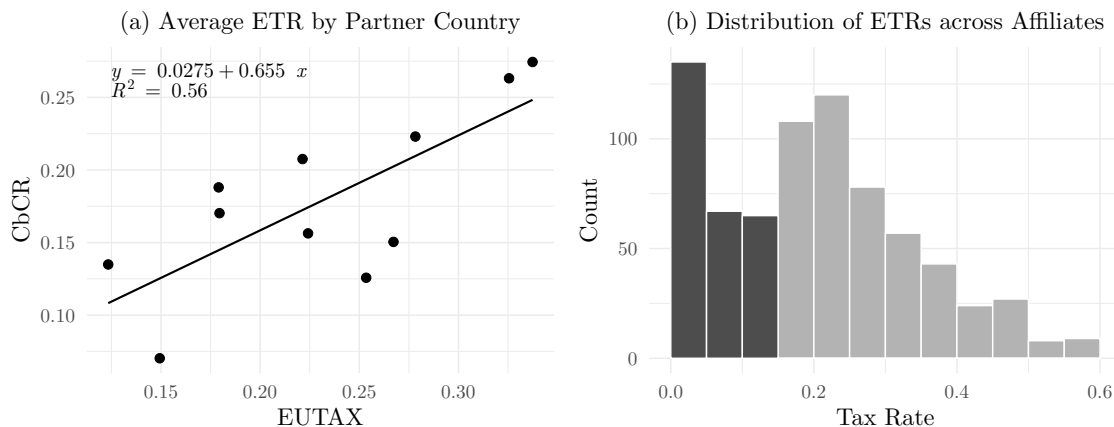
Summing EUTAX affiliate-level data by country and calculating the ETR shows they are consistent with estimates from the OECD CbCR tables (see figure 3a). For each recipient country (j), we take

$$z_j = \frac{\sum_k x_{jk}}{\sum_k y_{jk}}$$

where z is the ETR, x is the average tax paid by each affiliate (k), and y is the affiliate's average profits. Tax rates across countries in EUTAX tend to be larger than corresponding CbCR values. This is not surprising since most MNEs in the EUTAX database exclude intracompany dividends.

A surprisingly large share of affiliates have little or no tax liability in EUTAX, even though the average ETR is well above 15% for most countries. Around 37% of affiliates paid less than the Pillar Two minimum rate and 19% of affiliates paid an ETR less than 5%. Another interesting feature of the EUTAX data is the number of high-tax affiliates (see figure 3b). A large share report ETRs well above STRs. This is explained in part by the large number of resource extraction companies in the sample, which are often subject to tax surcharges. Also, a timing mismatch may arise whenever profits and associated taxes are recorded in different periods. As mentioned, EUTAX only reports one year of data in many cases. The tax distribution from Orbis is less right-skewed as several years are averaged together. The share of low-tax affiliates is also smaller.

Figure 3: The Distribution of Affiliate ETRs in the EUTAX Public CbCR Database, Averages 2016-21



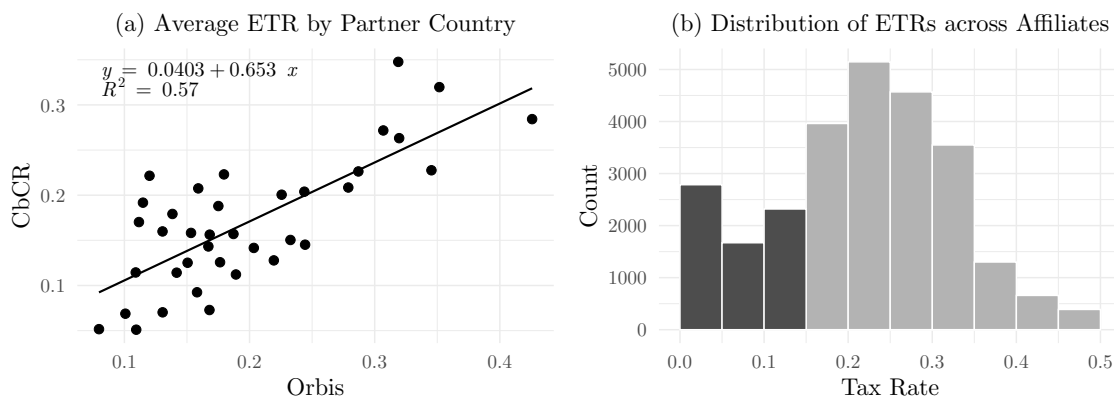
Source: OECD CbCR Tables and the EU Tax Observatory Public CbCR database.

Notes: Excludes affiliates in OFCs. Taxes paid and profits before tax are summed by country across firms/years to calculate the ETR. Since many MNEs only report one year, negative values are dropped (79 total). Panel (a) excludes countries with less than 15 observations. Panel (b) excludes OFCs.

The correlation between country average ETRs in the Orbis and OECD CbCR data remains fairly robust (see figure 4a). As with EUTAX, values in Orbis also tend to be higher. The gap is not a cause for concern since CbCRs often inflate profits due to the inclusion of intracompany dividends. Affiliates appear to follow a bimodal distribution in Orbis, similar to EUTAX, with a large proportion of affiliates paying little or no tax.

Around 30% of firms paid an ETR less than the Pillar Two minimum rate and 16% had an average ETR less than 5%. A disproportionate share of profits—more than 40%—accrued to these low-tax affiliates. This suggests the downward bias from ignoring tax heterogeneity is large and a substantial portion of the tax base is likely subject to some form of top-up tax.

Figure 4: The Distribution of Affiliate ETRs in Orbis, Averages 2013-19



Source: OECD CbCR Tables and Orbis.

Notes: Excludes affiliates in OFCs, holding companies, and regional headquarters. Taxes paid and profits before tax are summed by country across firms/years to calculate the ETR. Panel (a) excludes countries with less than 30 observations. Taxes paid and profits before tax are summed across firms/years within each country to calculate the ETR.

Low- and high- tax countries may have different characteristics. We divide the sample and tabulate the affiliate tax distribution separately; however, they appear quite similar. The tax distribution may substantially differ within countries as well. A bimodal pattern still appears in many, but not all cases.²⁵ Results are in the appendix. Explanations for tax heterogeneity might include the mix of activities, the structure of the tax code, various incentives, mismatches in reporting, data quality issues, and/or lax tax enforcement.²⁶ Such identification is beyond the scope of the current paper, but an interesting area for future research.

2.3 Do Low-Tax Affiliates Account for More FDI?

The joint distribution of capital and tax rates is a key input to assess the FDI impact of Pillar Two. As mentioned, a disproportionate share of profits are reported by low-tax affiliates. This could be a sign of profit shifting within countries, but such a conclusion is premature. If a firm pays a similar amount of tax each year, but has windfall profits, this mechanically pushes down its tax rate. While we attempt to capture tax deferrals by averaging multiple years together, windfall profits may occur near the end of the sample period. Still, the concentration of capital among low-tax affiliates suggests the results are not purely mechanical. The following analysis looks at how capital and profits interact with taxes—first from the perspective of international profit shifting and then looking at the distribution within countries. We find that capital and profits are highly correlated, suggesting FDI in the scope of the reform can serve as a reasonable proxy for the tax base.

²⁵Countries with sufficient observations are included in the appendix.

²⁶European countries are overrepresented in Orbis. Still, the sample includes affiliates in major economies such as China, India, and Japan. The United States is a notable omission.

First, there is strong evidence for profit shifting across countries in the Orbis sample. Both capital and profits follow the tax gradient. Although just 16% of affiliates are located in OFCs, they account for 39% of capital and profits—the majority held by affiliates paying an ETR less than 5% (see tables 1 and 2). It follows the average capital and profitability of affiliates in OFCs is much higher compared to other regions. Most of this capital is highly mobile and includes intellectual property and intracompany loans. While our sample is limited and cannot be generalized, there is a well-developed literature on international profit shifting (e.g. Tørsløv, Wier, and Zucman 2018; Janský and Palanský 2019). As Pillar Two takes effect, many MNE groups will change their capital structure and where they report income. This makes it difficult to fully anticipate its long-term effects. Our analysis is purely static.

Table 1: Selected Characteristics of Large MNE Affiliates in Orbis, Average 2013-19 (Millions USD)

	Obs.	Avg. Capital	Avg. Profits	% Affiliates	% Capital	% Profits
Full sample	33,807	264.4	21.8	100.0	100.0	100.0
Initial adopters	19,838	194.9	14.2	58.7	43.3	38.3
Other countries	8633	218.6	22.7	25.5	21.1	26.6
OFCs	5336	596.7	48.5	15.8	35.6	35.2

Source: Orbis.

Notes: Capital = total assets. Includes all firms reporting payroll and fixed assets.

Table 2 summarizes the joint distribution of capital, profits, and tax rates observed within each set of countries. Low-tax affiliates account for a disproportionate share of capital and profits in all cases.²⁷ Among countries adopting Pillar Two, almost one-half of capital and profits are held by low-tax affiliates. Of this, the majority is held by affiliates with an ETR under 5%. In the context of the minimum tax, this is significant. The tax burden will increase by a large margin for firms at the bottom of the tax scale. This is beneficial in terms of revenue, but may have negative effects on investment. Concentration at the bottom of the tax scale appears less acute for other countries in the sample (excluding OFCs).^[30] This may reflect that tax rates are generally higher in these countries. Repeating the same exercise for fixed assets (as opposed to total capital) also results in a similar pattern. This suggests capital intensive projects may receive favorable tax treatment.

The average ETR for a country appears a strong predictor of the low-tax share of capital. The results are presented in figure 5a. Even when the country average ETR is relatively high (20% for example), the expected relationship indicates a relatively large share of capital is undertaxed (more than 25%). This finding is significant in the context of the reform since many existing estimates of the tax impact do not fully account for tax heterogeneity within countries. The relationship between undertaxed profits and average ETRs is largely similar. For countries missing from the Orbis sample, we impute the undertaxed capital share using the country average ETR.²⁸ While country-specific results are likely inaccurate, the resulting distribution across countries gives the average or median value with reasonable precision.

The interquartile range for our estimates of the undertaxed capital share is large—between 15% and 60%. This reflects variation in tax rates across countries. Due to this heterogeneity, the final impact will be uneven. Still, it appears large in most cases. Around 40% of capital is undertaxed in the median country, given the

²⁷As before, disaggregated results are in the appendix. Table 2 includes affiliates reporting negative taxes. Their exclusion does not meaningfully change average profitability. We also exclude holding companies and the regional headquarters of MNEs. Affiliate engaged in these activities are overrepresented in low tax brackets due to exemptions on intracompany payments or for other reasons. Other low-tax affiliates are engaged in a wide variety of activities including business support, manufacturing, resource exploration, software, etc.

²⁸The relationship appears non-linear and we take the log of the country average ETR to account for this.

Table 2: Characteristics of Large MNE Affiliates in Orbis by Location, Average 2013-19 (Millions USD)

Tax Rate	Obs.	Avg. Capital	Avg. Profits	% Affiliates	% Capital	% Profits
<i>Initial adopters</i>						
Under 15%	4939	251.5	18.0	26.2	44.4	42.0
0-5%	2236	354.1	23.6	11.9	28.3	24.9
Over 15%	13,895	111.9	8.9	73.8	55.6	58.0
<i>Other countries</i>						
Under 15%	1834	343.7	38.5	21.3	33.6	36.3
0-5%	549	300.4	27.6	6.4	8.8	7.8
Over 15%	6775	183.9	18.3	78.7	66.4	63.7
<i>OFCs</i>						
Under 15%	2456	999.1	90.4	46.0	77.1	85.8
0-5%	1019	1694.9	174.3	19.1	54.2	68.7
Over 15%	2880	253.6	12.7	54.0	22.9	14.2

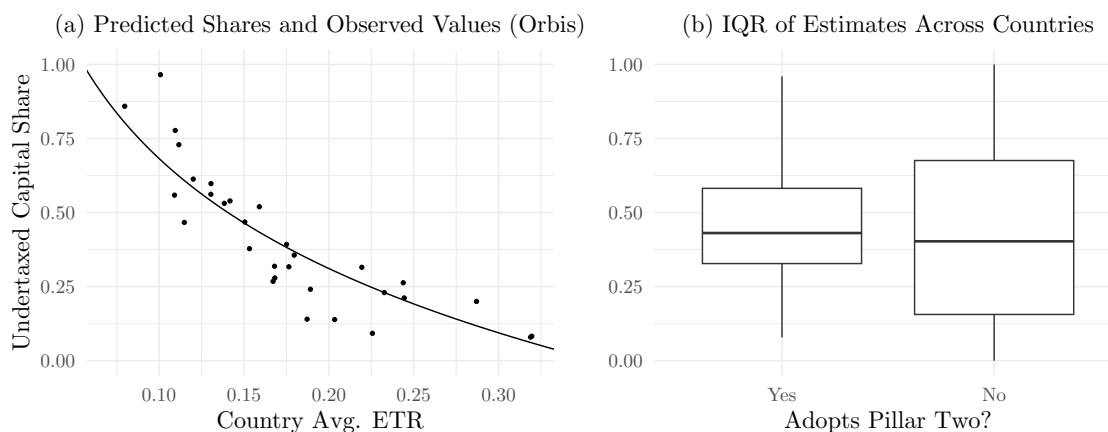
Source: Orbis.

Notes: Capital = total assets. Excludes holding companies and regional headquarters for non-OFCs.

Firms with negative tax values as reported as zero-tax.

median ETR is slightly above 15%. Countries outside Pillar Two tend to have higher tax rates and the undertaxed capital share is often lower. As a caveat, the results only reflect the amount of FDI potentially subject to tax. This does not predict the amount of additional tax revenue, where the distance between the ETR of the low-tax affiliate and the Pillar Two minimum rate also matters.²⁹

Figure 5: Share of Large MNE Capital Held by Low-Tax Affiliates



Source: Orbis and OECD CbCR databases and authors' calculations.

Notes: Excludes OFCs, holding companies, and regional headquarters. Panel (a) shows the predicted share of capital held by low-tax affiliates along with observed values by country. Panel (b) gives predicted values when actual values are unavailable. The prediction uses ETRs from the OECD CbCR tables. Details are in the appendix.

2.4 Are Carve-Outs Relevant?

The top-up tax calculation for Pillar Two allows for deductions based on payroll and tangible assets. Some low-tax affiliates may have their tax liability waived if the carve-out amount exceeds profits.³⁰ This is not

²⁹The undertaxed share is a bad predictor of the revenue gains since the tax distance also matters. Take that countries A and B both have 10 affiliates earning 100 in profits and holding 1000 in capital. One affiliate in country A pays 0 tax and the rest are above the minimum rate. All affiliates in country B pay 13.5 in tax and are subject to Pillar Two. The undertaxed capital share is 10% in country A and 100% in country B, while the revenue gain is the same.

³⁰See the 'excess profit' component in equation 1.

normally the case in OFCs, where most affiliates are shell companies without substantial activities, but may apply elsewhere. The share receiving a waiver also depends on the carve-out calculation. With the initial deductions – 8% of tangible assets and 10% of payroll – a greater number of affiliates are exempted from the top-up tax (see table 3).³¹ With the final deductions, we find only 7% of low-tax affiliates would be fully exempted.

Table 3: Share of Low-Tax Affiliates Receiving a Full Carve-Out by Location

	Obs.	Initial	Final
Full sample	9736	13.7	7.0
Initial adopters	5555	17.7	8.9
Other countries	1789	13.0	6.5
OFC	2392	5.1	2.8

Source: Orbis.

Notes: Only affiliates reporting payroll and fixed assets.

The initial carve-out appears to favor affiliates in countries first implementing the reform, but the differences become marginal as the carve-out decreases. In part, this reflects higher payroll costs in countries implementing the reform. Affiliates are less profitable in these countries as well, which mechanically increases the share with exemption. Lower profits may result international profit shifting, higher competition, or other factors. Due uncertainty on the correct allocation of profits, we exclude the carve-out from our final estimates. Moreover, there is no straightforward imputation for the carve-out when data are missing. The share of firms with a full carve-out is relatively small and the final results can be adjusted downward using results from table 3 if desired.

2.5 Final Estimates for the Scope

Investments by MNEs in the scope of Pillar Two constitute the majority of FDI in the typical country. Similarly, a significant share of this investment is held by low-tax affiliates. The overall scope of Pillar Two is given by the intersection of these two elements:

$$\% \text{ Investment by Large MNEs} \times \% \text{ Capital Held by Low-Tax Affiliates}$$

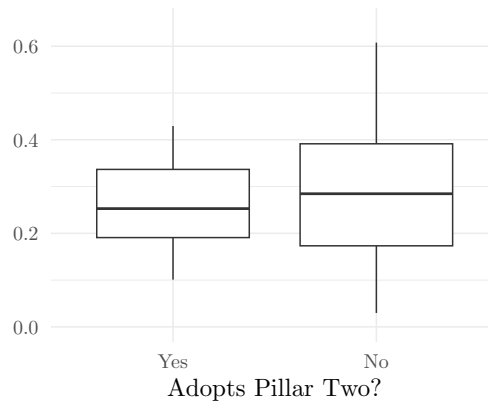
Around 25% of the FDI appears in the scope of Pillar Two for the typical country.³² The final sample includes 59 countries and covers 87% of global FDI. Applying country-specific shares to the FDI stock indicates \$7.7 trillion out of \$23.4 trillion in total FDI is in the scope of the reform, not counting OFCs.³³ At least \$6 trillion of this FDI stock is located in countries implementing the reform in the baseline scenario. Of the remaining \$1.7 trillion, around \$1.2 trillion is located in developing countries. This highlights that IIRs may be regressive in many cases, at least if they discourage investment in low-income countries.

³¹Results in table 3 are relatively consistent across tax brackets and are omitted for brevity.

³²The scope is similar to the impact given full implementation by all countries in the Inclusive Framework since they account for nearly all inward and outward FDI.

³³Here, we use 2019 values from the IMF BOP database.

Figure 6: Interquartile Ranges of Inward FDI in the Scope of Pillar Two



Note: Excludes OFCs.

3 Does Pillar Two Apply?

Pillar Two is designed to put a floor on tax competition. Countries forgo tax revenue whenever the IIR or UTPR are applied. The QDMTT should be interchangeable from the MNE perspective, so countries stand to gain revenue if they implement one. Still, implementation is lagging and IIRs may frequently apply over coming years. Most will apply to low-tax affiliates in OFCs, but also around \$1 trillion in FDI elsewhere may be affected (with two-thirds in developing countries).³⁴ This section outlines our approach to calculating the impact in country outside Pillar Two given our baseline scenario.³⁵

Within the countries initially adopting Pillar Two, the QDMTT will apply to all low-tax affiliates. Therefore, the scope and application are the same and no further elaboration is necessary. However, the same countries may equally apply an IIR or UTPR to undertaxed affiliates abroad, as mentioned. In many cases, the share of FDI subject to additional tax can be estimated using bilateral FDI positions. Countries implementing the reform account for the majority of FDI elsewhere (not counting OFCs). While large, these shares are also biased downward. Many investments are indirect—they first go through third countries before reaching their final destination—and bilateral statistics are limited to immediate investors in most cases. To adjust for ultimate ownership, we use an absorbing Markov chain methodology. This gives a better approximation of the FDI share subject to an IIR since ultimate investors are included. The following section outlines the mechanics of this approach. More detail is provided in Casella (2019).

3.1 Reallocating FDI to Ultimate Investors

To establish the effect of the IIR, it is necessary to first identify the location of the ultimate MNE parent. Information on ultimate ownership is not published for many countries and estimates based on immediate FDI could be downward biased (see box 2). We use an absorbing Markov chain approach, which is specified as follows. First, take that FDI has a ‘transient’ state i_T where country i both receives and makes direct

³⁴This raises questions about whether IIRs could be selectively applied. Still, \$1 trillion in FDI does not necessarily equate to large amount of tax revenue. A return of 10% implies \$100 billion in profits are subject to additional tax. A top-up tax on 10% of profits would generate \$10 billion in annual tax revenue. This is relatively insignificant in economic terms.

³⁵This share will increase over time. As more countries adopt Pillar Two, QDMTTs will apply to all domestic affiliates in the scope of Pillar Two. Similarly, IIRs will apply to low-tax foreign affiliates. As a consequence, the share of FDI affected by IIRs will increase for countries outside Pillar Two.

investments of equal amounts and an ‘absorbing’ state i_A where country i implements the direct investment as a project. This gives four probabilities for FDI from country i to country j :

$$p_{j,i}^{A,A} = Pr(i_A \xrightarrow{\text{DIR}} j_A) = \begin{cases} 1 & \text{if } i = j \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

$$p_{j,i}^{A,T} = Pr(i_T \xrightarrow{\text{DIR}} j_A) = 0 \quad (4)$$

$$p_{j,i}^{T,A} = Pr(i_A \xrightarrow{\text{DIR}} j_T) = p_d(j, i) [1 - p_c(i)] \quad (5)$$

$$p_{j,i}^{T,T} = Pr(i_T \xrightarrow{\text{DIR}} j_T) = p_d(j, i) p_c(i) \quad (6)$$

where $p_d(j, i)$ is the probability that country i is a direct investor in the recipient country j and $p_c(i)$ is the probability that direct investment from country i occurs through a conduit entity.³⁶ For a set of n countries $i \in \{1, 2, \dots, n\}$ four sub-matrices can be defined such that

$$\mathbf{P}^{A,A} = \begin{bmatrix} p_{1,1}^{A,A} & \cdots & p_{1,n}^{A,A} \\ \vdots & \ddots & \vdots \\ p_{n,1}^{A,A} & \cdots & p_{n,n}^{A,A} \end{bmatrix} \quad \text{etc.} \quad (7)$$

Here, rows give the probabilities for inward investment and columns capture the probabilities for outward investment. The transition matrix combines the sub-matrices, which can be rewritten using a standard notation (here \mathbf{I} is the identity matrix)

$$\mathbf{P} = \begin{bmatrix} \mathbf{P}^{A,A} & \mathbf{P}^{A,T} \\ \mathbf{P}^{T,A} & \mathbf{P}^{T,T} \end{bmatrix} = \begin{bmatrix} \mathbf{I} & \mathbf{0} \\ \mathbf{R} & \mathbf{Q} \end{bmatrix} \quad (8)$$

The solution matrix \mathbf{R}^* is given by

$$\mathbf{R}^* = (\mathbf{I} - \mathbf{Q})^{-1} \times \mathbf{R} = \begin{bmatrix} p_{1,1}^* & \cdots & p_{1,n}^* \\ \vdots & \ddots & \vdots \\ p_{n,1}^* & \cdots & p_{n,n}^* \end{bmatrix} \quad (9)$$

where, $p_{j,i}^*$ defines the share of country j 's FDI stock ultimately owned by country i . Finally, we can multiply each row of the solution matrix by an indicator matrix. The scalar product gives share of ultimate FDI subject to an IIR

$$z_j^* = \begin{bmatrix} \mathbf{1}(i_1 \in X) \\ \vdots \\ \mathbf{1}(i_n \in X) \end{bmatrix} \begin{bmatrix} p_{j,1}^* & \cdots & p_{j,n}^* \end{bmatrix} \quad (10)$$

Here, X is the set of countries adopting Pillar Two. Several data sources are needed to complete the exercise.

³⁶Specifically, $p_d(j, i)$ is the share of country i in country j 's total FDI stock and $p_c(i)$ is the share of SPEs in country i 's FDI stock. These shares are imputed in many cases and the underlying estimates are included in the appendix.

Bilateral FDI stocks are taken from the 2021 CDIS and SPE (conduit) shares are from the OECD Foreign Direct Investment Statistics database. The conduit shares are imputed when unavailable and the relevant estimates are included in the appendix

3.2 Immediate and Ultimate Investors Adopting Pillar Two

Our approach to finding ultimate investors depends on two steps: (i) identifying conduit locations and the conduit FDI share and (ii) probabilistically attributing FDI to the ultimate owner, based on the inward and outward positions of conduit countries. To find the share of inward FDI subject to an IIR, we can add the two components: non-conduit FDI and ultimate FDI. More formally, we estimate the shares as follows

$$\text{immediate: } z_j = \begin{bmatrix} \mathbf{1}(i_1 \in X) \\ \vdots \\ \mathbf{1}(i_n \in X) \end{bmatrix} \begin{bmatrix} p_{j,1} & \cdots & p_{j,n} \end{bmatrix} \quad (11)$$

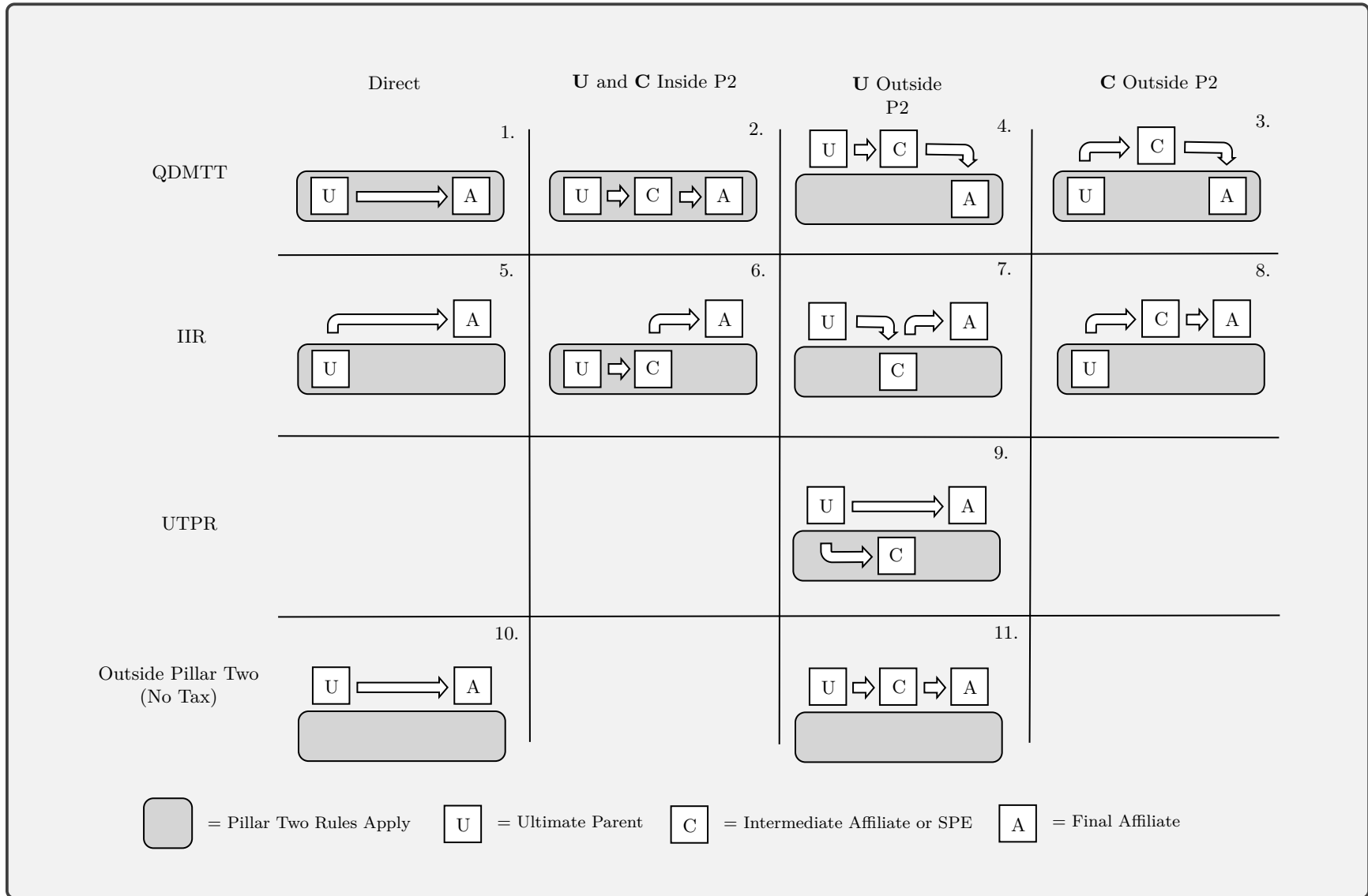
$$\text{total: } z'_j = z_j + \underbrace{\max\{z_j^* - z_j, 0\}}_{\text{indirect}} \quad (12)$$

Here, j is the index of all countries outside Pillar Two ($j = i \notin X$).³⁷ The immediate and ultimate shares of FDI from an investor country i into recipient j are given by $p_{j,i}$ and $p_{j,i}^*$ respectively. Figure 7b gives the interquartile range of FDI subject to an IIR for countries outside Pillar Two and follows the decomposition above. The gap between the immediate and ultimate investor shares is less than 5% for the median country, but relatively large in some cases. As box 3 discusses, immediate investment captures the majority of cases and we find it a reasonably good approximation most of the time. Indirect FDI captures instances where the conduit and recipient country are outside Pillar Two and an ultimate parent inside it.³⁸

³⁷In the case of countries adopting Pillar Two, $z_j = 1$.

³⁸For example, a large amount of investment into China goes through Hong Kong and 20% of this indirect FDI is subject to Pillar Two in our baseline scenario.

Box 3: Simplified Taxonomy of FDI Structures and Pillar Two Tax Regimes



1. Overview of Tax Regimes

Qualified Domestic Top-Up Tax (Cases 1-4): The QDMTT takes precedence over other Pillar Two taxes. The tax is collected by the country where the low-tax affiliate is located and the tax regime faced by other parts of the MNE group is irrelevant.

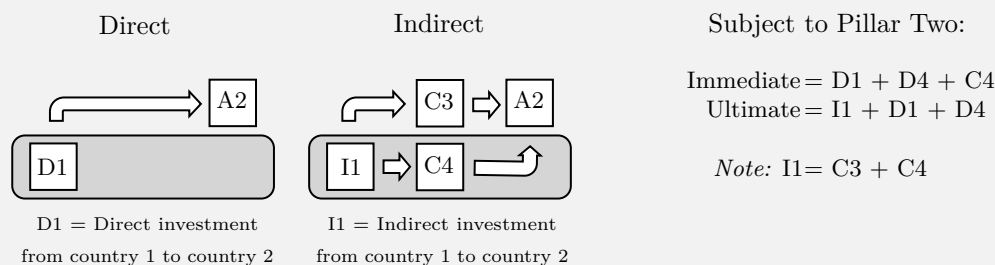
Income Inclusion Rule (Cases 5-8): The IIR has second priority. If an affiliate is low-tax and there is no QDMTT where it is located, then tax rights devolve to the country where the ultimate parent resides. If the ultimate parent is not subject to BEPS, then tax rights move down the ownership chain of the MNE group.

Undertaxed Payments Rule (Case 9): If both the MNE parent and its connection to the low-tax affiliate lie outside Pillar Two, the UTPR may apply if other parts of the MNE group are inside Pillar Two countries. The UTPR cancels any tax deduction these affiliate receive for intragroup payments, until tax underpayments recouped. The allocation of tax rights across Pillar Two countries is more complicated than the other rules. The first allocation key is roughly equal to each country's share of intragroup payments to the low-tax affiliate. If this is insufficient, then a second key allocates tax rights based on each country's share of intragroup expenditures.

2. Accounting for Indirect Investment

While investments may pass through multiple conduits, the simplified taxonomy captures the vast majority of cases. The location of the ultimate investor is needed to test if Pillar Two applies (cases 3, 4, 8, 10 and 11). Only the application of a UTPR (case 9) is difficult to distinguish using our approach. To motivate the inclusion of ultimate investors in the analysis, take the case below where countries 1 and 4 apply Pillar Two

Conduit FDI and FDI Subject to Pillar Two



Country 1 makes both direct and indirect investments into country 2 (denoted D1 and I1). Countries 3 and 4 serve as conduits for country 1 and also make direct investments into country 2 (D3 and D4). To estimate the share of FDI subject to Pillar Two, an approach using immediate investors correctly attributes conduit investment through country 4 (C4) to Pillar Two but does not capture conduit investment through country 3 (C3). This omission biases the estimate downward. We also have the situation where a conduit country is inside Pillar Two and the ultimate investor outside (case 7). Here, ultimate investment subject to Pillar Two is less than immediate investment

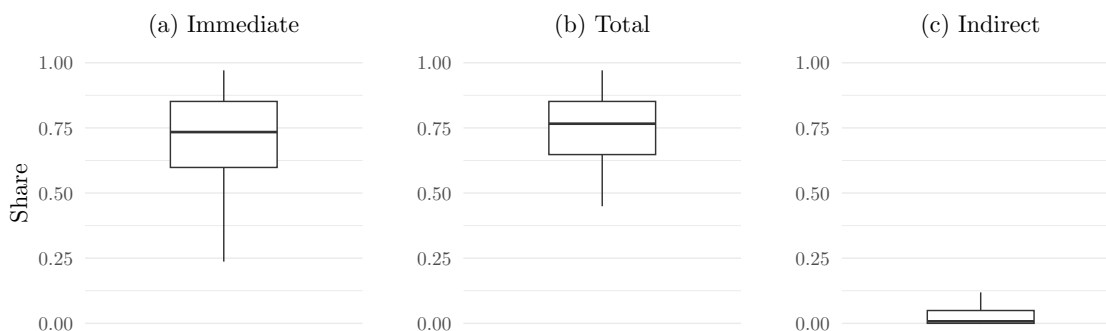
$$\text{Immediate} = D4 + C4 > \text{Ultimate} = D4$$

Both situations are captured by the following expression:

$$\text{Total} = \text{Immediate} + \max\{\text{Ultimate} - \text{Immediate}, 0\}$$

After adjusting for ultimate investment, we find countries adopting Pillar Two account for the majority of FDI outside the reform, around 55% in the typical country (see figure 7b). The simulation results can change depending on which countries are inside the reform’s perimeter. Adding China, a major investor in many developing countries, can have a large effect. The share of FDI within Pillar Two increases 10 percentage points for the typical developing country under this scenario. The exercise is also sensitive to whether the United States is included or not. It is the largest global investor and has implemented legislation similar to the Pillar Two model rules. Still, there are some important differences. First the revenue threshold defining large MNEs is higher, and fewer affiliates may be included in the scope.³⁹ Second, the US rules include several deductions not present in the OECD model rules.⁴⁰

Figure 7: Interquartile Ranges of FDI Subject to Additional Tax in Countries Outside Pillar Two



Source: IMF CDIS, OECD FDI, and UNCTAD databases and authors’ calculations. Notes: Excludes OFCs. Immediate investor estimates exclude conduit FDI. Outliers omitted.

4 Combined Estimates

Our final estimates capture the intersection of the Pillar Two scope and implementation:

$$\% \text{ FDI in Scope} \times \% \text{ FDI Subject to Pillar Two}$$

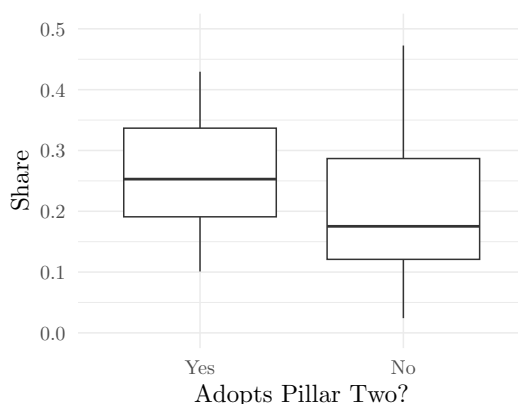
The carve-out is excluded since data are not available for many countries and only a small share of affiliates appear to benefit from a full deduction.

In the baseline scenario, a limited set of countries implement the reform, consistent with the rest of the paper. For these countries, all applicable FDI is taxed through QDMTTs and the final shares and scope are the same. For other countries, only some share of FDI is taxed through IIRs. Figure 8 gives the interquartile range of outcomes. With initial implementation, around 18% of FDI is subject to additional tax for the median country outside Pillar Two. In absolute terms, the cumulative impact is equal to \$1 trillion. Again, we find that a majority of the FDI stock outside Pillar Two countries is held by MNE affiliates in developing countries—around \$700 billion.

³⁹The US set the large MNE threshold at \$1 billion USD. Currently, this is higher than the €750 million threshold in the OECD model rules.

⁴⁰For this reason, some US policy makers have criticized elements of Pillar Two. They argue the gap between rules set by the US and the OECD may expose US MNEs to additional tax through UTPRs, creating conflicts with US policy objectives—such as subsidies for green investment. While this dispute is not of particular interest in the context of this paper, it highlights the potential frictions the IIR and UTPR may create.

Figure 8: Interquartile Ranges of Inward FDI Subject to Additional Tax (Baseline Scenario)



Note: Excludes OFCs.

5 The FDI Impact for Offshore Financial Centers

Around one-third of the FDI stock is located in OFCs. By design, most of the impact of Pillar Two will fall on these jurisdictions. The large MNE share appears similar for OFCs and non-OFCs, around 70%.⁴¹ We cannot elaborate these results much further and focus on tax distribution instead. Nine OFCs in our sample impose no corporate income tax (CIT).⁴² We assume all FDI in these countries is low-tax. Some OFCs also appear in the Orbis sample. Individual results are provided in table 4. As might be expected, a large share of capital is held by low-tax affiliates in these countries as well, much more than the typical non-OFC. With the exception of Singapore, all are expected to implement Pillar Two, so QDMTTs will apply in most cases.

Table 4: Share of Capital and Profits Reported by Low-Tax Affiliates in Orbis, Average 2013-19

ISO3	Obs.	% Affiliates	% Capital	% Profits
BEL	261	19.0	55.5	49.5
IRL	498	67.9	83.8	94.2
LUX	286	79.2	91.0	98.3
NLD	241	28.6	73.6	76.3
SGP	1163	57.8	82.2	90.8

Source: Orbis.

Notes: The observation count is only for low-tax affiliates.

Although we only have information on 14 out of 32 OFCs in our sample, they cover the majority of the FDI stock in OFCs, more than two-thirds. Two additional countries account for much of the remainder: Hong Kong and Switzerland. Neither country is strictly low-tax. Tax rates above and below 15% are observed for affiliates in the EUTAX public CbCR database. The tax regime in each country is complicated. Hong Kong has a two-tiered CIT. The initial rate is 8.25% for profits up to \$2 million HKD and then 16.5% on profits above. Since \$2 million HKD is far below the Pillar Two de minimis threshold, the higher tax rate should apply. While foreign-sourced income was not taxed in the past, revised tax rules for 2023 now count

⁴¹CbCRs are the only information source on MNE activity in most OFCs, but benchmarking is difficult. Few are included in the AMNE/FATS database. Individual results are included in the appendix when data are available.

⁴²According to the OECD's Corporate Tax Statistics. These are Anguilla, Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, and the Turks and Caicos Islands. The Tax Foundation's Corporate Tax Rates database also lists these countries as zero-tax.

offshore income for MNE groups. This includes interest, dividends, disposal gains, and IP licensing/royalty fees. Meanwhile, the Swiss federal government charges a flat 8.5% CIT rate. Individual cantons apply income taxes as well and there is considerable heterogeneity. Due to these ambiguities and lack of data, we exclude both from the final sample.

As before, we estimate the final impact accounting for both the scope of Pillar Two rules and their initial implementation. Results are tabulated by individual country. Table 5 also includes 8 of the 9 OFCs identified as zero-tax, which are grouped together.⁴³

Table 5: Initial Impact of Pillar Two on Inward FDI for Offshore Centers (Baseline Scenario)

ISO3	FDI Stock (Bil. USD)	Large MNE Share	Low-Tax Capital Share	Share Subject to Pillar Two	FDI Subject to Tax	
					(%)	(Bil. USD)
BEL	587	70	56	100	39	227
IRL	1033	80	84	100	67	696
LUX	3278	77	91	100	70	2302
NLD	4062	79	74	100	58	2357
SGP	1461	88	82	66	48	696
Other OFC	1407	71	100	46	33	464

Source: Orbis and IMF BOP, and UNCTAD FDI databases. FDI positions are 2019 values.

Notes: FDI in 'other OFCs' based on values from UNCTAD.

At least \$6.7 trillion of the \$11.8 trillion in offshore FDI identified appears subject to additional tax following the initial implementation of Pillar Two. An additional \$1.2 trillion is in-scope and could be subject to additional tax given all Inclusive Framework countries adopt the proposed rules. As might be expected, the share of FDI subject to tax is much higher in OFCs than elsewhere. The average gap between current tax rates and Pillar Two minimum is also large. Since tax revenue is a function of the tax distance and tax base, OFCs explain most of the anticipated revenue gains. Of course, our exercise is static and profit shifting behavior is also expected to change.

⁴³The FDI position for the Turks and Caicos Islands is missing. UNCTAD reports FDI positions for most countries in our sample, but two additional OFCs are missing as well, Andorra and Gibraltar. We prefer FDI reported in the IMF BOP database when available since UNCTAD omits SPEs.

6 Conclusion

The analysis covers 87% of the global FDI stock. In absolute terms, included countries account for \$35.3 trillion out of \$40.5 trillion in total FDI. Much of the unexplained remainder, \$3.2 trillion, is located in Hong Kong and Switzerland. Following Pillar Two implementation, additional taxes will apply to a large share of the global FDI stock. Almost \$16.3 trillion in FDI is within the scope of reform. Of this, at least three-quarters or \$12.4 trillion is located in countries likely to adopt the rules by 2024 (including those classified as OFCs). We identify another \$2.1 trillion in OFCs outside Pillar Two. Other countries explain the remainder, around \$1.7 trillion. While these countries account for a small share of all FDI subject to the reform – around 10% – this does not mean the impact will be small from their perspective. Most are developing or low-income and many have difficulty attracting investment.

While Pillar Two is generally well-targeted, countries could be selective about how IIRs or UTPRs are applied. In cases where an MNE has substantive activities in a low-income country, tax waivers should be considered. This would minimize the negative effects of the tax on investment decisions by MNEs. While there has been a long-standing debate about the benefits of tax competition, many developing countries cannot easily unwind existing tax incentives or implement new development strategies. As this paper highlights, the potential impact of Pillar Two on investment may be larger than currently anticipated for these countries. Furthermore, the revenue gain for countries inside Pillar Two would be small.

7 Works Cited

- Baraké, Mona, Paul-Emmanuel Chouc, Theresa Neef, and Gabriel Zucman. 2022. “Revenue Effects of the Global Minimum Tax Under Pillar Two.” *Intertax* 50: 689–710. <https://doi.org/10.54648/taxi2022074>.
- Bolwijn, Richard, Bruno Casella, and Davide Rigo. 2018. “An FDI-Driven Approach to Measuring the Scale and Economic Impact of BEPS.” Journal Article. *Transnational Corporations* 25 (2): 107–43. <https://doi.org/10.18356/c4f9fd3c-en>.
- Casella, Bruno. 2019. “Looking Through Conduit FDI in Search of Ultimate Investors: A Probabilistic Approach.” Journal Article. *Transnational Corporations* 26 (1): 109–49. <https://doi.org/10.18356/8a8b094c-en>.
- Casella, Bruno, and Baptiste Souillard. 2022. “A New Framework to Assess the Fiscal Impact of a Global Minimum Tax on FDI.” Journal Article. *Transnational Corporations* 29 (2): 105–43. <https://doi.org/10.18356/2076099x-29-2-5>.
- Coppola, Antonio, Matteo Maggiori, Brent Neiman, and Jesse Schreger. 2021. “Redrawing the Map of Global Capital Flows: The Role of Cross-Border Financing and Tax Havens*.” *The Quarterly Journal of Economics* 136 (3): 1499–1556. <https://doi.org/10.1093/qje/qjab014>.
- Damgaard, Jannick, Thomas Elkjaer, and Niels Johannesen. 2019. “What Is Real and What Is Not in the Global FDI Network?” *IMF Working Papers* 19/274 (December). <https://doi.org/10.5089/9781513521527.001>.
- De Backer, Koen, and Sébastien Miroudot. 2018. “Multinational enterprises in the global economy: Heavily debated but hardly measured.” *OECD Policy Note*.
- Janský, Petr, and Miroslav Palanský. 2019. “Estimating the Scale of Profit Shifting and Tax Revenue Losses Related to Foreign Direct Investment” 26 (1048-1103). <https://doi.org/10.1007/s10797-019-09547-8>.
- Tørsløv, Thomas R, Ludvig S Wier, and Gabriel Zucman. 2018. “The Missing Profits of Nations.” Working Paper 24701. Working Paper Series. National Bureau of Economic Research. <https://doi.org/10.3386/w24701>.
- Turban, Sébastien, Stéphane Sorbe, Valentine Millot, and Åsa Johansson. 2020. “A Set of Matrices to Map the Location of Profit and Economic Activity of Multinational Enterprises.” *OECD Taxation Working Papers*, no. 52. <https://doi.org/10.1787/4ec98acc-en>.
- UNCTAD. 2022. *World Investment Report 2022*. United Nations. <https://doi.org/10.18356/9789210015431>.

A Appendix

The following countries are treated as OFCs (by ISO3 code):

ABW; AIA; AND; ATG; BEL; BHR; BHS; BLZ; BMU; BRB; CHE; CUW; CYM; CYP; GIB; GRD; HKG; IRL; KNA; LBN; LCA; LUX; MHL; MLT; MUS; NLD; PAN; SGP; SYC; TCA; VCT; VGB

Figure 2 excludes the following countries.

AGO; ARE; BEN; GNB; TUN; TZA

Most are primary commodity exporters and taxes on income from resource extraction may apply.

A.1 The Large MNE Share

Alternative Estimates Using Greenfield FDI

Our alternative estimates follow directly from tabulations published in the UNCTAD (2022). The fDi Markets database records crossborder greenfield investments worldwide along with investor characteristics. Around 67% of greenfield investment is explained by large MNEs overall. This is very close to the average value we obtain from our baseline estimates using CbCRs and AMNE/FATS (66%). We also observe a similar wedge between developing and developed economies. In the fDi Markets database, large MNEs explain 70% of greenfield investment in developing countries and 66% in developed. Again, we obtain similar averages in the baseline (71% and 62%, respectively).

Adjusting for the Presence of Minority Interests

We use data from the US Bureau of Economic Analysis to align our baseline estimates with FDI concepts. The Worldwide Activities of US Multinational Enterprises tables include the total balance sheet of US foreign affiliate. The tables provide owners equity for all affiliates (including minority interests down to 10% of total equity) as well as affiliates that are majority owned. We use the difference to calculate the share of minority interests in total investment.

Owners equity is adjusted to reflect the consolidated total and we find a very close correlation with FDI at the country level. FDI and owner's equity have a near 1:1 relationship (see figure 9a).⁴⁴ Most residual variation is explain by the presence of SPEs. We then find the share of majority-ownership in total equity. Figure 9b provides the interquartile range of shares across countries. The median value is around 90% and we apply this value to the baseline exercise for the large MNE share.

⁴⁴We use majority ownership since country reporting is more complete.

Figure 9: The Share of FDI Explained by Majority Ownership



Source: US BEA USDIA and FDI databases and authors' calculations.

Notes: Excludes OFCs. Equity is adjusted for holding structures. Panel (a) shows the relationship between equity for majority-owned affiliates and FDI. Panel (b) compares the value of equity for majority-owned affiliates and all affiliates. Netherlands and Luxembourg are outliers and are omitted.

Removing Outliers

Table 6 presents summary statistics from the analysis of the large MNE share. Results are aggregated by country. As expected, values for turnover in the AMNE/FATS database tend to be larger than corresponding CbCR values. Higher average values in the countries initially adopting Pillar Two does not reflect affiliate size, but rather that more affiliates are present in these countries.

Table 6: Summary Statistics by Dyad, 2016-18 Average (Billions USD)

	N	Mean	St. Dev.	Min	Max
<i>Initial adopters</i>					
Unrelated Party Revenues	165	32.4	74.5	0.02	521.6
Turnover	165	40.4	93.5	0.03	664.9
<i>Other countries</i>					
Unrelated Party Revenues	178	12.4	29.9	0.02	249.3
Turnover	178	14.8	36.7	0.03	314.1
<i>OFCs</i>					
Unrelated Party Revenues	58	25.4	53.0	0.02	276.8
Turnover	58	31.9	70.4	0.07	334.8

Source: OECD CbCR and AMNE databases.

We remove outliers using a log-log regression (see table 7). Influential observations are removed whenever Cook's distance is greater than 5. A few specific parent-recipient dyads are problematic. Most involve OFCs: BEL/ECU; BEL/COL; ITA/CHL; ITA/COL; USA/ARE; USA/HKG; USA/LUX; USA/NLD

We also exclude countries where the number of entities in CbCR data routinely exceeds the number in FATS: LVA; ROU; NOR; DNK

Table 7: Regression of Revenue on Turnover (N = Dyads)

	<i>Dependent variable:</i>
	log(Revenue)
log(Turnover)	0.914*** (0.017)
Constant	1.683*** (0.359)
Observations	635
R ²	0.826
Adjusted R ²	0.825
Residual Std. Error	0.964 (df = 633)
F Statistic	2,995.158*** (df = 1; 633)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

The Large MNE Share in OFCs

A limited number of OFCs are included in the AMNE/FATS database. Table 8 overviews the results and they appear consistent. Most countries in the sample have a mix of real and financial activities and might not represent other OFCs where financial activities are dominant.

Table 8: Large MNE Shares in OFCs

ISO	Sales (Bil. USD)		Shares (%)
	CbCR	AMNE	
BEL	188	269	70
CHE	355	455	78
HKG	68	87	77
IRL	309	385	80
LUX	43	55	77
NLD	139	177	79
SGP	370	421	88

A.2 Tax Analysis

Data Sources

Three primary data sources inform the tax analysis. The OECD CbCR Tables provide an important benchmark. Despite some of the aforementioned issues, CbCRs capture affiliates within the scope of Pillar Two and the indicators are based on consistent reporting standards. The EUTAX database collects public CbCRs and publishes the data at the affiliate level, but suffers from selection bias and a small sample size. Orbis is by far the most comprehensive data source with information on MNE affiliates, but with several limitations. Accounting standards may be inconsistent with BEPS Pillar Two and not all affiliates are correctly linked to their ultimate owners. Additionally, the sample is biased towards larger affiliates and particular regions. Despite these issues, the datasets give a consistent set of results and show there is a large degree of variation in tax rates within most countries.

OECD Country by Country Reporting Tables

At the time of writing, the OECD has published tables with country-by-country data for 2016-18 at both the country level and for some country pairs. The CbCRs are now mandatory for all MNEs in the scope of Pillar Two and are collected by the jurisdiction where the MNE has its headquarters. Reporting includes most elements needed to calculate ETRs and the carve-out for country pairs, including profits, taxes accrued/paid and tangible assets.⁴⁵ For 2018, 48 countries provided information on MNEs headquartered in their jurisdictions in the public dataset while only 25 report all three years.⁴⁶ Results are based on sample averages using all years with data available. Ultimate parent countries and ‘stateless’ entities are excluded to avoid issues with double-counting and intra-firm dividends. Furthermore, several countries and country pairs are excluded since they report ETRs considerably higher than STRs. All are primary commodity exporters and taxes on income from resource extraction can be high relative to other activities.⁴⁷

The OECD notes several shortcomings of CbCR data relevant to this analysis. First, MNEs may include intra-company dividends in profit figures, introducing a downward bias when calculating effective tax rates. Dropping the ultimate parent jurisdiction is a common way to address this concern and our sample is limited to the international affiliates of MNEs. This also addresses another shortcoming of the data—tax exempt entities such as pension funds are required to file CbCRs and are included in the aggregates. Their inclusion could distort the relation between profits and taxes, but again most are headquartered in the reporting (ultimate parent) jurisdiction. There are other sources of bias we cannot address. The 2016, 2017 and 2018 samples are not fully comparable as CbCRs transitioned from voluntary to mandatory filing and the bilateral tax distribution is based on incomplete reporting. Around 100 out of 148 countries have more than 3 bilateral observations in CbCR data and only 43 have more than 10 observations. We expect these data issues will gradually resolve over time, but alternative data sources are needed given the timeline of the reform and planned 2024 implementation. We exclude the following countries from our analysis whenever CbCR tax rates are used: Angola, Benin, Guinea-Bissau, Tanzania, Tunisia, and the United Arab Emirates.

EU Tax Observatory Database of Public CbCRs

Some companies voluntarily disclose their CbCRs and the EU Tax Observatory (EUTAX) has constructed an affiliate-level database from these indicators, which includes profits before income taxes, income taxes paid/accrued, and tangible assets. Most reporters follow the GRI 207-4 accounting standard, which conforms with the OECD requirements and covers the series needed to calculate the GloBE ratio. In addition, the final report for the Action 13 (OECD) provides a template for multinationals to disclose information on their operations by jurisdiction, which some have also used. While the EUTAX database includes most variables needed to calculate the GloBE ratio and carve-out, payroll is a notable exception.

Similar to OECD CbCR database, we drop observations for the ultimate parent jurisdiction. Affiliates with negative profits are excluded from the sample, as are cases where the ETR is greater than one. When multiple observations are available, we use the average across years. Some MNEs report negative taxes and their inclusion as zero-tax affiliates can influence the results. These observations are dropped since many affiliates only have one year of data and we cannot determine if the negative values are idiosyncratic or persistent, but we track their presence.

⁴⁵Payroll is a notable exception. We refer to the ILO Labor Statistics database to find average payroll by country. Also, reporting of tangible assets may include inventories, which are excluded from the carve-out.

⁴⁶Source.

⁴⁷As noted in the previous section, covered taxes may include taxes on income from resource extraction.

ETRs are available for around one-third of the full EUTAX sample. The resulting subsample covers 165 public CbCRs for the 2017-21 fiscal years from 95 multinational companies headquartered in 21 different jurisdictions. The median MNE reports ETRs across 7 jurisdictions after data cleaning. Companies in the extraction and oil sector are overrepresented and make up more than 30% of the sample by count. Also, companies apply some discretion in choosing what variables to report and may not follow standard definitions. Despite these caveats, we find the results align fairly closely with the OECD CbCR Tables. We do not use the EUTAX database extensively in our estimates due to the small sample size by country, but it helps cross-validate our main findings using Orbis.

Bureau Van Dijk Orbis Database

Orbis provides comparable financial data for a large number of companies as well as information on their ownership structure and main activities. The database is global, but coverage is strongest for Europe. Out of the 41 million firms with detailed financial information, around 1 million are subsidiaries in the scope of BEPS and almost 50,000 provide unconsolidated information on accounting profits and tax paid over the 2013-19 sample period. Unfortunately, financial information for smaller subsidiaries may only appear on a consolidated basis, one possible source of bias in the data. An OECD study finds firms in Orbis are disproportionately larger, older, and more productive than the general population of firms.⁴⁸ The average firm size is 450 employees in the sample with operating revenue around \$200 million and profits around \$22 million—quite large compared to the average firm.

The sample is limited to firms where a foreign corporate entity is the majority shareholder and the ultimate parent has more than €750 million in revenue.⁴⁹ The following variables are used: profits ('P/L before tax'), taxes paid ('taxation'), total assets, tangible fixed assets, payroll ('costs of employees'), and the number of employees. To be included, the firm must provide unconsolidated financial statements and report profits more than €1 million for at least one year within the sample period. Firms with less than three observations over the 2013-19 sample period are dropped from the sample. Following the initial selection, taxes paid and profits before tax are summed across all years to calculate the final ETR. This helps avoid issues with deferred taxes and loss carry-forward. Firms with negative profits in aggregate and ETRs greater than one are then excluded from the sample. Firms reporting negative taxes are included as zero-tax affiliates in the baseline estimates if the negative tax is observed over two or more years. These observations are separately tracked. Holding companies, head offices, and business support activities are concentrated among low tax affiliates. We exclude them from figures and tables since intracompany dividends can distort tax ratios. The search criteria in Orbis are given in table 9.

⁴⁸Source.

⁴⁹We use average annual exchange rates when the Orbis interface does not offer native Euro conversion. Parent revenue is calculated for 2021.

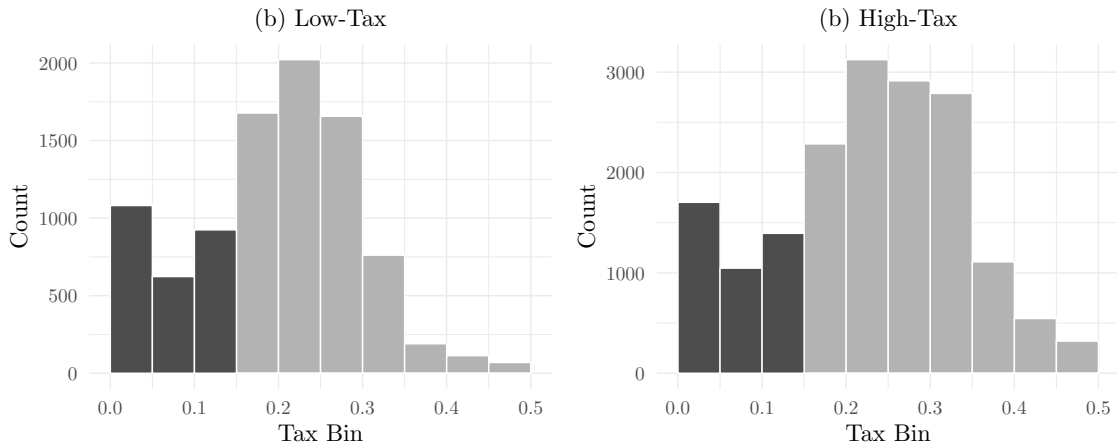
Table 9: Orbis Search Criteria

Search Step	Step result	Search result
1. Entity type	Corporate	412,603,479
2. Subsidiaries with Ultimate Owners by profile	UO with a given operating revenue of minimum 750m EUR; GUO only; Def. of the UO: min. path of 50.01%, known shareholder, closest quoted company in the path leading to the Ultimate Owner (if any)	1,027,858
3. P/L before tax (m EUR)	min=1, 2013-19, for at least one of the selected periods, exclusion of companies with no recent financial data and Public authorities/States/Governments	746,916
4. Taxation	All companies with a known value, 2013-19, for at least one of the selected periods, exclusion of companies with no recent financial data and Public authorities/States/Governments	14,708,314
5. Consolidation code	U1 (unconsolidated accounts with no consolidated companion), U2 (unconsolidated accounts with a consolidated companion), Additional unconsolidated accounts (U*)	42,683,339
6. Subsidiaries with foreign shareholders	An Ultimate Owner or shareholder owning together 51% located anywhere (excluding unknown countries); May have other shareholders located in country of origin; Def. of the UO: min. path of 50.01%, known shareholder, closest quoted company in the path leading to the Ultimate Owner (if any)	2,945,758
Boolean search	1 and 2 and 3 and 4 and 5 and 6	
TOTAL		48,072

The Tax Distribution of MNE Affiliates and Capital

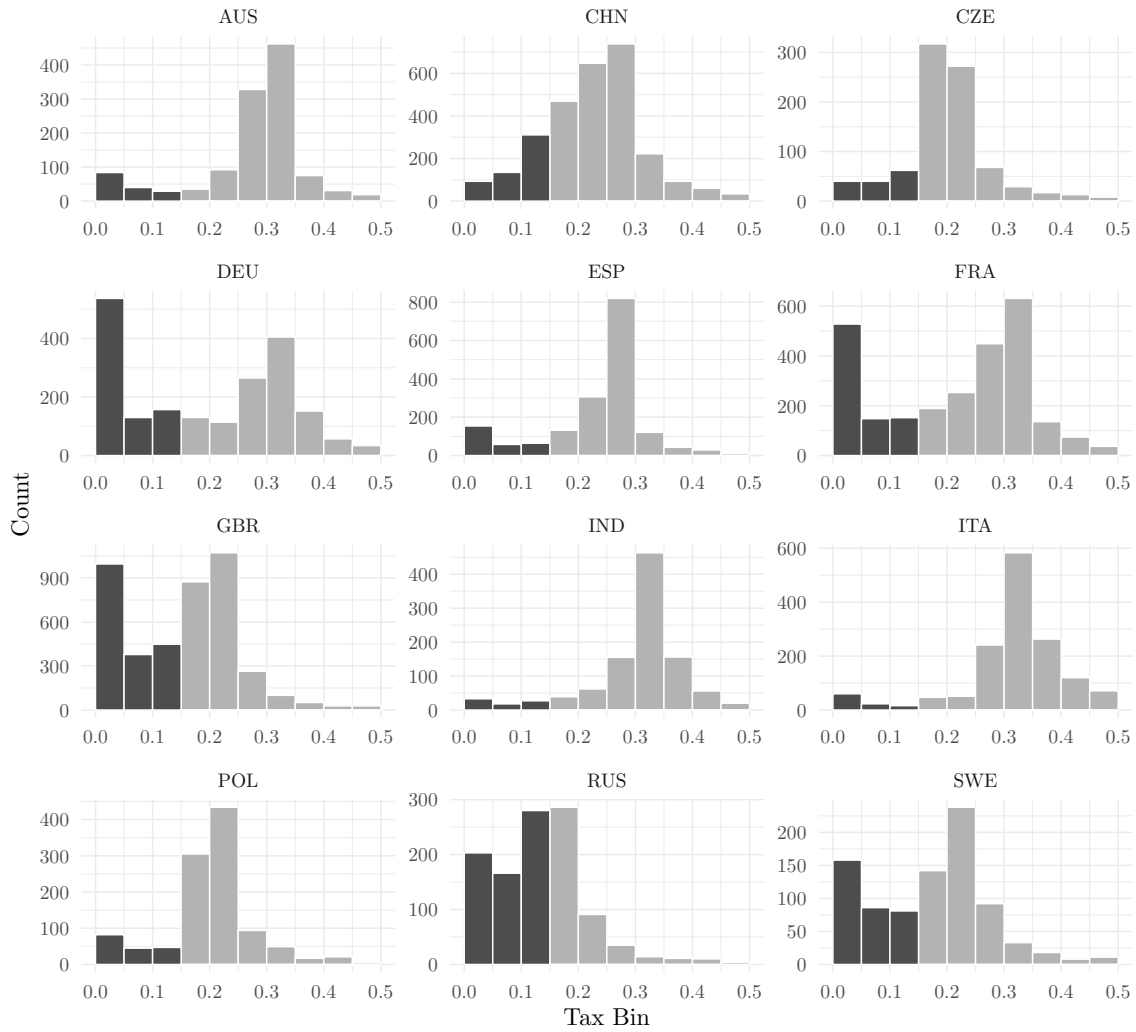
Low-tax affiliates have a substantial presence in countries with high average tax rates. The distributions for low- and high-tax countries are quite similar (see figure 10). There are large differences in the tax distribution across countries. We focus on the ‘median’ case because of this heterogeneity.

Figure 10: The Distribution of Affiliate ETRs in Low- and High-Tax Countries (Orbis)



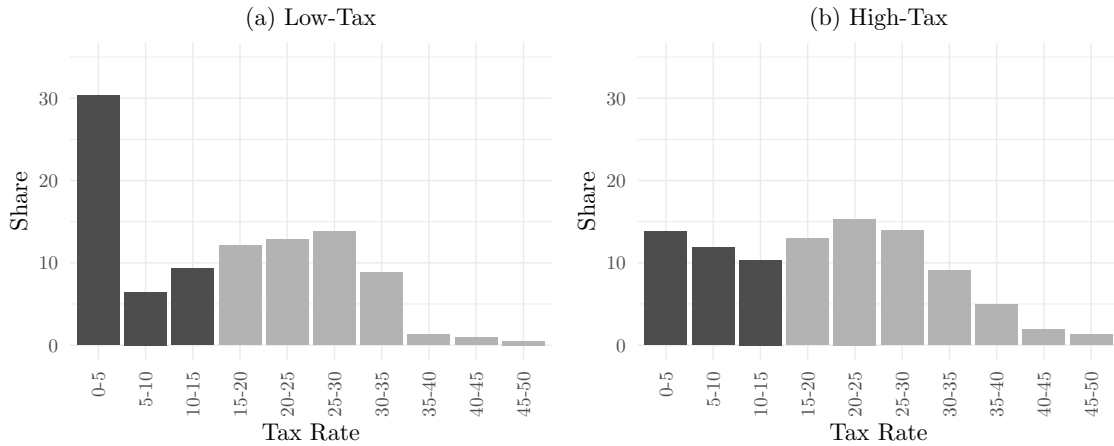
Source: OECD CbCR Tables and Orbis. Notes: Excludes OFCs, holding companies, and regional headquarters. High-tax = country average ETR over 15% in the OECD CbCR tables.

Figure 11: The Distribution of Affiliate ETRs in Orbis for Selected Countries, Averages 2013-19



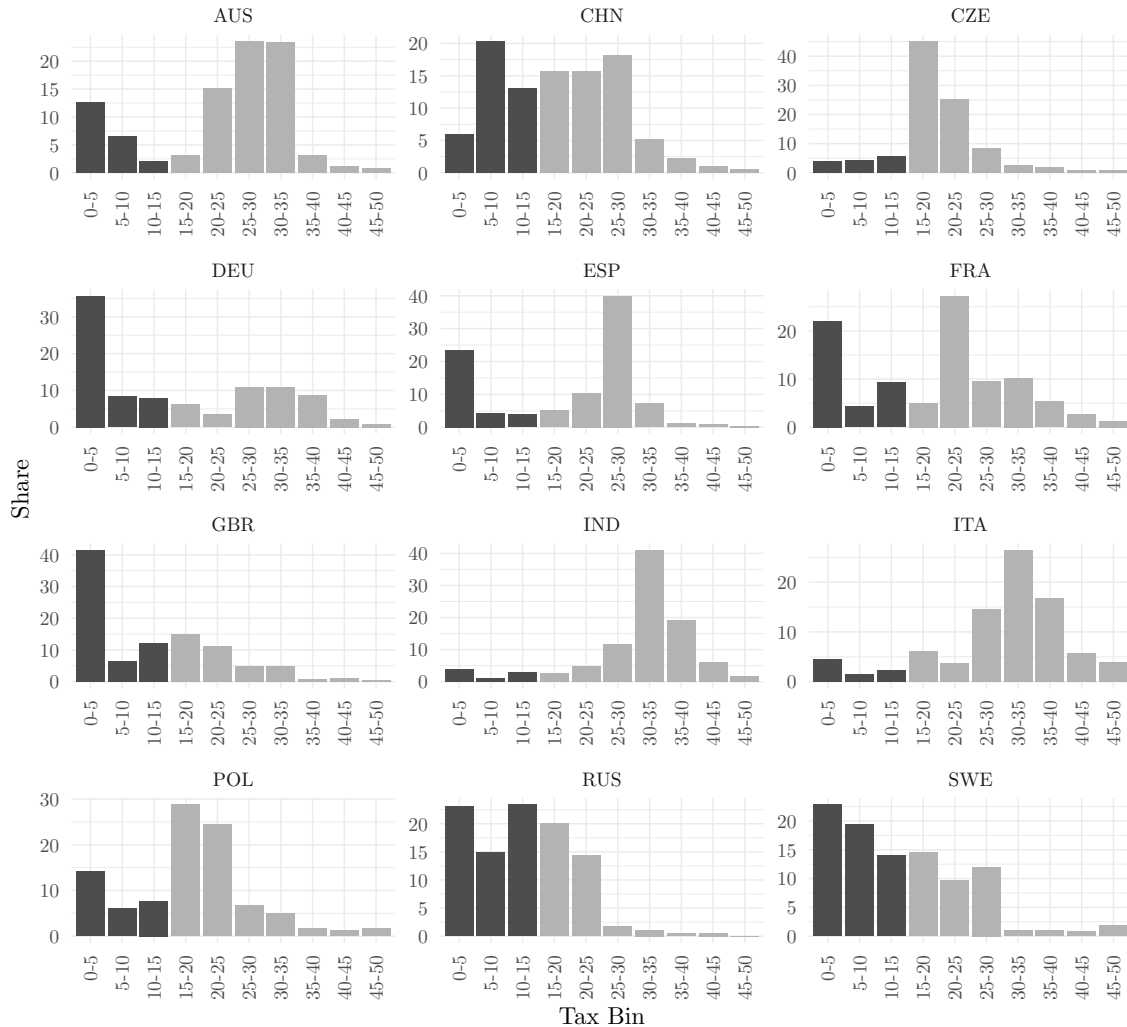
The distribution of capital across tax bins reveals some difference between low- and high-tax countries (figure 12). In low-tax countries, almost one-third of capital is held by affiliates paying little or no tax. There is much less concentration at the bottom of the tax scale in high-tax countries. Variation across individual countries remains (figure 13). In some countries, the tax distribution shifts left to a large extent, meaning more capital is held by low-tax affiliates. This is not evident in all countries. The results should be interpreted with caution since the full tax distribution is not available. The subset of firms in Orbis may not be representative.

Figure 12: The Distribution of Capital by Tax Rate in Low- and High-Tax Countries (Orbis)



Source: OECD CbCR Tables and Orbis. Notes: Excludes OFCs, holding companies, and regional headquarters. High-tax = country average ETR over 15% in the OECD CbCR tables.

Figure 13: The Distribution of Capital by Tax Rate in Orbis for Selected Countries, Averages 2013-19



Imputation of Undertaxed Capital

The following estimate is used in our imputation. The country average ETR derived from the OECD CbCR tables is adjusted to correspond with Orbis (see figure 2a).

Table 10: Regression of Undertaxed Capital on Average ETRs (N = Countries)

	<i>Dependent variable:</i>
	Undertaxed Capital Share
log(Country Avg. ETR)	-0.504*** (0.068)
Constant	-0.540*** (0.128)
Observations	31
R ²	0.804
Adjusted R ²	0.798
Residual Std. Error	0.107 (df = 29)
F Statistic	119.266*** (df = 1; 29)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01
Source: Orbis	

While results from Orbis best capture tax heterogeneity, a regression using bilateral ETRs from the OECD CbCR tables gives similar results. A large number of observations take either 0 or 1 values in the CbCR data and we treat this as censoring.⁵⁰ A Tobit model is specified.

Table 11: Tobit Regression of Undertaxed Capital on Average ETRs (N = Countries)

	<i>Dependent variable:</i>
	Undertaxed Capital Share
log(Country Avg. ETR)	-0.590*** (0.048)
Constant	-0.622*** (0.093)
Observations	103
Log Likelihood	-11.300
Wald Test	149.694*** (df = 1)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

A.3 Ultimate Investors

⁵⁰There are no observations at the bounds using Orbis.

The SPE Share of FDI

Offshore centers are characterized by large FDI asset and liability positions — often many multiples of their GDP — and small net positions. Most of this activity is explained by holding companies, commonly referred to as special purpose entities or SPEs.⁵¹ Between 30% and 40% of the global FDI is routed through offshore centers—sometimes for profit shifting, but also for investor protections and/or the consolidation of complex operations. Statistical collection has lagged and few countries provide FDI by ultimate investor or the SPE share, although reporting is improving. Due to gaps in the data, we infer the conduit share using the implied investment method documented in Bolwijn, Casella, and Rigo (2018).⁵² This approach builds on the assumption of a relationship between GDP and FDI stock. Countries with a disproportionate amount of FDI relative to their size are flagged as outliers and the excess component is then associated with FDI into SPEs. We employ a ‘hybrid’ approach using SPE data where available and the imputation only applies to countries missing data.

To estimate the average relationship between FDI and GDP, we first omit known OFCs from our sample. We then pool 2015-19 and identify the top quartile of countries by FDI stock and estimate the elasticity of outward FDI to GDP using this sub-sample (see table 12). Based on this, we predict the 90% confidence interval and identify any FDI above it as conduit. This ‘excess’ component is then divided by total outward FDI to find the conduit share for each country. We classify all FDI as conduit in some very economically small jurisdictions (e.g. Cayman Islands, Mauritius).

Table 12: Regression of Outward FDI on GDP (Between Estimator)

	<i>Dependent variable:</i>
	log(Outward FDI)
log(USD GDP)	0.837*** (0.104)
Constant	1.098 (1.448)
Observations	28
R ²	0.712
Adjusted R ²	0.701
F Statistic	64.297*** (df = 1; 26)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

⁵¹A SPE is a subsidiary created to gain legal protections or tax advantages for subsequent investments. Most are located in OFCs and act as intermediate links in MNE ownership chains.

⁵²Others approaches include Damgaard, Elkjaer, and Johannesen (2019), which is similar to our own, and Turban et al. (2020), which is used in the OECD Economic Impact Assessment of BEPS. Alternatively, Coppola et al. (2021) reconstructs ownership from affiliate-level data.