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Effective tax rates of MNEs: New evidence on global low-taxed profit

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Abstract

The effective taxation of corporate profits is at the centre of an active public and academic debate. This debate is often focused on the extent of low-taxed profit of multinational enterprises (MNEs) in jurisdictions with low statutory tax rates or low average effective tax rates (ETRs). However, some affiliates in high tax jurisdictions may also be subject to low ETRs, due to tax incentives or other provisions. To date, a global accounting of the ETRs paid by MNEs that incorporates within-country heterogeneity has been missing.

Using a new dataset on the global activities of large MNEs, this paper provides new estimates of the distribution of effective tax rates of large MNEs across and within jurisdictions. The results show that low tax profit is common. Of the average annual net profits of USD 5,929 billion in our four-year sample, 12.7% (USD 753 billion) are taxed at ETRs below 5%; a further 23.4% (USD 1,390 billion) are taxed at ETRs between 5% and 15%. The majority of MNE profit is taxed at ETRs between 15% and 30%.

The analysis shows that substantial low-taxed profit exists outside low tax jurisdictions. We estimate that high tax jurisdictions (jurisdictions with average ETRs of above 15%) account for more than half (53.2%) of global profits taxed below 15%, much more than very low tax jurisdictions (those with average ETRs below 5%) which only account for 18.7% of low-taxed profits. High tax jurisdictions even account for more than 10% of very low-taxed profits (profits with an ETR of below 5%). This suggests that an assessment of global low-taxed profit that focuses only on jurisdictions with low average ETRs could potentially miss out on more than half of global low-taxed profit. In a companion paper, this data is used to assess the impact of the Global Minimum Tax.

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1 Introduction

1. **The effective taxation of corporate profits is at the centre of an active public and academic debate.** This debate often involves discussions of profit shifting by multinational enterprises (MNEs) towards jurisdictions with low statutory tax rates (STRs) or average effective tax rates (ETRs). Whether competitive pressures induce countries to reduce corporate taxation has also been a central theme of this debate. At the same time, many jurisdictions typically considered "high tax" offer various incentives which can lead to substantially reduced tax rates. To date, data that captures within-country variation in ETRs is particularly scarce. This which has led much of the empirical debate to split jurisdictions into low tax and high tax jurisdictions, without noting that ETRs within jurisdictions can vary substantially. This paper seeks to fill this gap by building estimates of ETRs that can capture both within-country and between-country variation.

2. **In 2021, almost 140 member jurisdictions of the OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) agreed the two-pillar solution to address the tax challenges arising from digitalisation and globalisation of the economy.**[1] The resulting rules are intended to ensure a global minimum tax rate of 15%. In response to this envisaged global corporate minimum tax many jurisdictions are moving forward with the implementation of domestic minimum top-up taxes. These aim to impose a top-up tax on any low-taxed profit reported in their jurisdiction before this top-up tax can be collected by other jurisdictions through the application of the rules underpinning the Global Minimum Tax. The fact that the jurisdictions adopting domestic minimum taxes include many jurisdictions considered to be high tax suggests that low-taxed profits of MNEs are not a phenomenon found only in "low tax" jurisdictions.

3. **The absence of a comprehensive picture of the global taxation of large MNEs is problematic for several reasons.** First, estimates of firm responses to tax are often based on tax rates at the jurisdiction level, and highlight the incentives MNEs may have to shift profit to low tax jurisdictions. This literature often neglects the extent to which MNEs affiliates can generate low-taxed profit in high tax jurisdictions. This in turn suggests that the responses of MNEs to tax may be inadequately estimated. Second, the literature on low-taxed profits has often focused on the impact of tax competition between high versus low tax jurisdictions. It is important to understand the extent to which tax competition may also lead to low tax profit in jurisdictions with high STRs and high average ETRs. Third, the absence of information on the distribution of low-taxed profit globally can lead to misleading estimates of the impact of various international policy reforms, not least the Global Minimum Tax.

4. **This paper extends the empirical evidence on how the profits of large MNEs are taxed in several dimensions.** First, it provides an estimate of the average ETRs on the profits of large MNEs in 222 jurisdictions taking a much more comprehensive perspective relative to the existing literature. Second, using newly gathered data, this paper goes beyond average jurisdiction-level ETRs and develops a distribution of ETRs within each jurisdiction. Third, it combines the data on ETR distributions with information on profits reported in each jurisdiction to study the taxation of global MNE profits in detail – including the extent of low-taxed profits reported in jurisdictions that are generally considered high tax.

[1] See (OECD, 2021[28]).

5. **The main source of data used for this study is anonymised and aggregated Country-by-Country Reporting (CbCR) data.** This data summarises the global activities of MNEs with revenues above EUR 750 million. Additional granular information based on CbCR data is presented here for the first time. CbCR data is complemented with further information on ETRs of MNEs taken from the US Bureau of Economic Analysis (BEA) and Tørsløv, Wier, and Zucman (2023[1]). Additional data on the profits of large MNEs comes from Bureau van Dijk's Orbis database. Missing data is imputed based on macroeconomic data such as FDI stocks from OECD and IMF databases.

6. **The key findings of this paper can be summarised as follows.** Average ETRs estimated often differ significantly from statutory tax rates and vary strongly across jurisdictions. Average ETRs below 15% are concentrated in investment hubs,[2] but some non-hubs also have ETRs well below their statutory tax rate (STR). Looking at distributions of ETRs within jurisdictions reveals substantial heterogeneity. The dispersion of ETRs between MNEs in some jurisdictions is larger than the dispersion of average ETRs across jurisdictions. Some jurisdictions with average ETRs clearly a tax rate of 15% tax some of their profits at much lower rates. This creates low-taxed profit in high tax jurisdictions which is often overlooked but sizeable. We estimate that on average, there are USD 2,143 billion of profits of large MNEs taxed at rates below 15% in each year in our sample period. Of these profits more than half (53.2%) are reported in jurisdictions which do not have an average ETR or STR below 15%.

7. **The analysis of the global taxation of MNEs presented in this paper speaks to several strands of the literature.** First, the calculation of average ETRs expands the work on average backward looking ETRs conducted by e.g., Mendoza (1994[2]) both in timeliness and coverage.[3] In contrast to the estimation of average ETRs, little prior work exists on the distribution of ETRs within jurisdictions. Backward looking ETRs examining variation across firms has been carried out by Bachas et al. (2023[3]) and Bilicka (2019[4]), but have not reached the broad coverage presented in this paper. Bachas et al. (2023[3]) use firm-level data to investigate the relationship between the distribution of ETRs and firm sizes in 13 jurisdictions. While the authors also document heterogeneity in ETRs within jurisdictions, the limited coverage shows the difficulties in constructing ETR distributions from firm-level data. Second, our finding on the importance of low-taxed profit in high tax jurisdictions is highly relevant when investigating the responsiveness of profits and investment to tax. Most studies in this field rely on average rates and forward-looking ETRs following the Devereux-Griffith (2003[5]) methodology when calculating elasticities of investment to tax (see Feld and Heckemeyer (2011[6]) for a review) disregarding the heterogeneity in firms' ETRs which may lead to different responses. Third, our paper is related to the literature on the costs of tax expenditures and their effect on tax outcomes. The presence of substantial low-taxed profit in high tax jurisdictions highlights the important role that tax incentives play in many corporate tax systems (Abbas and Klemm, 2013[7]; Celani, Dressler and Wermelinger, 2022[8]; González Cabral et al., 2023[9]) and the important role they can play in firms' investment decisions. Lastly, our study contributes to the literature that measures global low-taxed profits. Previous studies on low-taxed profit often strongly focus on investment hubs, again ignoring low-taxed profit in high tax jurisdictions (a notable exception is Fuest, Hugger & Neumeier (2022[10]) who study German firm-level CbCR, but do not aim for a broader coverage). Our findings suggest that some existing approaches may severely underestimate the global amount of low-taxed profit.

8. **This paper offers new insights regarding the global taxation of profits of large MNEs, but the CbCR data used also comes with some limitations.** First, only MNEs with revenues exceeding EUR 750 million are included in the data. While our analysis does not include MNEs with revenues below that threshold, it should be noted that much of the debate on the location of low-taxed

[2] Income groups are defined based on gross national income per capita following the World Bank classification. Investment hubs are generally defined as jurisdictions with a total inward foreign direct investment (FDI) position above 150% of GDP on average across 2017-2020. Annex D lists the full allocation of jurisdictions to different groupings.

[3] Janský (2023[26]) reviews this literature.

profits is focused on larger MNEs, given their importance in today's globalised economy, and the fact that investment and value added a highly concentrated amongst large firms (Hebous, 2021[11]; Hanappi, Millot and Turban, 2023[12]). Second, some smaller jurisdictions are not covered by the available CbCR data, so the analysis presented in this paper has to rely on imputations to some extent. CbCR data also have known quality issues, especially for the earlier years. These mainly relate to the double counting of intra-company dividends (Blouin and Robinson, 2020[13]). Double counting of dividends if not addressed could lead to artificially low ETRs. It is for this reason that the analysis presented in this paper attempts to correct for this issue by applying downward corrections to profits, but despite thorough data cleaning, there might remain some quality issues for individual data points in this relatively new data source. Nevertheless, CbCR is the best source available to study the taxation of large MNEs for a comprehensive set of jurisdictions. Finally, the results reported in this paper are largely descriptive. The insights provided, however, still significantly advance our understanding of the global taxation of the profits of large MNEs and are highly relevant for the design of corporate tax policy.

9. **The remainder of the paper is structured as follows.** Section 2 focuses on average ETRs at the jurisdiction level. Section 3 turns to the distribution of ETRs within jurisdictions. In Section 4, the data on ETRs are combined with information on profits reported in each jurisdiction and are then used to describe the global taxation of the profits of large MNEs, including the distribution of low-taxed profit. Section 5 concludes.

2 Average effective tax rates across jurisdictions

10. **This section estimates average backward looking ETRs for a set of 222 jurisdictions to give a global picture of the average tax rates paid by large MNEs.** These average ETRs aim to measure the average tax burden on a dollar earned in a jurisdiction by MNEs. Section 2.1 describes the methodology to use CbCR data to estimate average jurisdictional ETRs. These are then examined in Section 2.2.

2.1. Calculating average ETRs

11. **The calculation of average jurisdictional ETRs in this paper primarily relies on information from anonymised and aggregated Country-by-Country reports.** CbCR data summarises the global activities of MNEs with revenues above EUR 750 million, broken down by jurisdiction into "subgroups". An MNE subgroup comprises all entities of an MNE group operating in a tax jurisdiction. The reporting standard was introduced as part of the OECD/G20 Base Erosion and Profit Shifting project to support tax authorities in the assessment of transfer pricing and other BEPS-related risks as well as the statistical analysis of BEPS. Typically, CbCRs are submitted to tax authorities in the jurisdiction of the ultimate parent entity of the MNE (UPE). Tax authorities then provide the OECD Secretariat with aggregated statistics combining all CbCRs received from MNEs that have a UPE in their jurisdiction. This anonymised and aggregated CbCR data is reported annually at the UPE-affiliate jurisdiction level, so each observation in the data contains information on the total activities of all large MNEs from one UPE jurisdiction in an affiliate jurisdiction.[4] Aggregated CbCR statistics are currently available for up to 52 UPE jurisdictions per year. Information is reported separately for MNE subgroups earning positive and negative profits in a given affiliate jurisdiction, and on a combined basis for both profitable and loss-making MNE subgroups.

12. **We address several known issues when considering ETR estimates based on CbCR data.** First, we focus on average jurisdictional ETRs, i.e., profit-weighted averages computed across all affiliates operating in the jurisdiction independent of where their UPE is located. This tries to account for the fact that bilateral ETRs may not be representative of the typical tax burden in a jurisdiction. Second, the aggregated CbCR data for some affiliate jurisdictions is based on a small number of MNEs. In such cases, we complement the CbCR data with additional sources. Third, we correct for potentially inflated profit values originating from the double counting of dividends in UPEs. Lastly, we exclude observations that are outliers in terms of their ETR, on the grounds that these may stem from erroneous reporting of individual MNEs as discussed further below.

13. **At the same time, some disadvantages of the CbCR data remain.** The reports are based on financial accounting standards. Some literature has suggested that profits for accounting purposes are typically larger than those posted for tax purposes (Desai, 2005[14]; Shackelford and Shevlin, 2001[15]). While accounting standards are more comparable across jurisdictions as compared to the definition of

[4] In some cases, data for some UPE-affiliate pairs is aggregated by region due to jurisdictions' confidentiality rules. This regional data cannot be used for the calculation of jurisdictional ETRs in this paper.

profits for tax purposes, they can still vary across countries, limiting the comparability of the data. In addition, MNEs may choose which set of accounts they use (e.g., consolidation reporting packages, internal management accounts) when filing CbCRs, which limits the comparability (and potentially the quality) of the data. Moreover, CbCR still is a relatively new data source such that MNEs as well as tax administrations are still improving reporting systems, and the data are not subject to the same audit and compliance burdens as financial reporting or tax returns. Gradual improvements over time are also reflected in the updated version of the CbCR guidance issued by the OECD (2022[16]).

14. **In the following, average ETRs from aggregated CbCR data are estimated in three steps.** First, we clean and prepare the data, including adjusting the tax base for average losses in a jurisdiction and correcting for potential double counting of profits. Second, we estimate bilateral ETRs for each UPE-affiliate jurisdiction pair. Third, we estimate profit-weighted averages of these bilateral ETRs at the level of the affiliate jurisdiction, combining CbCR data with additional sources and regression-based imputations to fill gaps in the data. Results on average ETRs only using jurisdictions for which some CbCR data is available are presented in the Annex. Since CbCR data is largely based on accounting principles, the tax base used in the ETR calculations for this paper should be interpreted as resembling an ETR on accounting profit, not an ETR relative to taxable profit definitions in the individual countries. Focusing on accounting profits allows for a better comparability of ETRs across jurisdictions and is also broadly in line with the approach taken for the calculation of the Global Minimum Tax.[5] At the same time, the resulting ETRs might differ from the ETRs that are applied to jurisdictional tax bases.

2.1.1. Preparing the CbCR data

15. **For the calculation of ETRs, the analysis starts with information on profits and tax accrued from aggregated CbCR data, reported on MNE subgroups with positive profits.**[6] This information is taken from aggregated CbCR statistics for the years 2017-2020.[7] Overall, the data comprises information from more than 20,000 MNE-year observations and hundreds of thousands of MNE subgroups over the sample period. Some observations of questionable data quality are removed from the dataset to ensure that ETRs are not biased by individual data errors. These observations are identified by comparing different vintages of CbCR data over time and with macroeconomic indicators as well as testing for nonsensical values such as negative numbers of employees or negative counts of CbCRs. This removes around 3% of all relevant observations available.

16. **To expand the data coverage, missing jurisdiction-pair-year observations are imputed using data from all subgroups and loss-making subgroups.**[8] If data on all subgroups and loss-making subgroups are available, values for profitable subgroups are imputed by combining this information. In other cases, only values for all subgroups are available. This data is scaled by the median ratio of profits

[5] Various details of the Global Minimum Tax base mean that the ETRs modelled in this paper will not be the same as the ETRs that are required to estimate the impact of the Global Minimum Tax. These are developed in a companion paper (Hugger, González Cabral and O'Reilly, forthcoming[29]).

[6] Since MNE subgroups can comprise several entities, subgroups with positive profits may include individual entities that report losses. Our level of granularity could be interpreted as "jurisdictional blending", i.e., consolidating all profits and losses at the jurisdiction level across all entities of the same MNE, which also forms the basis of the Global Minimum Tax.

[7] Data on subgroups with positive profits are taken from Panel AI of Table I of the anonymised and aggregated CbCR statistics. While data for the year 2016 is also available, we focus on the later years since the first year of reporting may suffer from quality issues.

[8] Data on all subgroups are taken from Panel A of Table I, while data on loss-making affiliates are taken from Panel AII of Table I of the anonymised and aggregated CbCR statistics.

and taxes for profitable subgroups to the values of profits and taxes of all subgroups by affiliate jurisdiction and year from other CbCRs.[9]

17. **We address the potential double counting issues in CbCR profits pointed out by Blouin and Robinson** (2020[13]) **and OECD** (2020[17]) **by applying a downward correction to profits of affiliates co-located with their ultimate parent entity.** The double-counting issue particularly impacts the profits of UPEs where intra-company dividends can accumulate. While the guidance for MNEs completing the CbCRs has been clarified to address this issue, the data used in this paper may be subject to inflated profits due to double counting, particularly for years prior to 2020 (OECD, 2022[16]). Our corrections are either based on additional information directly provided by tax authorities of UPE jurisdictions, or by comparing the ETRs paid by affiliates of MNEs with a domestic UPE in a jurisdiction with ETRs paid by affiliates of foreign MNEs. The approach is based on the assumption that foreign entities are less likely to be impacted by double counting issues as intra-company dividends are likely to be more prevalent in the jurisdiction of the UPE. This means that the ETRs of entities with foreign UPEs are likely to be unaffected by the double counting of dividends. Annex C provides additional details on this methodology. Overall, downward corrections to address double counting are applied to around two thirds of the profit values of UPEs. Figure 1 shows the distribution of corrections, split into two categories. First, those based on detailed information submitted by tax authorities from selected UPE jurisdictions, and second, those based on the ETR comparison methodology. While the majority of corrections are based on ETR comparisons, the distributions are in a similar range and lie between 0 and 55%. The median downward correction is 32.4%. Corrections tend to be larger in the first two years of the sample period, in line with a gradual improvement in data quality.

18. **Despite the application of these corrections for double counting, some issues may remain.** For example, affiliate to affiliate dividend payments in a tiered MNE structure would also lead to double counting, which would not be corrected through the approach outlined above**.** Anecdotal reporting by CbCR filing jurisdictions suggests that double counting of profits is concentrated in the UPE jurisdiction. However, because of the issues concerning affiliate to affiliate or conduit payments, double counting issues may remain in some cases. As these issues cannot be identified in this methodology, such double counting as exists off outside of the UPE jurisdiction is not adjusted for in this paper. This may result in ETRs that are downward biased.

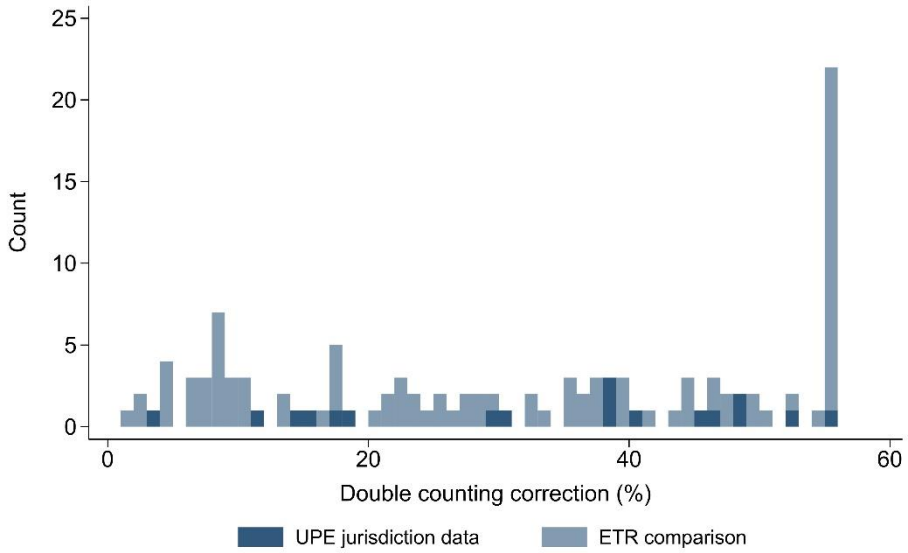
19. **Lastly, we adjust positive profits reported in CbCR for the typical share of losses in a jurisdiction.** Our approach is to approximate the ETR that would apply across the business cycle to MNEs which report profits in some years, but losses in others. Not adjusting for losses would lead to a downward bias in ETRs and not adequately reflect the tax treatment of losses that occur over the life cycle of a project.[10] For the loss adjustment, we adjust positive profits reported in a jurisdiction by the typical share of losses in positive profits observed in this jurisdiction (Annex C provides further details). Since our data is aggregated at the UPE-affiliate jurisdiction level, we are unable to account for prior-period losses at the level of individual entities. At the same time, the jurisdictional perspective allows us to use information on a large number of firms undertaking an even larger number of investment projects within a jurisdiction.

[9] If information for a given affiliate jurisdiction is available from less than three UPE jurisdictions, the global median by year is used for the scaling. Before the scaling, we exclude outliers and winsorise the ratios at the 5th percentile. For profits, the resulting scaling factor lies between 1 and 1.4 with a median of 1.05; for taxes accrued the scaling factor lies between 0.8 and 1 with a median of 0.99.

[10] For example, assume an MNE makes a profit of 100 and pays taxes of 20 in one year, but has losses of 15 and pays no taxes in another year. The average ETR if only positive profits are considered is $20/100 = 20\%$, while the average ETR computed across net profits over the life cycle of the project is $20/(100 - 15) = 24\%$. It is this latter ETR that we are interested in for the purposes of this paper. If jurisdictions allow for full loss offset, this approach would reduce taxes in profitable years and would result in lower ETRs. Table A.1 in Annex A provides illustrative examples for the ETR calculation in jurisdictions with no, partial, and full loss offset.

Assuming that investment projects are at different stages of their life cycle, exploiting several years of data should give a good approximation of the typical ratio of losses to profits in a jurisdiction and allows a representative net tax base to be estimated.

Figure 1. Double counting corrections to UPE profits in CbCR

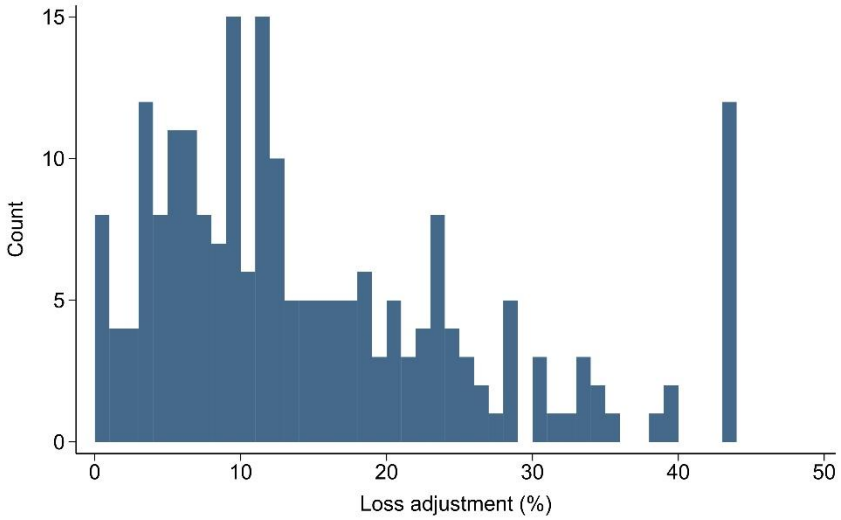


Note: Distribution of downward corrections to UPE jurisdictions' profits to account for potentially inflated profits due to double counting of intra-company dividends. Bins have a width of one percentage point. Corrections are based on information provided by UPE jurisdictions or the comparison of ETRs in a jurisdiction with ETRs paid by foreign MNEs. Corrections based on ETR comparisons are limited to the maximum correction observed in the data provided by jurisdictions of 55.5%.

20. **The loss adjustment to the tax base varies strongly across jurisdictions and could be driven by different factors.** Figure 2 shows the distribution of the reduction in positive profits due to the loss adjustment. The median adjustment to the tax base reduces positive profits by 11.8%. The variation across jurisdictions could reflect different risk profiles across jurisdictions or different accounting treatments of losses or other provisions. For investment hubs, this adjustment tends to be larger than for other jurisdictions (with a median of 18.1% in hubs vs. 11.6% in non-hub jurisdictions, respectively), potentially reflecting the shifting of risk to investment hubs described by Becker, Johannesen and Riedel (2020[18]). As far as jurisdictions allow firms to use prior-period losses to offset current taxable profits or allow for loss carry-backs, these loss-offset provisions should reduce tax payments of profitable entities observed in the data.[11] The resulting loss-adjusted ETRs estimated in this paper thus also reflect the generosity of actual loss offset rules used by MNEs in a jurisdiction.

[11] For example, Hanappi (2018[25]) provides an overview on loss-offset regulation across 34 OECD and non-OECD jurisdictions.

Figure 2. Loss adjustments to positive profit in CbCR



Note: Distribution of downward adjustments to positive profits from aggregated CbCR data to account for the typical share of losses relative to positive profits in an affiliate jurisdiction. Bins have a width of one percentage point. Adjustments are based on the typical amount of losses as a share of positive profits observed in a jurisdiction and are winsorised at the 5th and 95th percentile.

2.1.2. Calculating bilateral ETRs

21. **Bilateral ETRs at the UPE-affiliate-year jurisdiction level are estimated by dividing income tax accrued by adjusted profits, which represent the net tax base.** Data on income tax accrued are taken from aggregated CbCR data. While the tax base is constructed to be larger than or equal to zero, taxes accrued are negative in around 5% of observations. ETRs are calculated by dividing taxes accrued by loss and double-counting adjusted profits at the level of the UPE-affiliate pair in each year. Of the resulting ETRs, we drop the top and bottom 5 percentiles of the distribution under the assumption that these could be driven by one-off events that are not representative of the typical tax treatment in a jurisdiction, or by data errors. Under the assumption that negative ETRs are unlikely to be typical features of tax systems, UPE-affiliate-year-level ETRs are limited to positive values. At the other end of the distribution, incomplete loss-offset can lead to ETRs on net profits that exceed the statutory rate in a jurisdiction.[12] We therefore allow ETRs to exceed STRs in principle but cap the extent to which they can do so, based on the average impact of the loss adjustment at the jurisdictional level. Again, this is to limit the impact of outliers on jurisdictional averages estimated below.[13] The final dataset of bilateral ETRs consists of 8,386 UPE-affiliate jurisdiction observations which are based on more than 265,000 MNE subgroup-year observations. The bilateral ETRs cover 211 affiliate jurisdictions with data reported by 52 unique UPE jurisdictions over the period 2017-2020 (see Panel A of Table A.2 in Annex A for summary statistics).

[12] ETRs above the STR are also observed in Orbis microdata analysed as part of this paper.

[13] More precisely, we calculate the difference between the loss-adjusted and the unadjusted ETRs for each UPE-affiliate jurisdiction pair. After the exclusion of outliers at the top and the bottom, we then calculate the profit-weighted average difference between the two ETRs to estimate the average impact of the loss adjustment on ETRs for each jurisdiction. Bilateral ETRs are capped at the STR plus this average difference at the jurisdictional level unless the STR is zero. If the STR is zero, loss adjusted ETRs are capped at this STR.

2.1.3. Estimating jurisdictional ETRs

22. **Average ETRs at the jurisdictional level are estimated as a profit-weighted average across all bilateral ETRs for each affiliate jurisdiction.** Since the domestic tax system applicable in a jurisdiction generally does not discriminate based on the jurisdiction of the ultimate owner, ETRs paid by MNEs in a jurisdiction should not vary systematically across different UPE jurisdictions. The resulting jurisdictional ETRs are available for 211 unique affiliate jurisdictions (Panel B of Table A.2).

23. **To reduce the impact of potential time series volatility in the data, final ETRs are computed as the (unweighted) average ETR across all years available (2017-2020).** To account for the impact of tax reforms on ETRs, we only average across all years if there is no larger STR change in the respective jurisdiction over that period.[14] Larger STR changes are defined as changes in the headline rate of more than one percentage point. Such changes are interpreted as an indication of a more significant CIT reform which would likely also lead to changes in ETRs.[15] In jurisdictions with larger STR changes between 2017 and 2020, ETRs are only averaged across the years without a larger change. For example, if there was a larger STR change between 2019 and 2020, ETRs are averaged across 2017-2019, but separately calculated for 2020. The fact that the correlation between CbCR ETRs across years is high (0.82 on average), and that there is no substantial change in levels over time (medians are 17.2%, 17.2%, 16.2%, and 17.0% for 2017-2020), suggests that averaging over years does not mask any global trends over the sample period.

24. **To maximise the coverage of our dataset, we complement the average ETRs from CbCR with data from additional sources.** These include the US Bureau of Economic Analysis (BEA), Tørsløv, Wier, and Zucman (2023[1]), hereafter TWZ, and regression-based imputations. The BEA provides an annual report on the global activity of US MNEs in a large set of affiliate jurisdictions. In each affiliate jurisdiction, the average ETR of US MNEs is computed by dividing foreign taxes paid by "profit-type return", which aims to approximate profit before tax excluding various sources of financial income, ensuring no double counting. This data is available for up to 55 unique affiliate jurisdictions (other than the US) over the period 2017-2020.[16] TWZ calculate jurisdictional ETRs mainly based on a combination of aggregate macroeconomic data and assumptions, focusing on ETRs on profits of foreign-owned MNEs. This data is available for 78 jurisdictions for 2017-2019. Both BEA and TWZ aggregate profitable and loss-making MNE subgroups, leading to ETRs comparable to our loss adjusted CbCR ETRs. To fill any remaining gaps in the data, a regression model is used to impute ETRs based on jurisdiction-level predictors available for all jurisdictions such as statutory tax rates, the existence of tax incentives that can result in zero CIT rates, the FDI to GDP ratio, and jurisdiction size. The regression model and data are discussed in detail in Annex B. The ETRs resulting from the regressions are highly correlated with the ETRs calculated from CbCR data (correlation of 0.79 for jurisdictions for which CbCR data is available from more than 20 MNE subgroups). Before combining the additional data with CbCR information, we average between BEA data and information from Tørsløv, Wier, and Zucman (2023[1]) within each year since we consider them to be of similar quality. In combination, these BEA/TWZ ETRs cover 91 jurisdictions. The averaging across years for BEA/TWZ ETRs, as well as for the regression results follows the same approach as applied to CbCR ETRs described above. The resulting ETRs are also bounded in the same way by a lower bound of zero

[14] In a small number of cases, individual jurisdictions have informed the OECD about data issues in some earlier vintages of their aggregated CbCR data. In such cases, the problematic years have been excluded from the averages.

[15] On average, around 5% of jurisdictions per year have a relevant STR change in the sample period.

[16] The BEA data is taken from the statistics on U.S. Direct Investment Abroad (USDIA) dataset, focusing on Majority-Owned Foreign Affiliates. Specifically, the data on taxes and profits used to calculate effective tax rates paid by US MNEs abroad are taken from Table II.D1 (*Foreign income taxes*, used for the numerator in the ETR calculation) and Table II.F1 (*Profit-type return*, used for the denominator).

and an upper bound computed as the jurisdictional STR plus the typical loss-adjustment at the jurisdiction level.

25. **Finally, a single jurisdictional ETR is selected following a rank-order of data sources**.

1. CbCR ETRs are used whenever they are based on information from more than 20 MNE subgroups for a given jurisdiction in the relevant period to ensure that the CbCR ETRs are sufficiently representative.
2. If there are fewer than 20 subgroups available, CbCR ETRs are blended with the combined BEA/TWZ ETRs. The weighting between CbCR and BEA/TWZ ETRs depends on the number of subgroups available in CbCR.[17]
3. If there is no CbCR information available, BEA/TWZ ETRs are used.
4. If CbCR data alone are insufficient and BEA/TWZ is unavailable, a weighted average between CbCR ETRs and the regression-based imputations is constructed.
5. If neither CbCR, BEA, or TWZ are available, we resort to the regression result.

Summary statistics of each source of ETR data as well as the resulting combined rates are provided by Panel B of Table A.2.

26. **CbCR data is used for most jurisdictions and almost all global profit.** Figure 3 summarises the coverage of the different data sources. Jurisdictional average ETRs are directly derived from CbCR data in 81.0% of cases (up to 183 jurisdictions).[18] Jurisdictions for which this preferred source of ETR data is available account for 99.6% of GDP and 99.9% of total profit in the overall sample. Another 13.6% of average ETRs are estimated as the combination of CbCR ETRs with BEA/TWZ data, or with regression-based imputations. The remaining data come from BEA/TWZ (0.9%) and imputations (4.5%). Taken together, the 44 jurisdictions for which not sufficient or no CbCR data is available in all or some years only account for 0.4% of global GDP and around 0.1% of the total profits of large MNEs.

Figure 3. Data sources of average ETRs

Note: Coverage and preference order of data sources for jurisdictional average ETRs relative to the number of jurisdictions, total GDP, and total profit. Profit values are taken from the profit distribution described in Section 4 and Annex C. Labels for values <0.5% are supressed to improve readability.

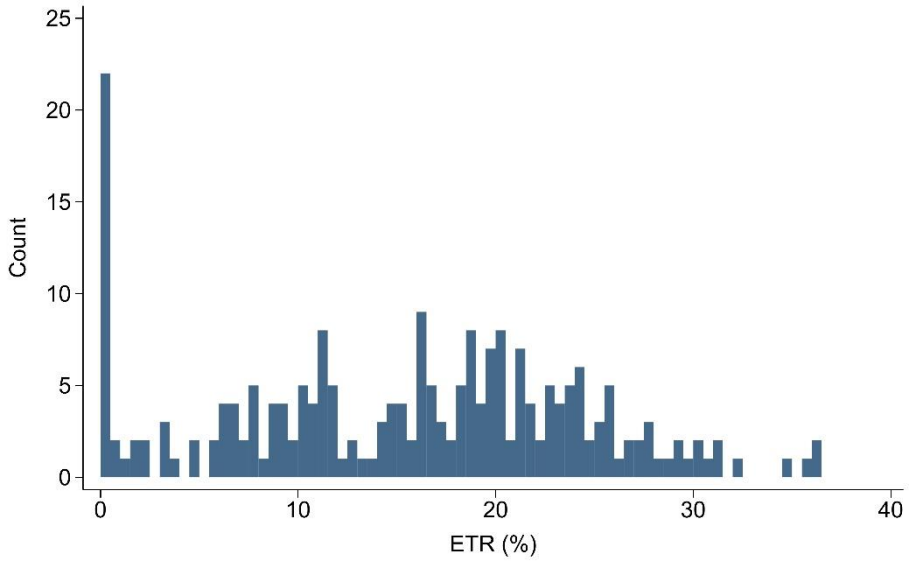
[17] The weight of the CbCR ETRs is higher, the more CbCR information is available. If, for example, CbCR ETRs are based on 15 subgroups for the relevant period, i.e., three quarters of the 20 subgroups set as our limit, the weight of the CbCR ETR is 75%, while the weight of the BEA/TWZ ETR is 25%.

[18] Accordingly, the correlation between the combined ETRs used in the paper and the ETRs calculated from CbCR data is high (0.93), with almost identical medians (16.6% for the combined ETR and 16.9% for the CbCR ETR in the yearly data). The correlation between the CbCR ETRs and the combined ETR for jurisdictions with sufficient CbCR data is 1 by construction.

2.2. Average ETRs across jurisdictions: Results

27. **Our full dataset shows the variation in average backward looking ETRs of 222 jurisdictions from 2017-2020.** For countries without any tax reform, ETRs do not vary over time by construction due to the averaging described above. Countries with larger changes in their STR have different ETRs across years. When discussing and visualising average ETRs in the following, we construct one data point for each jurisdiction representing the average ETR over the four-year period.[19] The global distribution of the resulting average ETRs at the jurisdictional level is plotted in Figure 4. The global median ETR applied to profits of large MNEs in our sample period is 16.4%, but there are substantial differences between jurisdictions: some countries have an average ETR of zero, others tax profits reported in their jurisdictions at more than 35% on average. In total, 18 jurisdictions have an average ETR of zero according to our estimates, another 17 jurisdictions have average ETRs strictly larger than zero, but below 5%. At the same time, more than half of all jurisdictions (125 jurisdictions, 56.3%) have an average ETR above 15%. In 31 jurisdictions the average ETR exceeds 25%.

Figure 4. Distribution of average ETRs



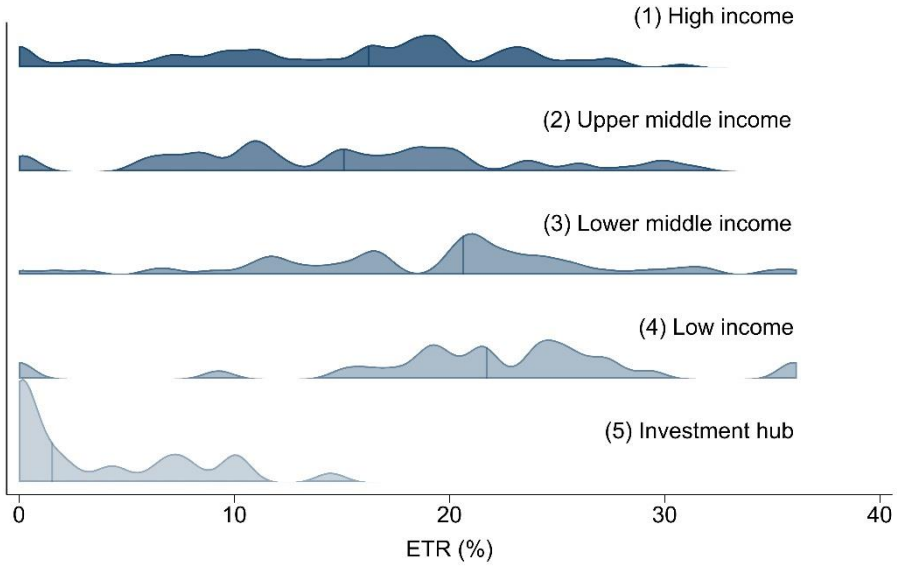
Note: Distribution of average ETRs at the jurisdictional level. ETRs are averages across the years 2017-2020. Bins have a width of 0.5 percentage points. Figure A.1 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

28. **To get to a more nuanced picture, we also examine the distribution of ETRs by jurisdiction groups.** Density plots on the distribution of average ETRs by income group with an additional group for investment hubs are shown in Figure 5. Median ETRs in high income jurisdictions (16.3%) and upper middle income jurisdictions (15.1%) are lower than in lower middle income jurisdictions (20.7%) and low income jurisdictions (21.7%). ETRs are also more concentrated in low income jurisdictions than in other non-hubs with the majority of mass between around 18% and 28%. Investment hubs exhibit particularly

[19] This ensures that all jurisdictions are represented equally and avoids plotting identical datapoints several times artificially inflating the number of observations. Corporate tax reforms are still reflected in the data since they change the four-year average of the ETRs for affected jurisdictions. Summary statistics on the resulting 4-year averages for jurisdictional ETRs are provided in Panel C of Table A.2.

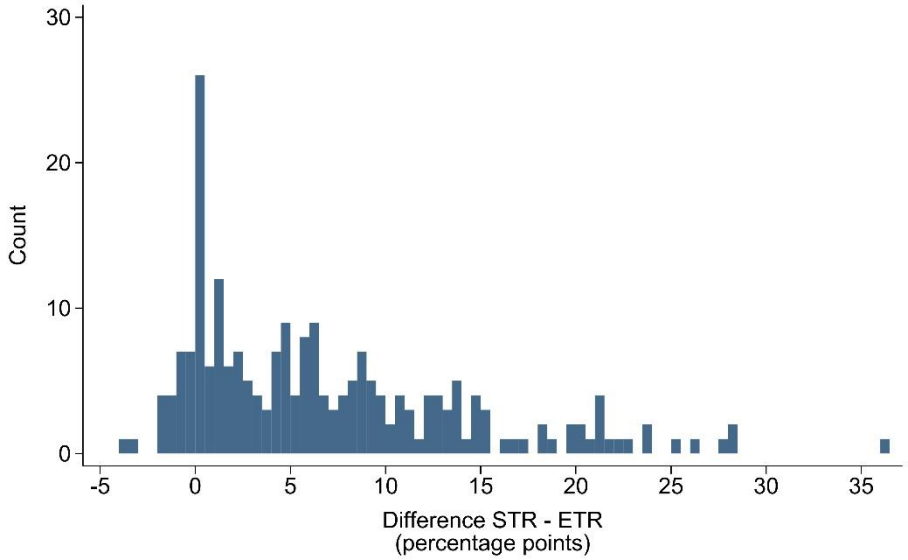
low ETRs, with a median of 1.6%. Figure A.3 and Figure A.4 in Annex A show average ETR distributions by regional group, under the exclusion of investment hubs, and by STR group.

Figure 5. Distribution of average ETRs by income group



Note: Density plots of average ETR distributions by income group. ETRs are averages across the years 2017-2020 at the jurisdiction level. Table D.1 shows the allocation of jurisdictions to income groups. The vertical lines indicate the median of the respective distributions. Figure A.2 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

Figure 6. Differences between STRs and ETRs



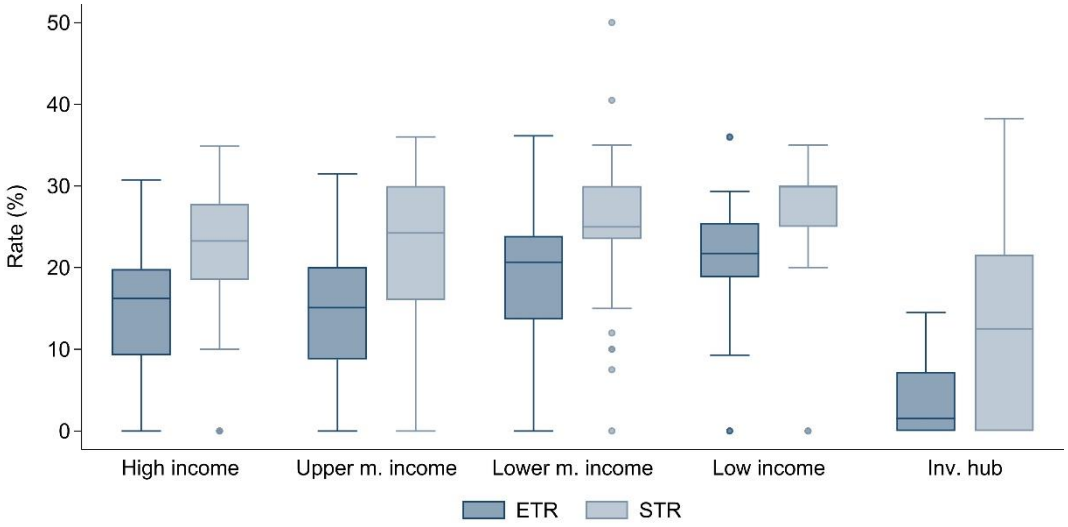
Note: Distribution of the difference between STRs and ETRs in a jurisdiction in percentage points. Figure A.5 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

29. **The data also shows large differences between ETRs and statutory tax rates in many jurisdictions.** While there clearly is a positive correlation between the two rates (correlation coefficient of 0.69), ETRs are on average 6.9 percentage points lower than the STR in the same jurisdiction. At the same

time, ETRs exceed STRs in around 10% of cases. This may be due to limited loss-offset in jurisdictions with relatively high shares of losses relative to positive profits. The distribution of the differences between STRs and ETRs is shown in Figure 6. The comparably large mass of jurisdictions where statutory and estimated effective rates are identical are mainly zero-tax jurisdictions.

30. **Differences between ETRs and STRs vary across income groups.** The box plots displayed in Figure 7 show that differences between STRs and ETRs can be observed in all income groups but are largest in investment hubs with a difference in medians of 11.0 percentage points. Turning to regional groups (Figure A.8) shows that the difference between effective and statutory tax rates is notably smaller in Europe than in the other regions. In the Americas, the difference in medians is as high as 13.2 percentage points. Last, we divide the sample into groups based on jurisdictions' statutory tax rates (Figure 8). As might be expected, jurisdictions with the lowest STRs also have by far the lowest effective rates. The difference between STRs and ETRs tends to be small in these jurisdictions. In contrast, jurisdictions with highest statutory tax rates exhibit a large variation in ETRs. The difference in medians between the two rates for this group is 8.3 percentage points.

Figure 7. Average ETRs and STRs by income group

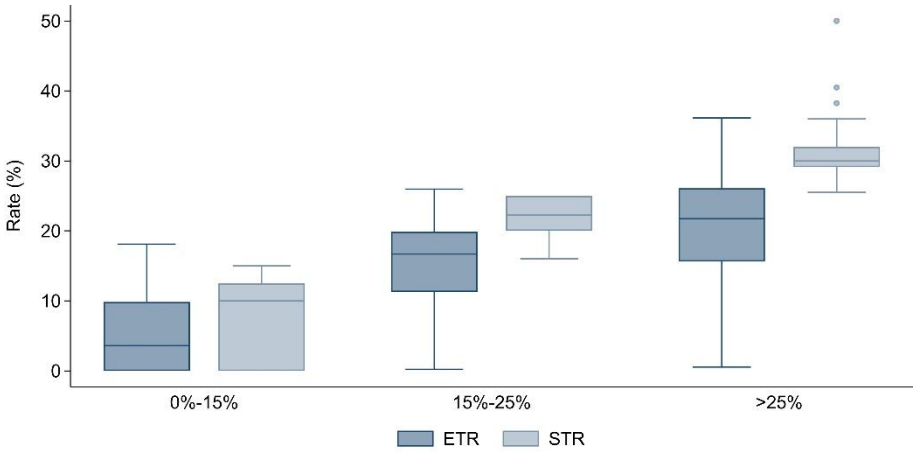


Note: Distributions of average ETRs and STRs by income group. ETRs and STRs are averages across the years 2017-2020 at the jurisdiction level. Table D.1 shows the allocation of jurisdictions to income groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range. Figure A.6 shows the same distributions only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

31. **The ETR estimates are robust to an alternative approach to constructing the ETR.** Instead of using information on subgroups with positive profits and correcting for the typical share of losses, we use the sum of profits and taxes reported by all subgroups (i.e., subgroups making losses and positive profits) in aggregated CbCR data to estimate ETRs. This reduces the number of jurisdiction-year observations available due to a higher share of observations with negative profits that are excluded but allows the use of information from a larger number of subgroups. The resulting alternative ETR is very similar to the baseline. The correlation between the baseline ETR using loss-adjusted positive profits and the ETR based on all subgroups is 0.97. The median ETRs are 16.4 and 16.6% the baseline and the ETR calculated based on data for all subgroups. Figure A.9 in Annex A shows that the overall distributions of the two measures are also very similar. In addition, the figure shows the importance of taking losses into account. The median ETR without any loss adjustment is 2.2 percentage points lower than for our baseline loss adjusted ETRs. All key results presented above are largely unchanged where jurisdictions for which

no CbCR data is available are excluded (Figure A.1, Figure A.2, Figure A.5, Figure A.6, and Figure A.7 in Annex A).

Figure 8. Average ETRs and STRs by STR group



Note: Distributions of average ETRs and STRs by STR group. ETRs and STRs are averages across the years 2017-2020 at the jurisdiction level. The distribution of ETRs within jurisdictions. Table D.3 shows the allocation of jurisdictions to STR groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range. Figure A.7 shows the same distributions only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

3 The distribution of effective tax rates within jurisdictions

32. **Average ETRs are useful in assessing the average tax burden of MNEs in a jurisdiction but may mask heterogeneity across firms.** This heterogeneity within jurisdictions can result from different firm circumstances but can also come from tax policies that reduce ETRs. These can include patent boxes or R&D tax credits (most commonly offered in higher income countries), or tax exemptions or tax holidays (more commonly offered in lower-income countries). Incentives are frequently targeted at specific sectors, geographic regions, or firm types (Celani, Dressler and Wermelinger, 2022[19]). These and other design features differentially affect the tax burdens of MNEs with different characteristics.

33. **To provide additional insights on the resulting heterogeneities, we approximate the distribution of ETRs within each jurisdiction.** Our approach proceeds in three main steps. First, we gather data on selected percentiles of ETRs at the UPE-affiliate level. Second, we use imputations to expand the data, beginning by imputing the 50th percentile across the entire dataset, and then turning to the remaining percentiles. Finally, in a third step we adjust the distributions of the ETRs so that they align with the average ETRs estimated in the previous section (where data quality and consistency are likely higher). To the best of our knowledge, such an analysis of ETR distributions within jurisdictions has not yet been conducted on a comparable scale.

3.1. Estimating ETR distributions

3.1.1. Exploiting a new data source

34. **We have gathered additional information on individual distribution points of ETRs across MNE subgroups based on CbCR data from a subset of UPE jurisdictions.** As is the case for other aggregate CbCR data, this information is disaggregated by affiliate jurisdiction and based on the firm-level CbCRs received by tax authorities**.** Mostly, the distribution points provided are the 5th (p5), 25th (p25), 50th (p50), 75th (p75), and 95th (p95) percentile, but some UPE jurisdictions only provide a subset of these points due to local confidentiality constraints. The distribution points are available from up to 30 UPE jurisdictions per year across the period 2017-2020. The data have not been used for research before and can provide valuable new insights into the distribution of ETRs within jurisdictions. Since we are not aware of any other aggregate data on these ETR distributions, this novel dataset also serves as the basis for imputing any missing data.

35. **Before putting the data on percentiles to use, we apply a strict data cleaning procedure**. All UPE-affiliate-year distributions are excluded entirely if the percentiles within that UPE-affiliate-year do not follow a logical sequence (for instance, if the value for the 5th percentile is larger than the value for the 25th percentile). We also exclude all UPE-affiliate-year distributions in which the lowest percentile available (usually the 5th percentile) in that distribution is among the bottom or top 5% all observations of this percentile in the entire dataset. Similarly, we exclude all observations in which the highest percentile available (usually the 95th percentile) is in the bottom 5% or top 10% of all observations of this percentile

in the entire dataset.[20] The asymmetric cleaning accounts for the observation that outliers at the top, i.e., unreasonably high ETRs, are relatively frequent in the data. The remaining dataset contains 3,173 observations at the UPE-affiliate jurisdiction level for the 50th percentile, covering 183 unique affiliate jurisdictions (Panel A of Table A.3). This data is based on information from more than 75,000 MNE subgroup-year observations. For the other four distribution points, there is a little less cleaned data available, but the number of affiliate jurisdictions covered is identical.

36. **As in the previous section, we rely in the first instance on information for MNE subgroups with positive profits, while adjusting for losses at a later step.** Focusing on distribution points for profitable subgroups avoids issues regarding the interpretation of negative ETRs, and of positive ETRs generated from subgroups with negative profits and negative tax payments. In a similar manner to the treatment of bilateral ETRs in Section 2, the ETR distribution points are bounded at the top and bottom before jurisdictional averages are computed. Since the distribution points are exclusively based on subgroups with positive profits, the limits are set at zero and the STR at this stage. When adjusting for losses in step 3 below, the upper limit is increased reflecting that limited loss-offset can result in ETRs exceeding the STR.

3.1.2. Constructing a full set of distribution points

37. **From data at the UPE-affiliate level we estimate the distribution of ETRs at the jurisdiction level.** In line with the estimation of average ETRs in Section 2, the taxation of affiliates within a jurisdiction is assumed to be independent of the nationality of the UPE. The data available for each distribution point at the UPE-affiliate level is aggregated at the affiliate jurisdiction level by calculating a weighted average within each year (e.g., the weighted average 5th percentile in a jurisdiction in year 2020). Observations are weighted by the number of subgroups to give more weight to observations with higher informational content. Information from the UPE jurisdiction itself is only included in these weighted averages if they are unlikely to be impacted by double counting issues.[21]

38. **To impute missing data on the 50th percentile of ETR distributions within jurisdictions, we use a regression model that includes the average ETRs estimated above as an explanatory variable.** This model is closely related to the model used to impute missing data on average ETRs in Section 2, and is discussed further in Annex B. The averaging across years and the combination of CbCR data with imputations follow the same approach as discussed in Section 2.1 for average ETRs. Again, yearly data is averaged across the sample period if there are no larger STR changes. The CbCR data is used on its own when it is based on more than 20 subgroups for the relevant period. If the CbCR data is based on less than 20 subgroups, it is combined with the regression-based imputations.[22] The combined data on the 50th percentile of ETRs again covers 222 jurisdictions across the years 2017-2020. While the

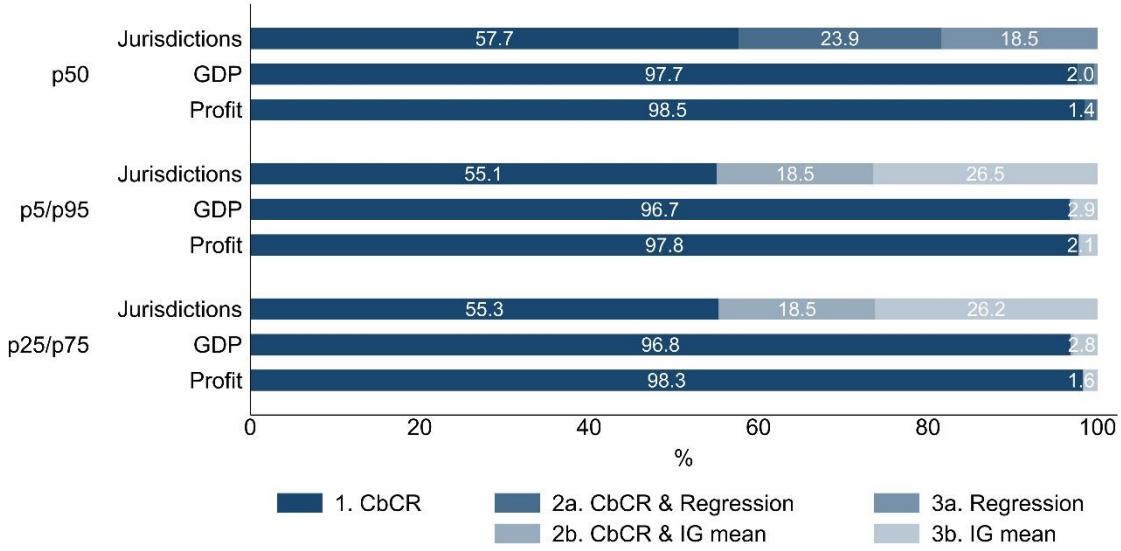
[20] For example, if the 95th percentile value for UPE X and affiliate Y in 2020 is in the top 1% of every 95th percentile observation in the entire sample, then the entire set of distribution points (5th, 25th, 50th, 75th, and 95th) for UPE X and affiliate Y in 2020 is dropped.

[21] Inflated profits would lead to artificially low ETR distribution points. To ensure this potential bias does not carry through to the averages, the information from the UPE jurisdiction is only included in the jurisdictional average if the average including entities located in the UPE jurisdiction is higher than the average excluding these entities.

[22] In contrast to average ETRs, there is no data from other sources available on the distribution points. Information on the 50th percentile of a jurisdiction's ETRs is therefore directly combined with regression-based imputation if the CbCR data available is insufficient. Weights in these combinations depend on the number of subgroups for which CbCR data is available. If there is no CbCR information on the 50th percentile available for a jurisdiction, only the imputation is used.

imputations are contributing to the construction of the 50th percentile for 42.3% of jurisdictions, the CbCR data directly covers 97.7% of GDP and 98.5% of total positive profit (Figure 9).[23]

Figure 9. Data sources of ETR percentiles



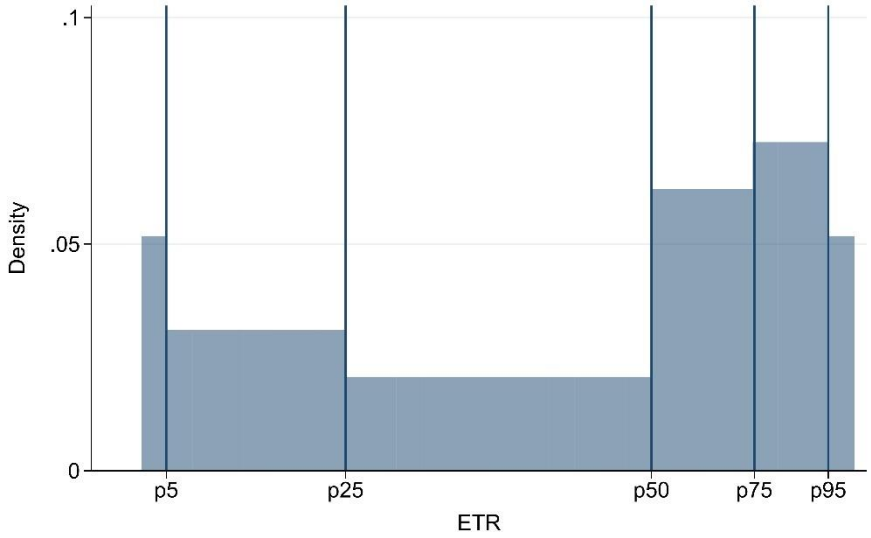
Note: Coverage and preference order of data sources for jurisdictional ETR percentiles relative to the number of jurisdictions, total GDP, and total profit. Profit values are taken from the profit distribution described in Section 4 and Annex C. *IG mean* relates to imputations based on averages by income group. Labels for values <0.5% are supressed to improve readability.

39. **When constructing the remaining percentiles, we focus on the typical distance in terms of percentage points between the 50th percentile and the other percentiles of interest.** These are the fifth, 25th, 75th, and 95th, respectively. This ensures that the resulting percentiles follow a logical order which could not be guaranteed by simply averaging at the jurisdictional level or a regression-based approach. If there is sufficient information from CbCR available, the average distance between the relevant percentile and the median is estimated at the jurisdictional level. Information from entities located in the UPE jurisdiction is excluded if their inclusion would yield a more disperse distribution assuming that double counting issues could lead to more extreme distributions. If the CbCR data is based on less than 20 subgroups, it is combined with average distances between p50 and the other percentiles estimated at the income group level; if there is no CbCR information available for a jurisdiction, only the income group average is used. Due to a comparably small number of observations available, lower middle income and low income jurisdictions are combined in the averaging. In addition, the resulting distances at the jurisdiction and income group level are multiplied by a factor of 1.5 for these groups to account for the larger variance observed in the underlying available data for these jurisdiction groups. The averaging across years for the individual distribution points follows the same approach taken in the calculation of average ETRs and for the 50th percentile. Imputations contribute to the estimation of the values for the remaining percentiles in 42%-45% of jurisdictions, but these jurisdictions only account for a very small share of GDP and total MNE profit as shown in Figure 9.

[23] Note, when CbCR-based percentiles are not available for jurisdiction A, available CbCR-based percentiles from other jurisdictions' affiliates operating in jurisdiction A are used as proxy percentiles, including for UPEs in jurisdiction A. To the extent that the profit distribution of UPEs looks different than the profit distribution of foreign affiliates operating in jurisdiction A, the proxy could contain measurement error for the profit distribution of UPEs.

40. **The resulting dataset contains information on five ETR percentiles for 222 jurisdictions for the years 2017-2020, from which we calculate the full distribution.** To get to a full distribution for each jurisdiction, we need to make assumptions on the distributions between the percentiles as illustrated by Figure 10. In the absence of other information, we first assume a uniform distribution of ETRs over profit between the five percentiles observed.[24] Second, we assume that all ETRs below the 5th percentile equal the 5th percentile, and that all ETRs above the 95th percentile equal the 95th percentile. Since the capping of distribution points at top and bottom (at zero and the STR) is binding for most jurisdictions, the second assumption imposes little additional constraints.

Figure 10. Illustration of ETR distribution data



Note: Illustration of the ETR distribution points available and the additional assumptions imposed. The underlying data is created for illustration purposes only. For clarity of presentation, the assumed mass at the 5th percentile is plotted just below the corresponding label; the assumed mass at the 95th percentile is plotted just above the corresponding label.

3.1.3. Shifting the distribution

41. **Next, the distribution of ETRs based on unweighted positive profits is adjusted to account for losses and the weighting by profits.** In line with the baseline data, the distribution of ETRs resulting from the steps described above is based on positive profits and defined across subgroups. By contrast, ETRs estimated in Section 2 are corrected for losses and weighted by profit to reflect the average tax burden of a dollar earned in a jurisdiction. To estimate a distribution of ETRs across the net tax base of large MNEs, we adjust the estimated distribution such that the resulting average ETR matches the profit-weighted and loss-adjusted average from Section 2. For this, we shift the distribution points of a jurisdiction upwards or downwards until they match its average ETR. Most shifts necessary are upward shifts due to the need to adjust for losses. Before shifting the distribution, the median difference between the profit weighted average ETR from Section 2 and the average ETR estimated from the distribution is 4.3 percentage points. After shifting the distribution, this difference is zero by construction.

42. **The distributional adjustments account for factors that may drive very low tax rates in some jurisdictions but not others.** Specifically, we differentiate between jurisdictions with and without tax

[24] This assumption does not account for the potential concentration of profits in a small number of entities. In jurisdictions with a small overall number of MNE affiliates, this would lead to a less smooth distribution. However, the precise distribution cannot be observed in the data.

incentives that can result in zero CIT rates such as tax holidays or full CIT exemptions.[25] Since it is unlikely that MNEs allocate substantial portions of their losses to entities benefiting from generous tax incentives, we assume losses to be concentrated at the higher ETR percentiles. For this reason, we also concentrate the shifting of the distribution of ETRs at the highest percentiles if a jurisdiction offers "zero tax" incentives. This often amplifies bimodal distributions of ETRs, with a substantial mass of profit taxed at a very low rate, and another substantial mass taxed close to the STR. In contrast, for jurisdictions that do not offer "zero-tax" incentives, we assume low ETRs are primarily driven by loss offset provisions. In these jurisdictions, low ETRs of subgroups with positive profits are thus more likely to be due to profits that do not adequately reflect the net tax base.[26] For this reason, we concentrate the loss adjustment for jurisdictions without "zero-tax" incentives at the lower end of the ETR distribution. This creates a more concentrated distribution of ETRs in these jurisdictions.[27] Panel B of Table A.3 shows summary statistics on the resulting five distribution points at the jurisdiction-year level.

3.2. ETR distributions within jurisdictions: Results

43. **The resulting data estimates the distribution of ETR percentiles across the globe.** The distributions for the full sample are shown in Figure 11. To facilitate the interpretation of results, we again focus on averages over the period of 2017-2020 by jurisdiction.[28] As would be expected, the distribution of ETRs for the 5th percentile is heavily concentrated at low ETRs, with a median of 0.8%. The 25th percentile of ETRs is still around 7.1% for more than half of the jurisdictions, while the median of the 50th and 75th percentile are at 20.5% and 22.9%. The distribution of the 50th and 75th percentile also exhibit significantly higher variation than the lower percentiles. For a small number of jurisdictions, even the 95th percentile of ETRs is in the single digits, but it clearly exceeds 15% in most cases with a median of 24.2%.

44. **By construction, the differential treatment of jurisdictions with and without "zero-tax" incentives can be seen in the distribution points.** Figure A.11 shows box plots for each distribution point for the two groups. In jurisdictions with "zero-tax" incentives, the 5th percentile is often very low: the median 5th percentile in this set of countries is zero compared to 5.4% for other jurisdictions. In contrast, the medians for the 50th, 75th and 95th percentiles for jurisdictions with "zero-tax" incentives similar to those for jurisdictions without "zero-tax" incentives. This reflects the strong bimodal distribution of ETRs in the presence of "zero-tax" incentives on the one hand, and the more compressed distribution of ETRs in other jurisdictions in the other.

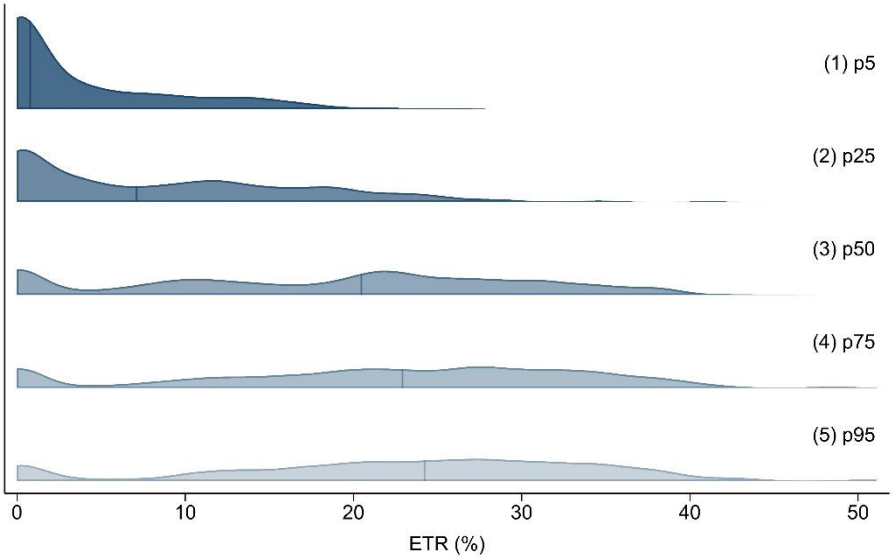
[25] These "zero-tax" incentives are also used in the regression models to impute average and median ETRs (see Annex B). A list of jurisdictions which are considered to offer such incentives is provided in Annex D.

[26] This is in line with anecdotal evidence provided by some tax authorities.

[27] The paragraph focuses on the upward shifts and the loss adjustments since these account for more than 80% of all cases. However, there are also some downward shifts in the model, which likely result from lower ETRs paid by subgroups with larger profits. In the case of downward shifts, the approach is the inverse to the one described in this paragraph. That is, for jurisdictions without "zero-tax" incentives, we push the distribution towards zero in these cases, starting with the highest percentiles. For jurisdictions with "zero-tax" incentives, we start with the lowest percentiles and move these down.

[28] As for average ETRs, distribution points for jurisdictions without larger changes in their STR do not vary across the sample period; if there are larger STR changes, the distribution points of a jurisdiction are allowed to vary over time. Panel C of Table A.3 shows summary statistics for the averages.

Figure 11. Distribution of ETR percentiles



Note: Density plots of ETR distributions for each percentile available. ETR distribution points are averages across the years 2017-2020 at the jurisdiction level. The vertical lines indicate the median of the respective distribution. Figure A.10 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

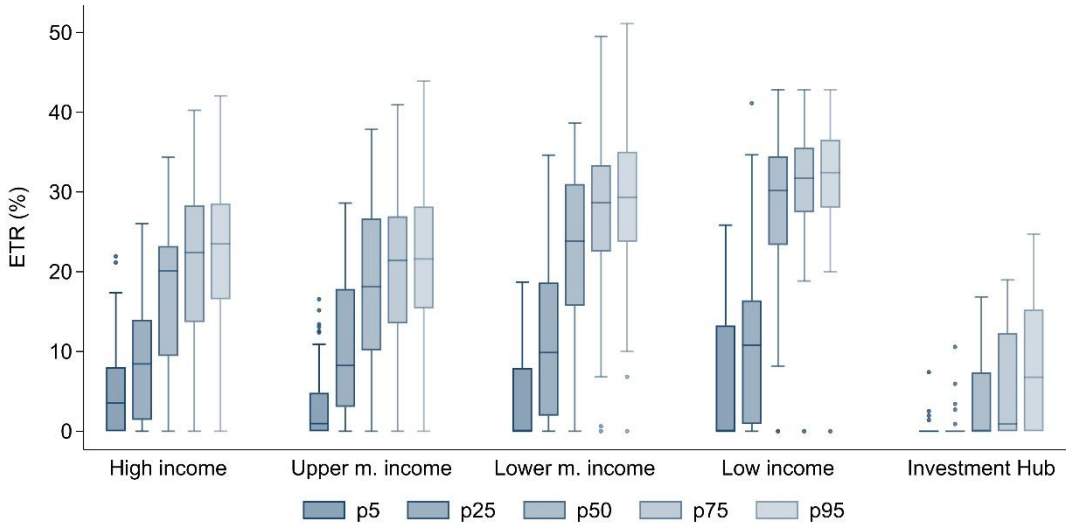
45. **The distribution of percentiles also varies substantially across income groups**. In high income jurisdictions, there are some very low ETRs, but the bulk of ETRs are located between 10% and 25% (Figure 12). In the other non-hub groups, the difference between the lower distribution points and the median is much larger than in high income jurisdictions. The upper two distribution points in low and lower middle-income jurisdictions tend to be higher than in the other groups. These differences between high income jurisdictions and other non-hubs might reflect the larger availability of generous tax incentives in lower income jurisdictions. Finally, most investment hubs exhibit low ETRs throughout most of the distribution. The median of the 75th percentile is still below 1% in these jurisdictions. The median of the 95th percentile of investment hubs is lower than the median 25th percentile in non-hubs. The distribution of percentiles across regional groups and STR groups is presented in Figure A.13 and Figure A.14 in Annex A.

46. **The estimated dispersion of ETRs within jurisdictions is often larger than the dispersion of average ETRs across jurisdictions, emphasising the value of going beyond average ETRs when studying MNE taxation.** Figure 13 shows the distribution of the distance between the average 5th and the average 95th percentile within jurisdictions. The median of this distance is 20.2 percentage points. The absolute value of this distance tends to be increasing with the average ETR. While the distance between p5 and p95 is often negligible for jurisdictions with average ETRs below 5%, the median distance is 21.6 percentage points for jurisdictions with higher average ETRs.

47. **The heterogeneity of ETR distributions across jurisdictions with different average tax rates can be clearly seen in the data.** Figure 14 shows box plots for the different percentiles. The sample is split into jurisdiction groups defined over average ETRs. Jurisdictions with average ETRs below 5% mostly have very low ETRs across the entire distribution. At higher ETRs, there is more variation of ETRs within jurisdictions. For jurisdictions with average ETRs between 15% and 25% for instance, the median 5th percentile is just below 4%, and the median 25th percentile is at 11.4%. In contrast, the median of the 50th percentile is at 23.5%, and both the medians of the 75th and 95th percentile exceed 27.5%. Even jurisdictions with average ETRs above 25% sometimes tax some profit at rates below 15%, given that the median 5th percentile for this group is 12.4%. The heterogeneity of ETRs within jurisdictions with higher

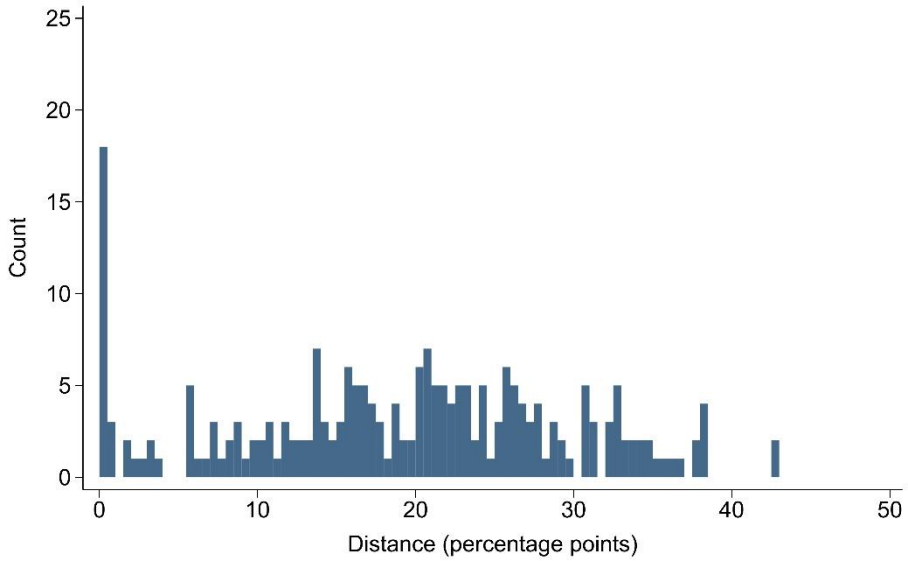
average ETRs highlights the existence of considerable low-taxed profit in these jurisdictions. The existence of low ETRs in jurisdictions with high average tax rates is also confirmed in firm-level data from Orbis.

Figure 12. Distribution of ETR percentiles by income group



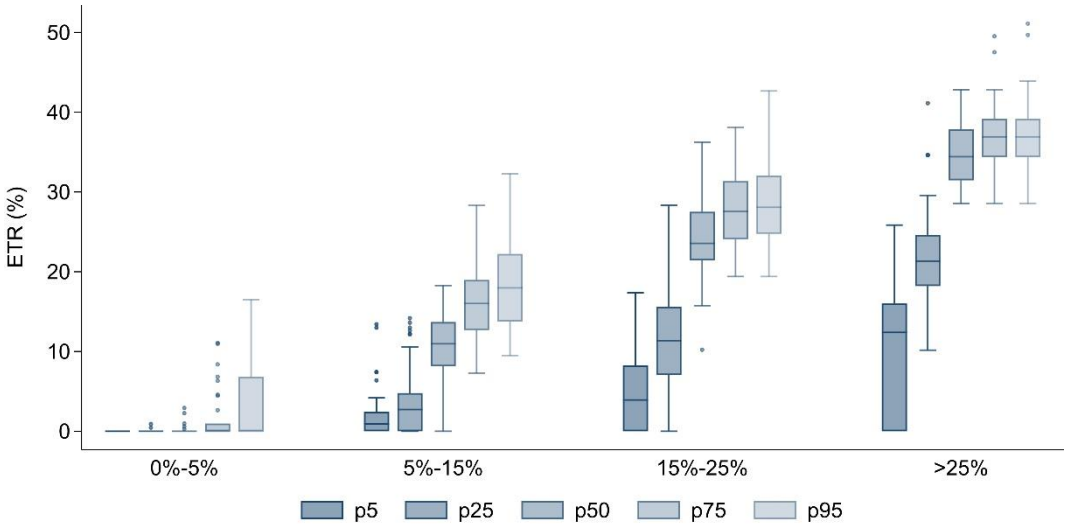
Note: Distributions of ETR percentiles across income groups. ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. Table D.1 shows the allocation of jurisdictions to income groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range. Figure A.12 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

Figure 13. Distribution of distance between p5 and p95 within jurisdictions



Note: Distribution of distances between the 5th and the 95th percentile of estimated ETR distributions within jurisdictions. Distribution points used are averages across the years 2017-2020. Bins have a width of 0.5 percentage points. Figure A.15 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

Figure 14. Distribution of ETR percentiles by average ETR group



Note: Distributions of ETR percentiles across ETR groups. ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range. Figure A.16 shows the same distribution only including jurisdictions where some CbCR data is used in the calculation of average ETRs.

4 The global taxation of MNE profits

48. **This section combines the data on ETR distributions within jurisdictions with information on the global distribution of profits to examine the global taxation of MNE profit.** The dataset allows the analysis to go beyond accounting for low-taxed profits in jurisdictions with generally low tax rates, and to also investigate low-taxed profit in jurisdictions with generally high tax rates. While low-taxed profit in investment hubs has been the centre of public and academic debate, there is little cross-country evidence on the scale of low-taxed profit in high tax jurisdictions.

4.1. Estimating the global distribution of MNE profit

49. **To assess the global taxation of the profits of large MNEs, we need to know where these profits are reported for tax purposes.** For this, we build on OECD (2020[20]) and construct a comprehensive matrix on the distribution of the profits of large MNEs around the globe, combining several complementary data sources. The methodology of OECD (2020[20]) has been updated and extended in several dimensions as discussed in Annex C. For this paper, we aggregate the data at the level of the affiliate jurisdiction, resulting in a dataset containing the stock of profit in each of the 222 affiliate jurisdictions for the years 2017-2020. Three types of data are used, including CbCR data, aggregated firm-level data from Orbis, and imputations based on macroeconomic data such as FDI statistics. CbCR data directly accounts for 85.3% of total profit across the four sample years. By contrast, extrapolations contribute only 9.7% of total profit (see Annex C for additional details on the data sources).

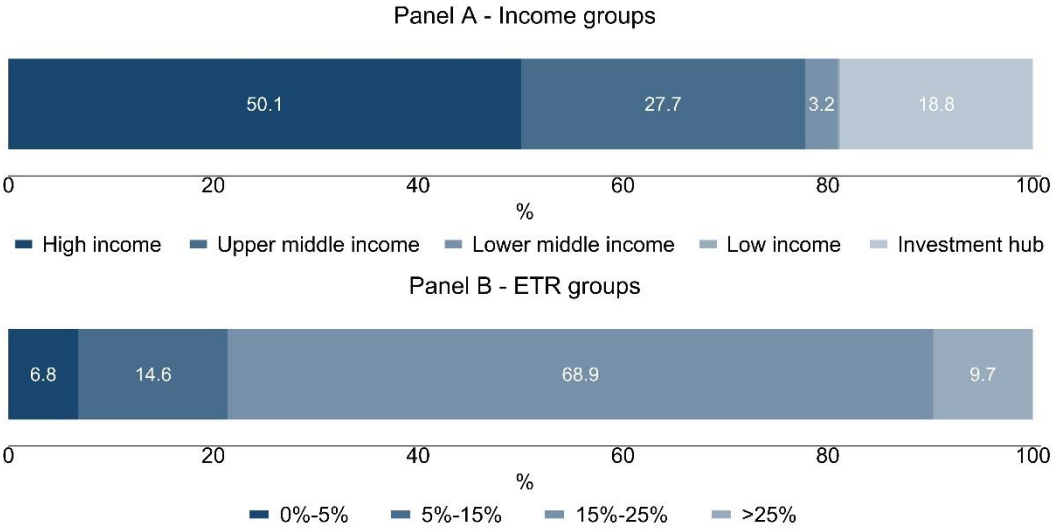
50. **In line with the calculation of ETRs in the previous sections, we focus on net profit**. As in the calculation of the denominator for the average ETRs of Section 2, we estimate a matrix of net profits by first starting with data on positive profits of large MNEs around the world. In a second step, we apply loss adjustments based on the typical share of losses in positive profits observed in aggregated CbCR data at the affiliate jurisdiction level.

51. **The data offer a comprehensive picture on the global distribution of the profits of large MNEs, but also have their limitations.** The extrapolations used can only serve as imperfect proxies for the actual profits of large MNEs. Similarly, the sources of hard data have their limitations. For instance, misreporting by MNEs can lead to errors in aggregated CbCR statistics. While we have taken steps to address the issue of double counting of profits in CbCR, and additional guidance has been issued to the tax administrations preparing the data to alleviate this issue in the later years of the sample, the corrections are again based on assumptions as outlined in Section 2. In Orbis, coverage varies across jurisdictions which could result in underestimations of totals when the firm-level data is aggregated. Overall, the resulting profit distribution is therefore an estimate and should be interpreted with some caution. This particularly applies for jurisdictions for which more data is imputed such as many lower income jurisdictions. The extensive benchmarking exercises and consistency checks reported in OECD (2020[20]) give some confidence that this is the case. Nevertheless, results in the following are mostly presented for groups of jurisdictions so that the impact of potential issues in individual matrix cells should be limited.

52. **Overall, profits of large MNEs are concentrated in high and upper middle income jurisdictions, and investment hubs.** The data aggregated by income group and averaged across the

sample period of 2017-2020 is shown in Panel A of Figure 15.[29] Global net profits of large MNEs in the sample period sum to USD 23,715 billion, or USD 5,929 billion per year. Half (50.1%) of the global profits of large MNEs are booked in high income jurisdictions, 27.7% in upper middle income jurisdictions, and 18.8% in investment hubs. Only small shares of the total profits of large MNEs are reported in lower middle and low income jurisdictions.

Figure 15. Profit by income group and ETR group



Note: Distribution of profit of large MNEs across income groups (Panel A), and ETR groups (Panel B) Values shown are profit-weighted averages across the years 2017-2020. Labels for values <1% are supressed to improve readability. The value for low income jurisdictions in Panel A is 0.2%. Table D.1 shows the allocation of jurisdictions to income groups. The sum of global profits of large MNEs in the sample period is USD 23,715 billion over the sample period, or USD 5,929 billion per year.

53. **MNE profits are also concentrated in jurisdictions with medium average effective tax rates.** The split of MNE profit by ETR group shows that only 6.8% of the total profits of large MNEs are reported in jurisdictions with average ETRs below 5%, and 14.6% of profits are reported in jurisdictions with average ETRs between 5% and 15% (Panel B of Figure 15). The majority of profits (68.9%) is reported in jurisdictions with average ETRs between 15% and 25%; another 9.7% of profit is reported in jurisdictions with average ETRs exceeding 25%.

4.2. The distribution of global profits by effective tax rate: results

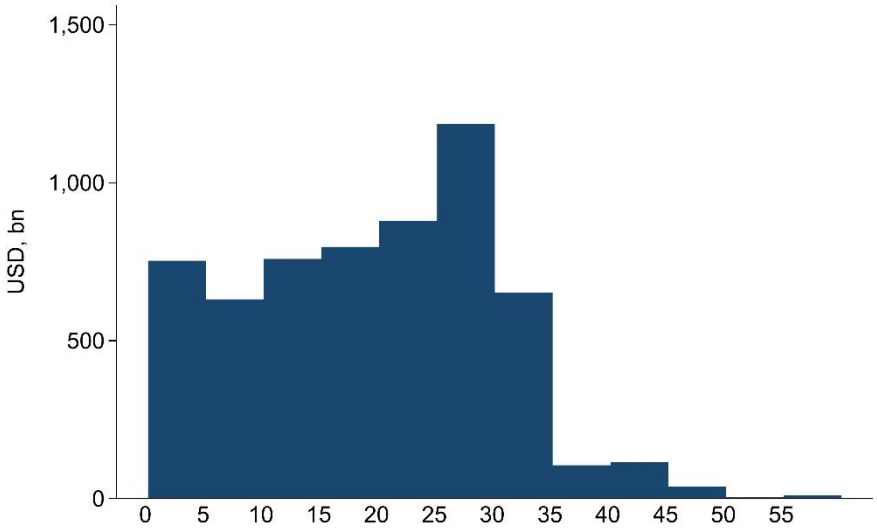
54. **We combine the data on the global distribution of the profits of large MNEs with the information on jurisdictional ETR distributions to assess the distribution of the profits across different ETR bands.** For this, we allocate the profit reported in a jurisdiction into ETR bins. The share of profit within each affiliate jurisdiction that is allocated to a bin is informed by the distribution points estimated in Section 3 under the assumption of a uniform distribution of profit between the individual percentiles. As discussed above, we additionally assume that all ETRs below the 5th percentile are equal to the 5th percentile, and all ETRs above the 95th percentile are equal to the 95th percentile. The second assumption has little impact due to the fact that the ETRs are limited at 0 and at an upper bound based on the STR plus a loss adjustment. Still, the distributions shown may be somewhat compressed compared to reality.

[29] Figure A.17 shows the splits by regional group and STR group.

This allows us to be conservative when estimating the total size of the amount of global low-taxed profit below.

55. **The global distribution of profits of large MNEs across ETR bins for the period 2017-2020 shows substantial low-taxed profit globally.** These data are summarised in Figure 16. The values shown are averages across the sample period. Over the full sample, profits of large MNEs are taxed at a profit-weighted average effective tax rate of 19.1%. At the same time, a substantial share of profits is taxed at much lower rates. Of the average annual net profits of USD 5,929 billion, 12.7% or USD 753 billion are taxed below 5%; another 23.4% (USD 1,390 billion) are taxed at ETRs between 5% and 15%. The majority of large MNEs' profit is taxed at rates between 15% and 30%. Only USD 272 billion or 4.6% of average annual net profits are taxed at rates above 35%.

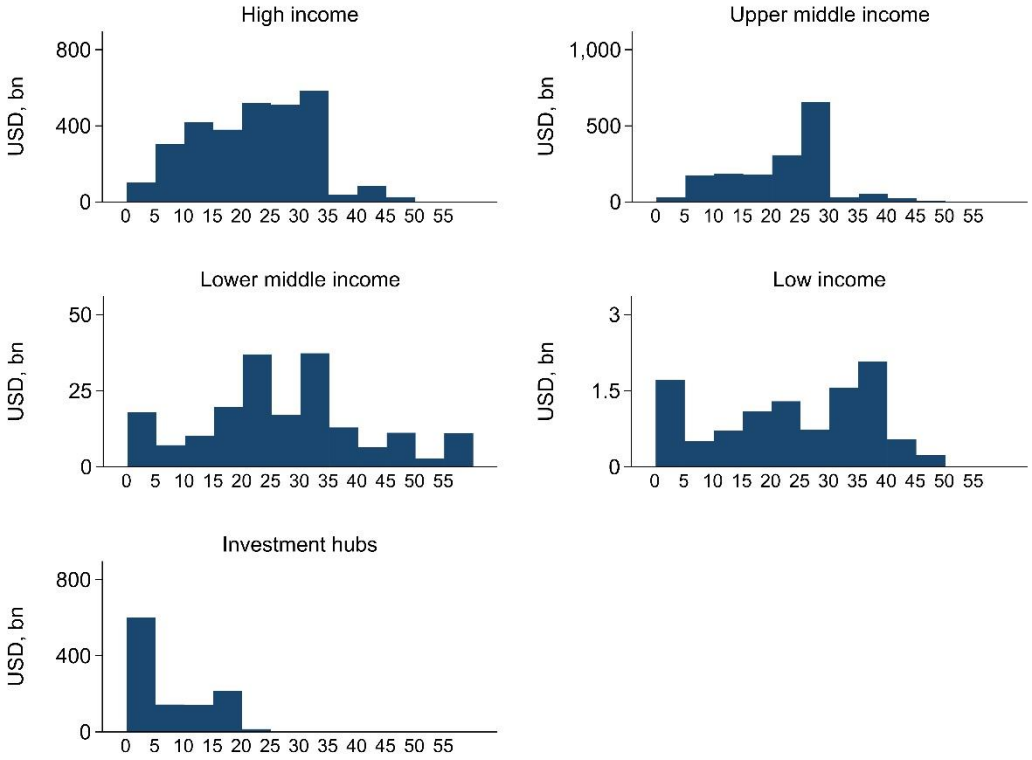
Figure 16. Global distribution of profits across ETR bins



Note: Distribution of profit of large MNEs across ETR bins, averaged over the period 2017-2020. Bins have a width of five percentage points. The average sum of global profits of large MNEs is USD 5,929 billion per year.

56. **Moving to the distribution of profits across ETR bins by jurisdiction group shows substantial heterogeneity across groups.** Figure 17 shows these distributions (note that the y axes differ across income groups). In high income and upper middle income jurisdictions, only 5.0% and 4.7% of profits of large MNEs are taxed above 35%. In lower middle income and low income jurisdictions, this share is 23.2% and 27.3%, respectively. In investment hubs, virtually no profit is taxed at ETRs over 25%. In contrast, 53.8% of MNE profit reported in investment hubs is taxed at less 5% and 79.4% at less than 15%.

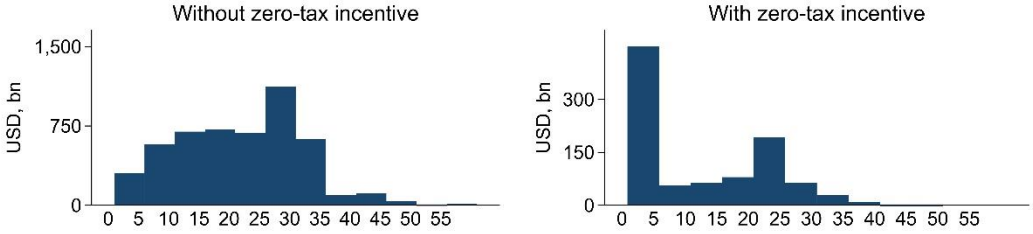
Figure 17. Distribution of ETRs over MNE profit by income group



Note: Distribution of profit of large MNEs across ETR bins, averaged over the period 2017-2020, by income group. Table D.1 shows the allocation of jurisdictions to income groups. Bins have a width of five percentage points. The average sum of global profits of large MNEs is USD 5,929 billion per year.

57. **The data also show how low-taxed profit can exist in jurisdictions with high tax rates.** As might be expected, most profit in jurisdictions with statutory tax rates between 0% and 15% is taxed at low effective rates (71.3% at ETRs below 5%, see Figure A.18). Yet, there is also low-taxed profit in jurisdictions with high STRs. In jurisdictions with STRs between 15% and 25%, around one ninth of profit is taxed below 5% and more than a third of all profit is taxed below 15%. Jurisdictions with STRs above 25% still tax more than a quarter of their profits at ETRs below 15%. The split between jurisdictions with and without "zero-tax" incentives shown in Figure 18 illustrates the bimodal distribution of ETRs, which as discussed above is partially by construction. Figure A.19 shows the same data by regional group.

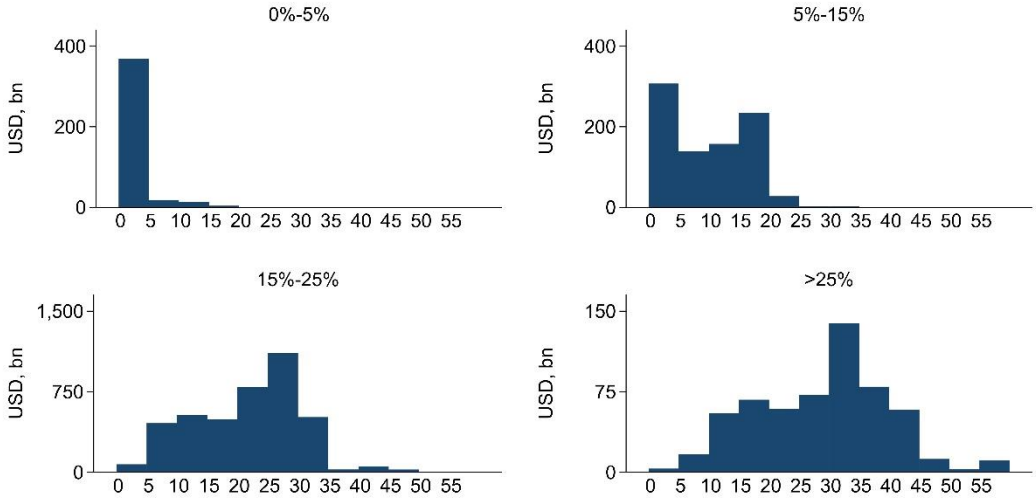
Figure 18. Distribution of ETRs over MNE profit, with and without "zero tax" incentives



Note: Distribution of profit of large MNEs across ETR bins, averaged over the period 2017-2020, for jurisdictions with and without "zero-tax" incentives. Table D.4 provides a list of jurisdictions with "zero-tax" incentives. Bins have a width of five percentage points. The average sum of global profits of large MNEs is USD 5,929 billion per year.

58. **The extent of low-taxed profit also varies by the average ETR of the jurisdiction.** Figure 19 shows the distribution of profits of large MNEs across ETR bins for different jurisdiction groups based on their average ETR. Most studies on low-taxed profit focus on jurisdictions with low average ETRs. And indeed, almost all profit in jurisdictions with average ETRs below 5% is also taxed at ETRs below 5%; in jurisdictions with average ETRs between 5 and 15%, the majority profit is taxed at rates below 15%. Yet, these jurisdictions combined only account for around one fifth of global profit (see Section 4.1). The largest share of profit is reported in jurisdictions with average ETRs between 15% and 25% which are typically not considered "low tax". However, substantial amounts of profit in these jurisdictions are taxed at ETRs below 15% (26.1% of all profits in this jurisdiction group). To a lesser extent, this still holds for jurisdictions with average ETRs above 25%, in which 13.0% of profits are taxed at rates below 15%. This indicates that ignoring low-taxed profit in jurisdictions with high average ETRs can lead to a substantial underestimation of global low-taxed profit.

Figure 19. Distribution of ETRs over MNE profit by ETR group



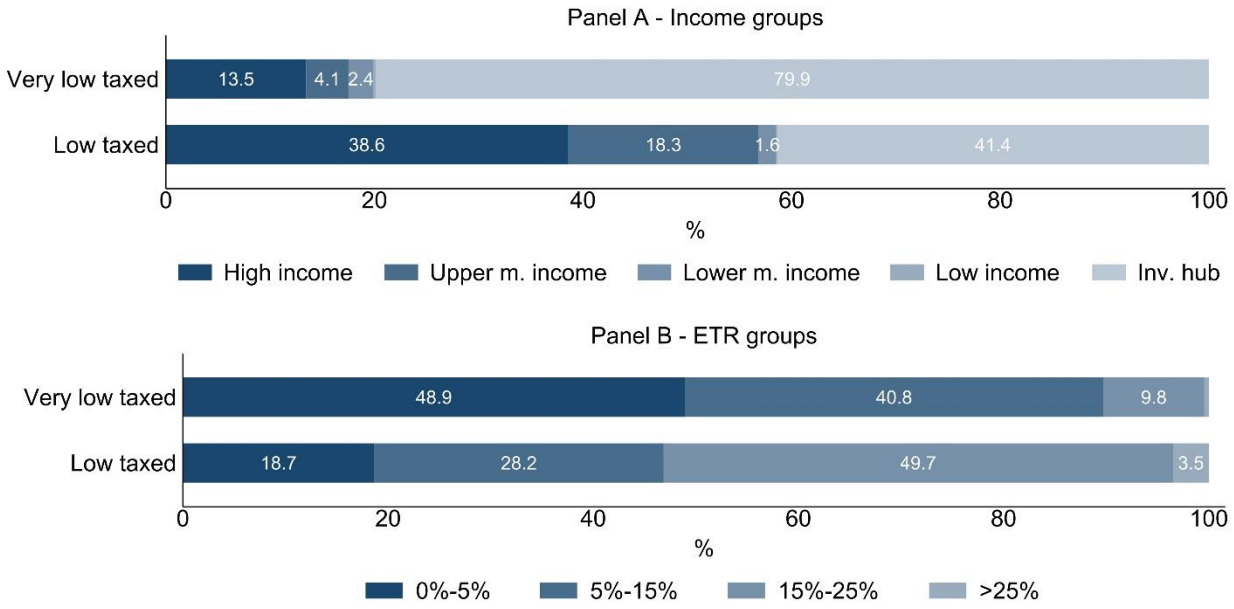
Note: Distribution of profit of large MNEs across ETR bins, averaged over the period 2017-2020, by ETR group. Bins have a width of five percentage points. The average sum of global profits of large MNEs is USD 5,929 billion per year.

4.3. Global low-taxed profit

59. **This subsection focuses on the distribution of very low-taxed and low-taxed profit around the world.** We define low-taxed profit as profit that is taxed at an effective tax rate below 15%, and very low-taxed profit as profit that is taxed at an effective rate below 5%. Of the USD 5,929 billion in average annual net profit of large MNEs, we estimate that USD 753 billion (12.7%) is very low-taxed; and USD 2,143 billion (36.1%) is low-taxed. Panel A of Figure 20 splits these sums of very low and low-taxed profit across income groups.[30] Of all very low-taxed profit, 79.9% is reported in investment hubs, and 13.5% is reported in high income jurisdictions. Upper and lower middle income jurisdictions account for 4.1% and 2.4% of all profit taxed at less than 5%. The distribution of profit taxed below 15% is quite different. Close to 60% of these profits are reported outside investment hubs; with the share of total low-taxed profit in high income jurisdictions alone being almost as high as the share in hubs (38.6% vs. 41.4%).

[30] Annex A contains additional charts splitting global very low-taxed profit by regional group and by STR group (Figure A.20).

Figure 20. Global very low-taxed profit by income group and ETR group

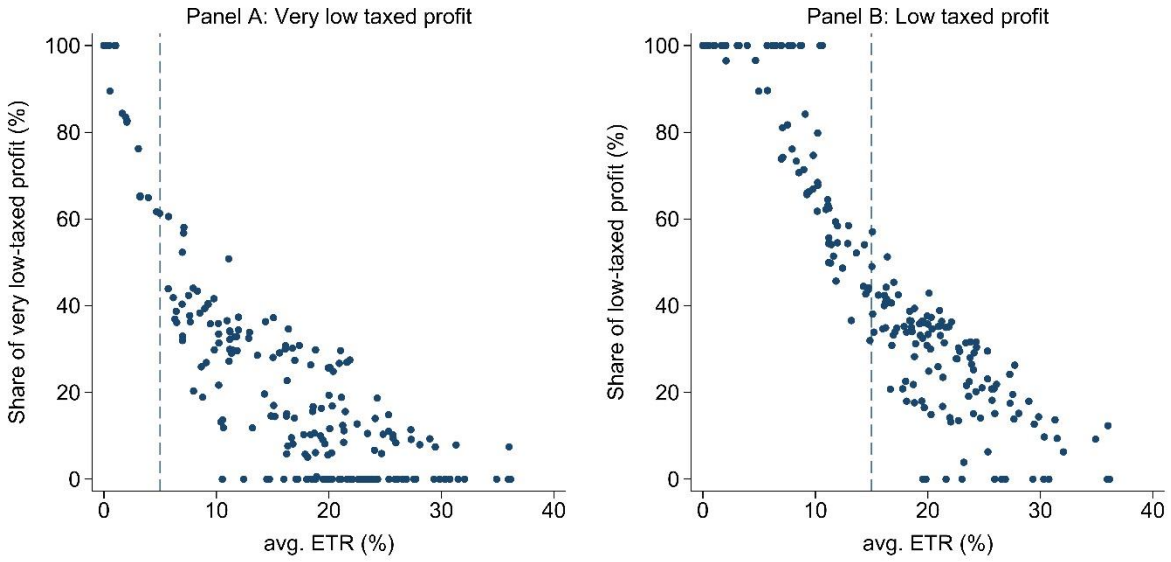


Note: Distribution of very low and low-taxed profit over income groups (Panel A) and ETR groups (Panel B). Table D.1 shows the allocation of jurisdictions to income groups. Very low-taxed is defined as all profit taxed at ETRs < 5%; low-taxed profit is defined as all profit taxed at ETRs < 15% and includes very low-taxed profit. Labels for values <0.5% are supressed to improve readability. Values for low income jurisdictions in Panel A are 0.2% for very low-taxed profit and 0.1% for low-taxed profit. The value for jurisdictions with ETRs above 25% in Panel B is 0.4% for low-taxed profit.

60. **The data also show the extent to which low-taxed profit arises in jurisdictions with different average ETRs.** Panel B of Figure 20 splits global very low-taxed profit across jurisdiction groups defined over average ETRs. Interestingly, less than half of very low-taxed profit is reported in jurisdictions with average ETRs below 5%. Almost 10% of very low-taxed profits are reported in jurisdictions with average ETRs above 15% which are typically not considered as low tax jurisdictions. These jurisdictions even account for more than half (53.2%) of global profits taxed below 15%. This suggests that an assessment of global low-taxed profit that focuses only on jurisdictions with low average tax rates could potentially not account for more than half of global low-taxed profit.

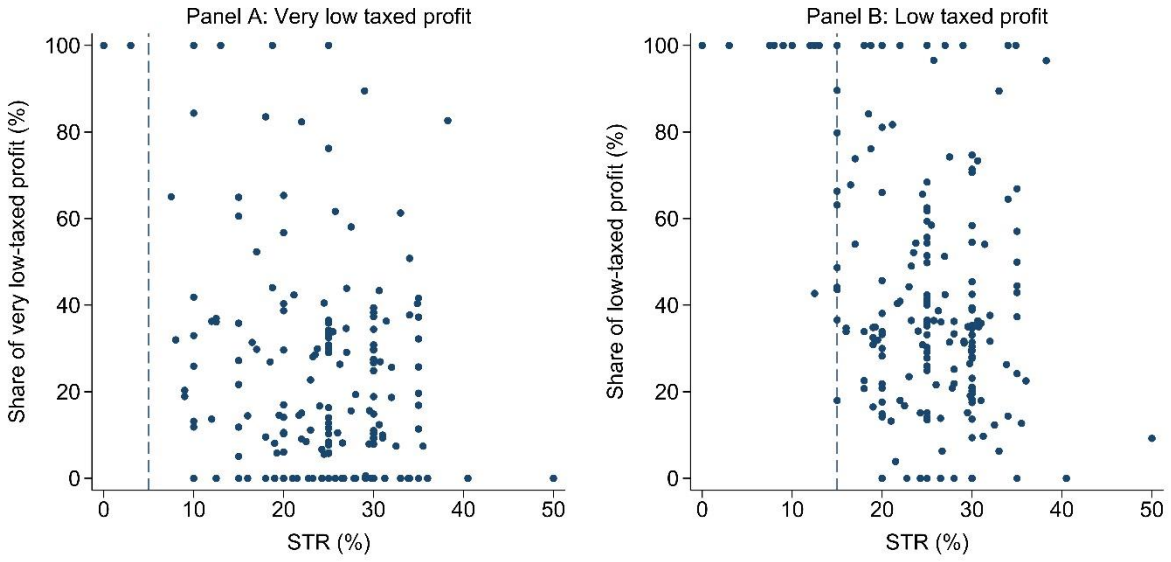
61. **The data highlight the importance of investigating the distribution of ETRs within jurisdictions when assessing global low-taxed profit.** Panel A of Figure 21 plots the share of very low-taxed profit in total profit reported in a jurisdiction against average ETRs of these jurisdictions. All values are averages over the period 2017-2020. Panel B looks at the shares of low-taxed profit in the same way. These scatter plots show that the shares of very low and low-taxed profit are decreasing with higher average STRs. The correlation between average ETRs and the share of very low and low-taxed profit is -0.86 and -0.93. There are some jurisdictions in which all profit is low-taxed; in a small number of jurisdictions all profit is even taxed at ETRs below 5%. At the other end of the spectrum, all profit reported in some jurisdictions is taxed at rates above 5% or even above 15%. The main contribution of this paper, however, is analysing the jurisdictions in between, in which only some profit is low-taxed. Many jurisdictions with average ETRs well above 5% still tax substantial shares of profit at very low rates. Similarly, many jurisdictions with average ETRs well above 15% have substantial shares of low-taxed profit. The distributional data on ETRs used in this paper therefore adds an important dimension to the analysis of global low-taxed profit. The data also shows that relying on statutory tax rates to identify low-taxed profit can be misleading (Figure 22).

Figure 21. Share of very low-taxed and low-taxed profit vs. average ETRs



Note: Panel A: very low-taxed profit compared to the average ETR in a jurisdiction; Panel B low-taxed profit compared to the average ETR in a jurisdiction. Each dot is a jurisdiction observation. Vertical lines indicate 5% in Panel A and 15% in Panel B. Values shown are averages across the years 2017-2020 for both shares of low-taxed profit and ETRs. Very low-taxed is defined as all profit taxed at ETRs below 5%; low-taxed profit is defined as all profit taxed at ETRs below 15% and includes very low-taxed profit.

Figure 22. Share of very low-taxed and low-taxed profit vs. STRs



Note: Panel A: very low-taxed profit compared to the STR in a jurisdiction; Panel B low-taxed profit compared to the STR in a jurisdiction. Vertical lines indicate 5% in Panel A and 15% in Panel B. Values shown are averages across the years 2017-2020 for both shares of low-taxed profit and STRs. Very low-taxed is defined as all profit taxed at ETRs below 5%; low-taxed profit is defined as all profit taxed at ETRs below 15% and includes very low-taxed profit.

5 Conclusion

62. **This paper examines the taxation of the profits of large MNEs around the world using newly collected data on the distribution of effective tax rates within jurisdictions for the years 2017-2020.** The analysis starts with the estimation of average backward looking ETRs for a comprehensive set of jurisdictions from aggregated Country-by-Country reporting data complemented with information from additional data sources. Using data on distribution points of ETRs within jurisdictions, we then estimate ETR distributions within each jurisdiction. Lastly, the data on ETR distributions is combined with information on the global distribution of MNE profits to analyse how profit is taxed globally.

63. **The analysis suggests that while average ETRs vary significantly across jurisdictions, the dispersion of ETRs within jurisdictions can be even larger**. Some jurisdictions with high estimated average rates tax considerable shares of profit at low rates in the estimates, creating low-taxed profit in high tax jurisdictions. While this profit is often overlooked, we estimate that there is more low-taxed profit reported in high tax jurisdictions than in low tax jurisdictions.

64. **This paper therefore offers key insights for the design of corporate tax policy.** This includes the coordinated reform of the global corporate tax system initiated by the G20/OECD Inclusive Framework on BEPS to introduce a Global Minimum Tax. The relevance of low-taxed profit in high tax jurisdictions implies that domestic minimum taxes could raise considerable revenue not only in jurisdictions with low average rates, but also in jurisdictions with average rates above the minimum tax.

65. **The results of this paper should be interpreted with consideration of the limitations of the data used.** Most of the analysis relies heavily on aggregated CbCR data. This relatively new data source still suffers from some data quality issues and not all UPE jurisdictions provide aggregated CbCR statistics. The data also only covers MNEs with revenues above EUR 750 million. Some of the issues such as double counting of profits in CbCR are addressed in this paper, however these corrections are based on estimates only. The results in this paper remain estimates of actual ETRs faced by firms and remain subject to error.

66. **The insights gained should therefore form a good starting point for further research on the global taxation of MNEs as well as the potential impact of corporate tax reform both at the national and international level.** A companion paper builds on the results presented here to investigate the effects of the introduction of the global corporate minimum tax.

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Annex A. Additional figures and tables

A1. Additional figures and tables from Section 2

Table A.1. Illustrative examples of ETR calculations

	Jurisdiction A No loss offset	Jurisdiction B Partial loss offset (50%)	Jurisdiction C Full loss offset
Tax rate	10%	10%	10%
Profits	200	200	200
Prior-period losses	100	100	100
Tax base	200	150	100
Tax	20	15	10
ETR on net profit	**20%**	**15%**	**10%**

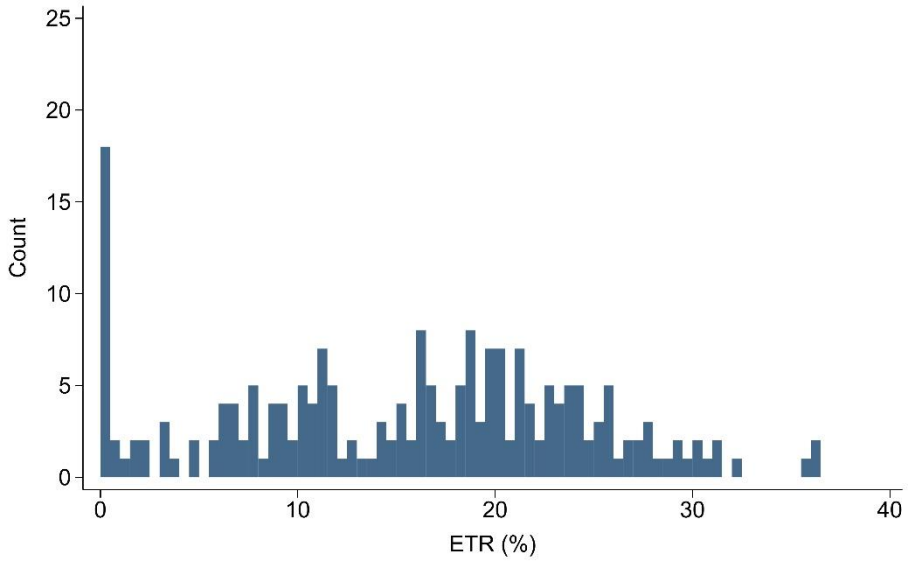
Note: This table provides examples of ETR calculations for jurisdictions with no, partial, and full loss offset. These stylised examples are for illustration purposes only and do not aim to accurately describe the calculation of tax bases or taxes accrued.

Table A.2. Summary statistics on jurisdictional average ETRs

	Observations	Unique affiliate jurisdictions	Mean (%)	Median (%)	Min. (%)	Max. (%)	SD
Panel A: Bilateral data (UPE-affiliate-jurisdiction-year level)							
ETRs (loss adjusted)	8,386	211	16.20	16.52	0.00	53.06	11.19
Panel B: Jurisdictional data (affiliate-jurisdiction-year level)							
CbCR ETRs (loss adj.)	804	211	16.02	17.00	0.00	46.31	10.08
ETRs from BEA	206	55	21.36	21.25	0.00	45.29	9.19
ETRs from TWZ	234	78	9.81	7.37	0.00	36.92	9.71
Imputed ETRs	888	222	16.47	17.41	0.00	39.90	7.97
Combined ETRs (yearly)	888	222	15.44	16.58	0.00	40.31	9.11
Panel C: Jurisdictional data (affiliate jurisdiction level, avg. 2017-2020)							
Combined ETRs (avg.)	222	222	15.44	16.37	0.00	36.15	9.05
STRs (avg.)	222	222	22.36	25.00	0.00	50.00	9.69

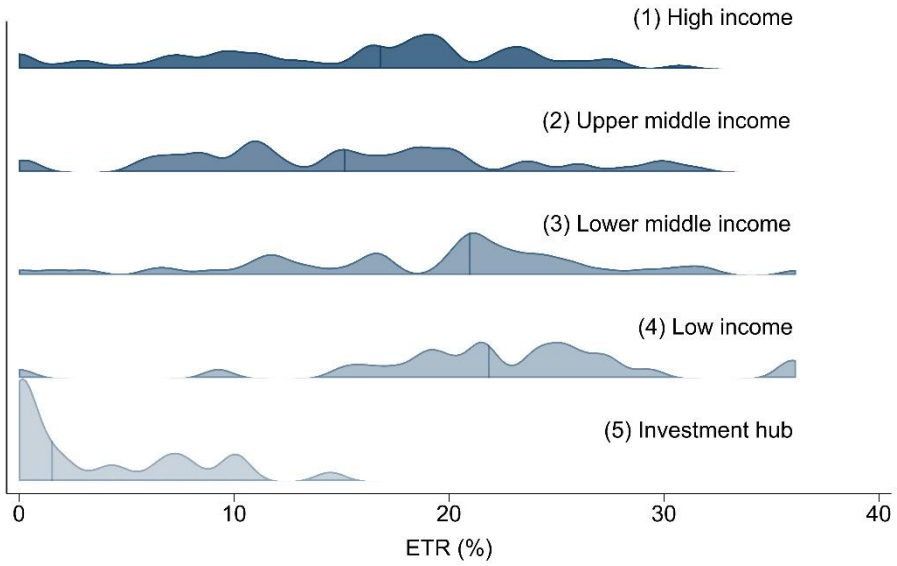
Note: Panel A provides summary statistics on yearly bilateral ETR data at the affiliate-UPE jurisdiction level from aggregated CbCR available after cleaning which is used in the calculation of annual jurisdictional average ETRs. Panel B provides summary statistics on ETR data available at the jurisdiction-year level from CbCR, BEA, Tørsløv, Wier, and Zucman (2023[1]), and regression-based imputations as well as the resulting combined annual ETRs. Panel C provides summary statistics on averages across years 2017-2020 for the combined ETR and statutory tax rates.

Figure A.1. Distribution of average ETRs – CbCR ETRs only



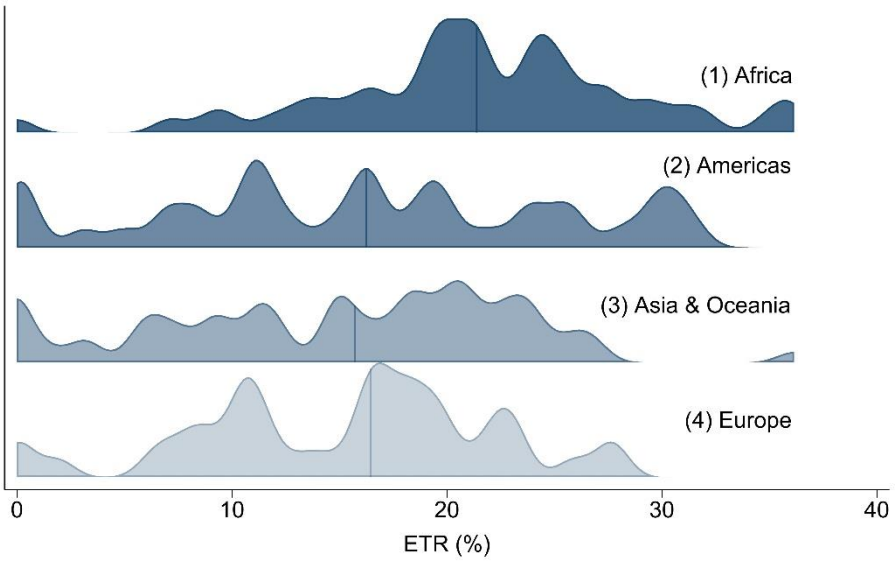
Note: Distribution of average ETRs at the jurisdictional level, excluding jurisdictions for which no CbCR data on ETRs is available. ETRs are averages across the years 2017-2020. Bins have a width of 0.5 percentage points.

Figure A.2. Distribution of average ETRs by income group – CbCR ETRs only



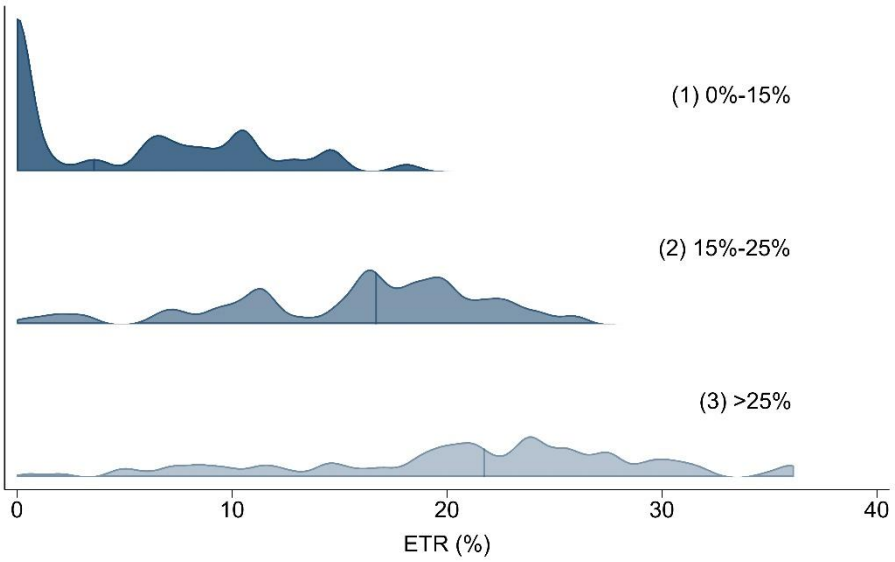
Note: Density plots of average ETR distributions by income group, excluding jurisdictions for which no CbCR data on ETRs is available. ETRs are averages across the years 2017-2020 at the jurisdiction level. Table D.1 shows the allocation of jurisdictions to income groups. The vertical lines indicate the median of the respective distributions.

Figure A.3. Distribution of average ETRs by regional group



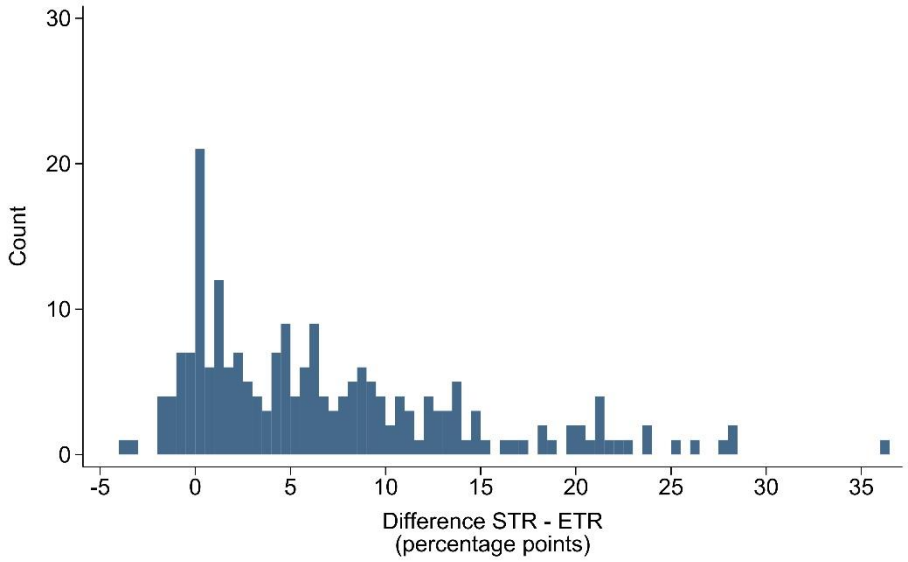
Note: Density plots of average ETR distributions by regional group, excluding jurisdictions for which no CbCR data on ETRs is available. ETRs are averages across the years 2017-2020 at the jurisdiction level. Table D.2 shows the allocation of jurisdictions to regional groups. The vertical lines indicate the median of the respective distributions.

Figure A.4. Distribution of average ETRs by STR group



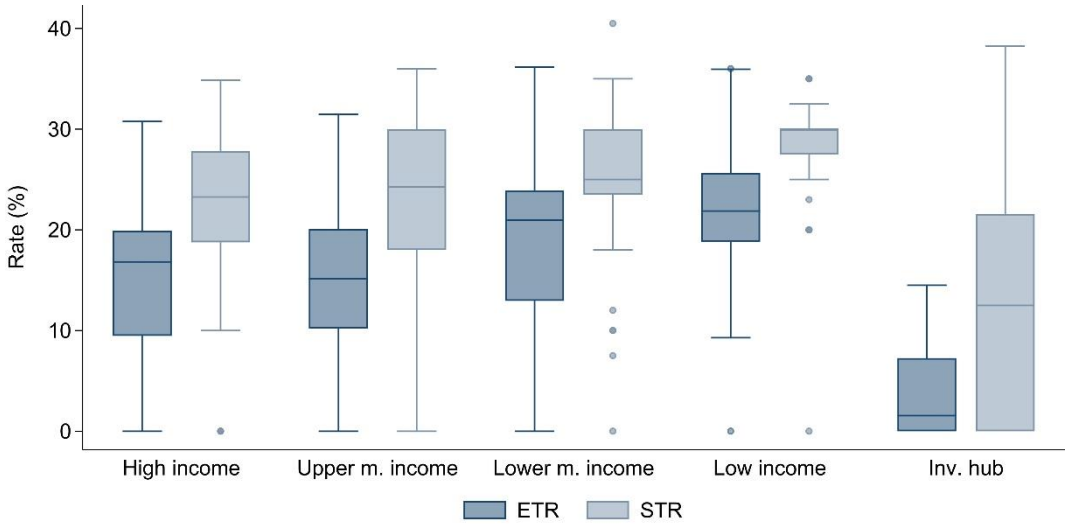
Note: Density plots of average ETR distributions by STR group, excluding jurisdictions for which no CbCR data on ETRs is available. ETRs are averages across the years 2017-2020 at the jurisdiction level. Table D.3 shows the allocation of jurisdictions to STR groups. The vertical lines indicate the median of the respective distributions.

Figure A.5. Differences between STRs and ETRs – CbCR ETRs only



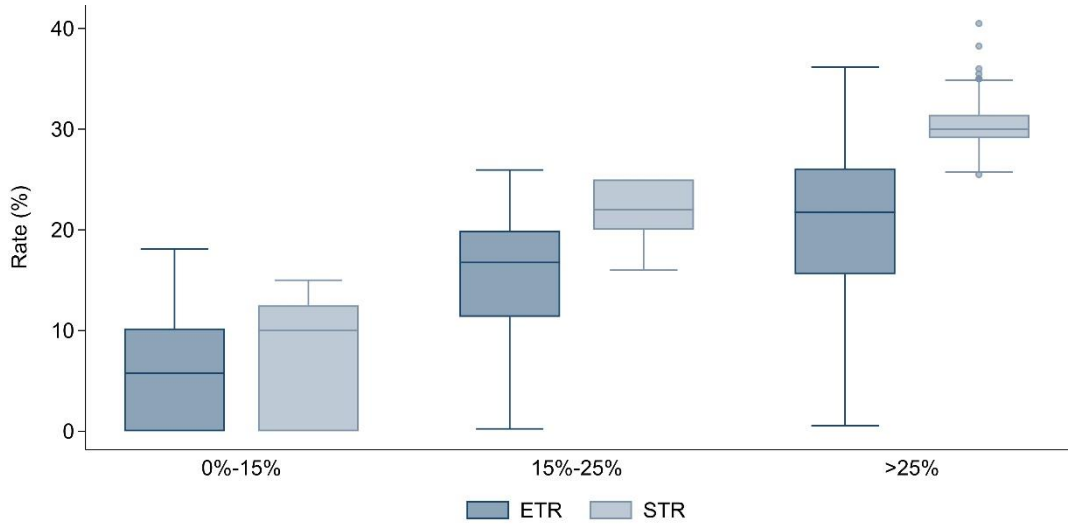
Note: Distribution of the difference between STRs and ETRs in a jurisdiction in percentage points.

Figure A.6. Average ETRs and STRs by income group – CbCR ETRs only



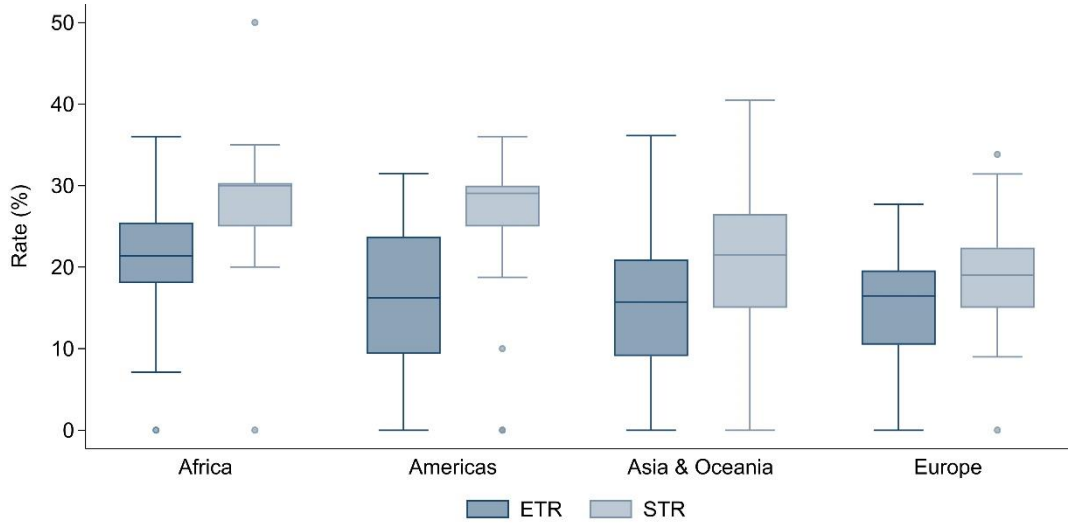
Note: Distributions of average ETRs and STRs by income group, excluding jurisdictions for which no CbCR data on ETRs is available. ETRs and STRs are averages across the years 2017-2020 at the jurisdiction level. Table D.1 shows the allocation of jurisdictions to income groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.7. Average ETRs and STRs by STR group – CbCR ETRs only



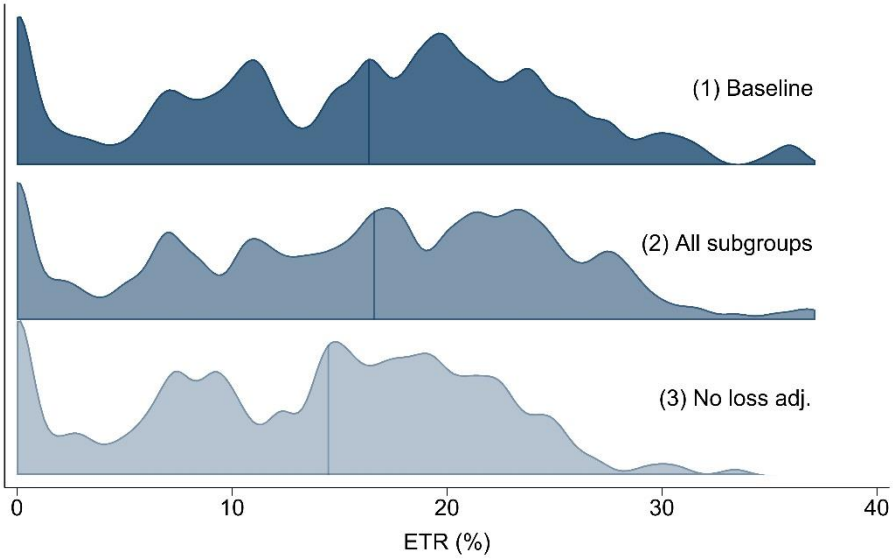
Note: Distributions of average ETRs and STRs by STR group, excluding jurisdictions for which no CbCR data on ETRs is available. ETRs and STRs are averages across the years 2017-2020 at the jurisdiction level. The distribution of ETRs within jurisdictions. Table D.3 shows the allocation of jurisdictions to STR groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.8. Average ETRs and STRs by regional group



Note: Distributions of average ETRs and STRs by regional group (excluding investment hubs), excluding jurisdictions for which no CbCR data on ETRs is available. ETRs and STRs are averages across the years 2017-2020 at the jurisdiction level. Table D.2 shows the allocation of jurisdictions to regional groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.9. Average ETR calculation – robustness checks



Note: Distribution of average ETRs in percent using different data taken from aggregated CbCR data. ETRs of distribution (1) are based on loss-adjusted profits and taxes accrued of profitable subgroups; ETRs of distribution (2) are based on data of all subgroups; ETRs of distribution (3) are based profits and taxes of profitable subgroups without loss adjustment. The vertical lines indicate median of the respective distributions.

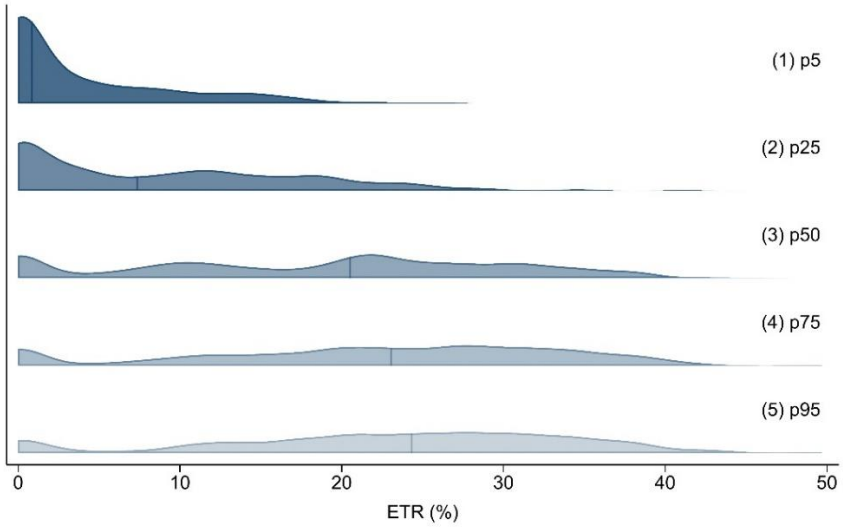
A2. Additional figures and tables from Section 3

Table A.3. Summary statistics on jurisdictional ETR distribution points

ETR distribution point	Observations	Unique affiliate jurisdictions	Mean (%)	Median (%)	Min. (%)	Max. (%)	SD
Panel A: Bilateral data (UPE-affiliate-jurisdiction-year level)							
P5	2,375	183	1.79	0.00	0.00	24.00	4.46
P25	2,767	183	5.02	1.10	0.00	30.00	6.87
P50	3,173	183	12.70	12.50	0.00	40.55	9.83
P75	2,767	183	17.30	19.22	0.00	47.92	10.28
P95	2,375	183	18.54	20.00	0.00	48.32	10.38
Panel B: Jurisdictional data (affiliate-jurisdiction-year level)							
P5	888	222	3.88	0.44	0.00	25.83	5.59
P25	888	222	8.88	7.02	0.00	42.44	8.80
P50	888	222	18.22	20.43	0.00	45.12	11.73
P75	888	222	21.71	22.83	0.00	58.31	11.93
P95	888	222	22.81	24.22	0.00	58.74	11.62
Panel C: Jurisdictional data (affiliate jurisdiction level, avg. 2017-2020)							
P5	222	222	3.88	0.78	0.00	25.83	5.49
P25	222	222	8.88	7.12	0.00	41.12	8.72
P50	222	222	18.22	20.48	0.00	42.81	11.66
P75	222	222	21.71	22.92	0.00	49.51	11.84
P95	222	222	22.81	24.22	0.00	51.11	11.53

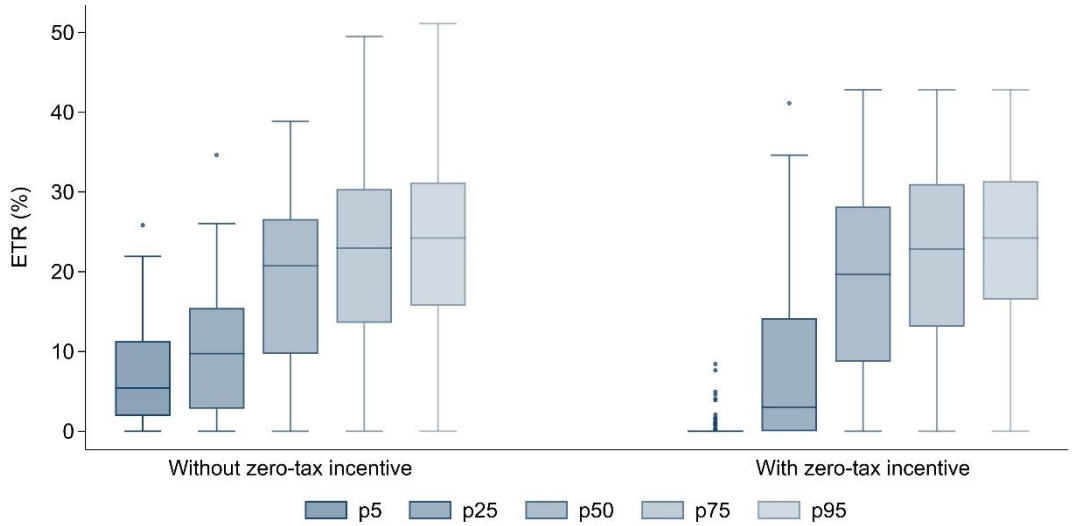
Note: Panel A provides summary statistics on ETR distribution points from aggregated CbCR available after cleaning which is used in the calculation of annual jurisdictional averages. Panel B provides summary statistics on ETR distribution points available at the jurisdiction-year level after data cleaning and adjusting for losses and other differences to the average ETRs estimated in Section 2. Panel C provides summary statistics on averages across years 2017-2020 for final ETR distribution points.

Figure A.10. Distribution of ETR percentiles – CbCR ETRs only



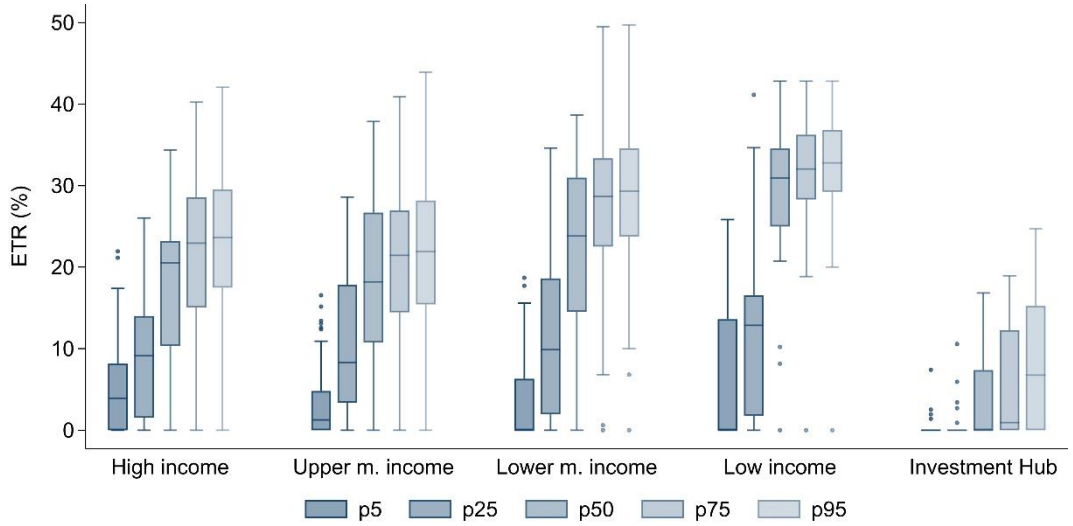
Note: Density plots of ETR distributions for each percentile available, excluding jurisdictions for which no CbCR data on ETRs is available. ETR distribution points are averages across the years 2017-2020 at the jurisdiction level. The vertical lines indicate the median of the respective distribution.

Figure A.11. Distribution of ETR percentiles – Jurisdictions with and without "zero-tax" incentives



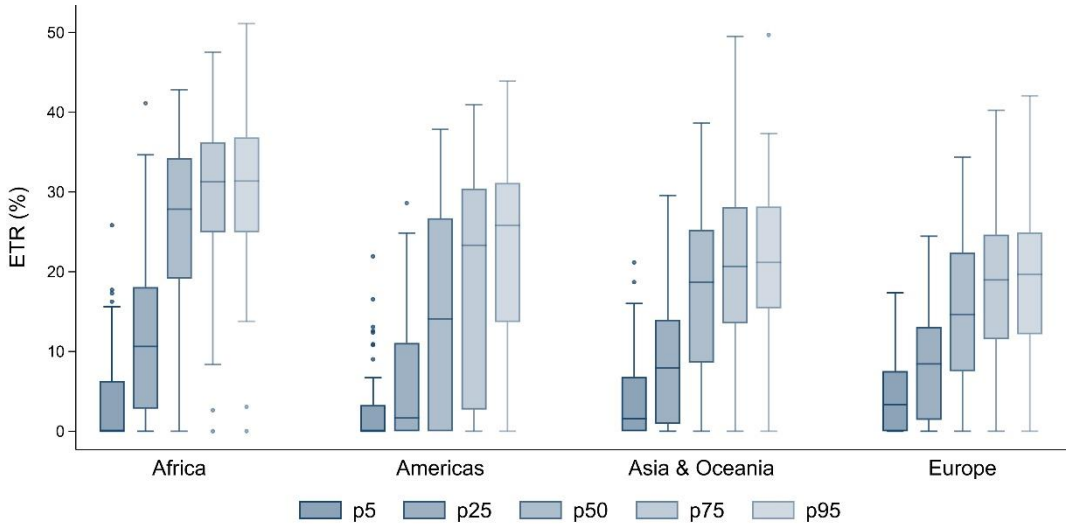
Note: Distributions of ETR percentiles for jurisdictions with and without "zero-tax" incentives. ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. Table D.4 provides a list of jurisdictions with "zero-tax" incentives. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.12. Distribution of ETR percentiles by income group – CbCR ETRs only



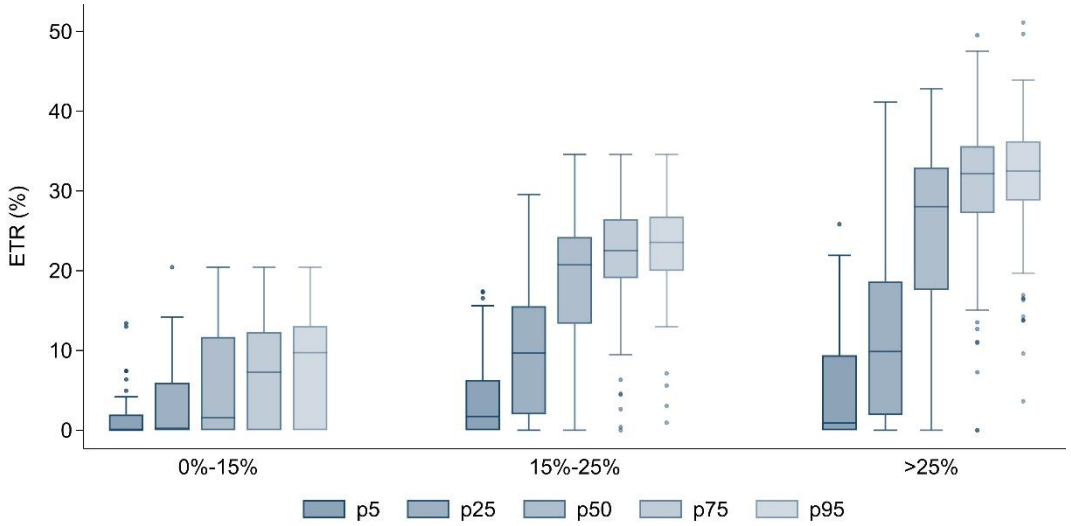
Note: Distributions of ETR percentiles across income groups. ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. Table D.1 shows the allocation of jurisdictions to income groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.13. Distribution of ETR percentiles by regional group



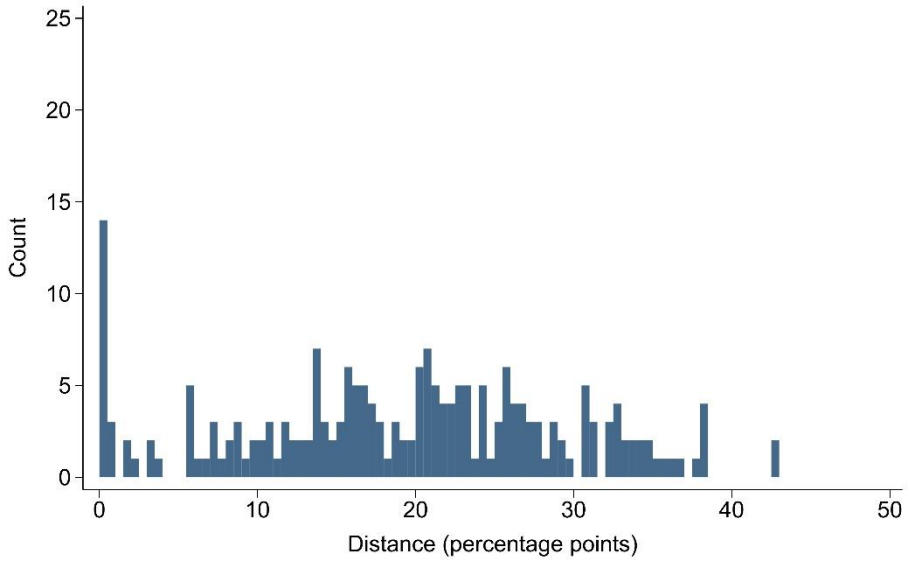
Note: Distributions of ETR percentiles across regional groups (excluding investment hubs). ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. Table D.2 shows the allocation of jurisdictions to regional groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.14. Distribution of ETR percentiles by STR group



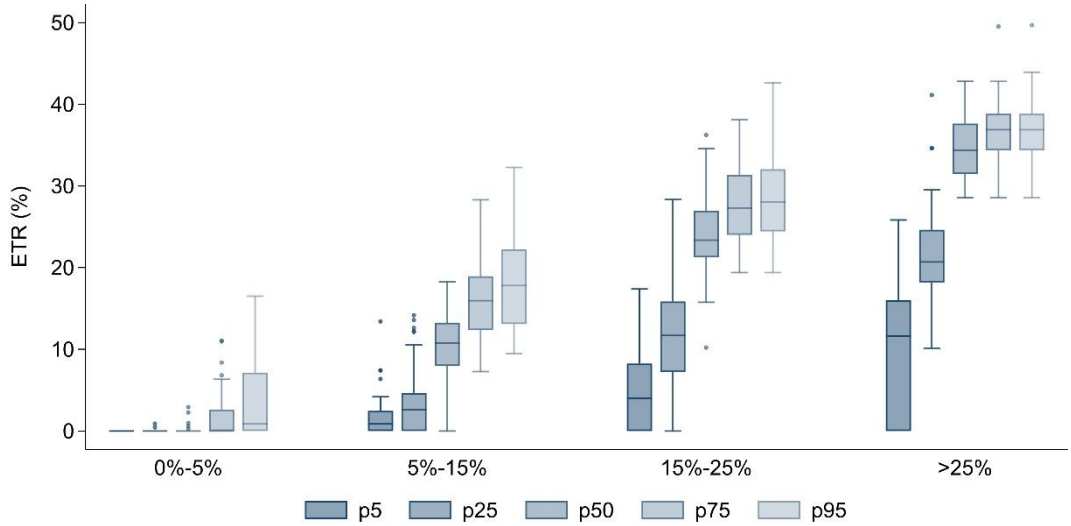
Note: Distributions of ETR percentiles across STR groups. ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. Table D.3 shows the allocation of jurisdictions to STR groups. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

Figure A.15. Distribution of distance between p5 and p95 within jurisdictions – CbCR ETRs only



Note: Distribution of distances between the 5th and the 95th percentile of estimated ETR distributions within jurisdictions, excluding jurisdictions for which no CbCR data on ETRs is available. Distribution points used are averages across the years 2017-2020. Bins have a width of 0.5 percentage points.

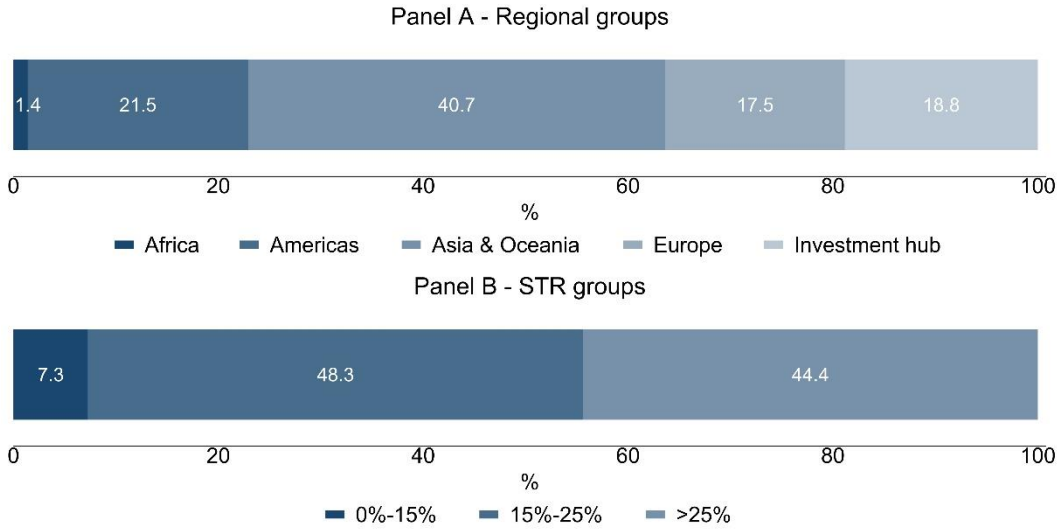
Figure A.16. Distribution of ETR percentiles by ETR group – CbCR ETRs only



Note: Distributions of ETR percentiles across STR groups. ETR percentiles are averages across the years 2017-2020 at the jurisdiction level. The boxes illustrate the 25th to 75th percentile; the horizontal line within the boxes indicates the median. Whiskers mark 1.5 times the interquartile ranges at the top and bottom. Dots indicate individual observations outside this range.

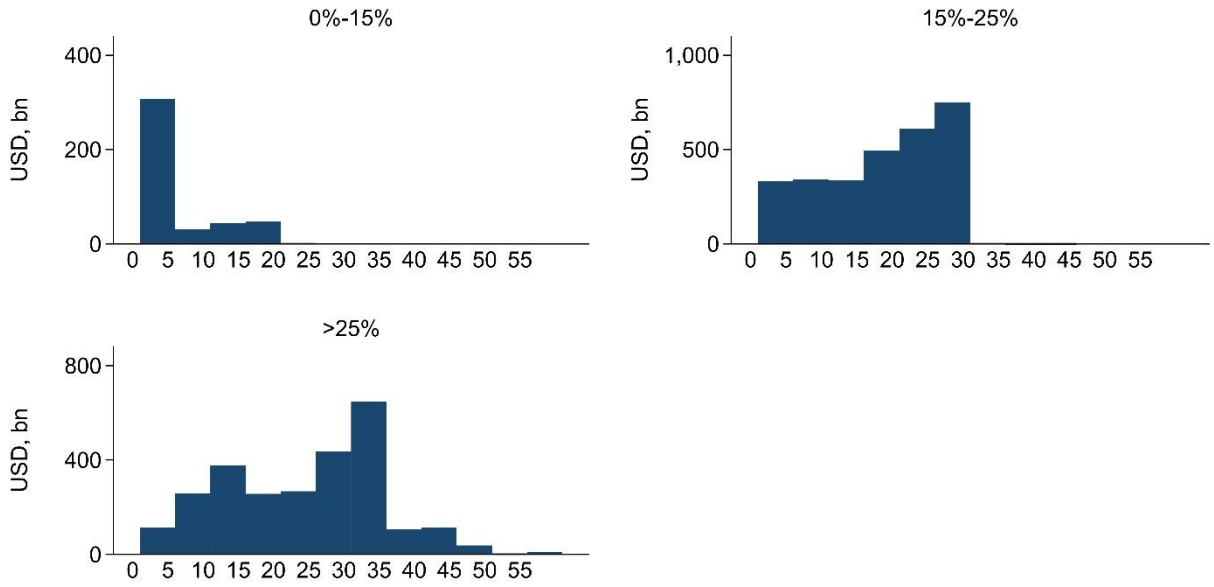
A3. Additional figures and tables from Section 4

Figure A.17. Profit by affiliate jurisdiction regional group and STR group



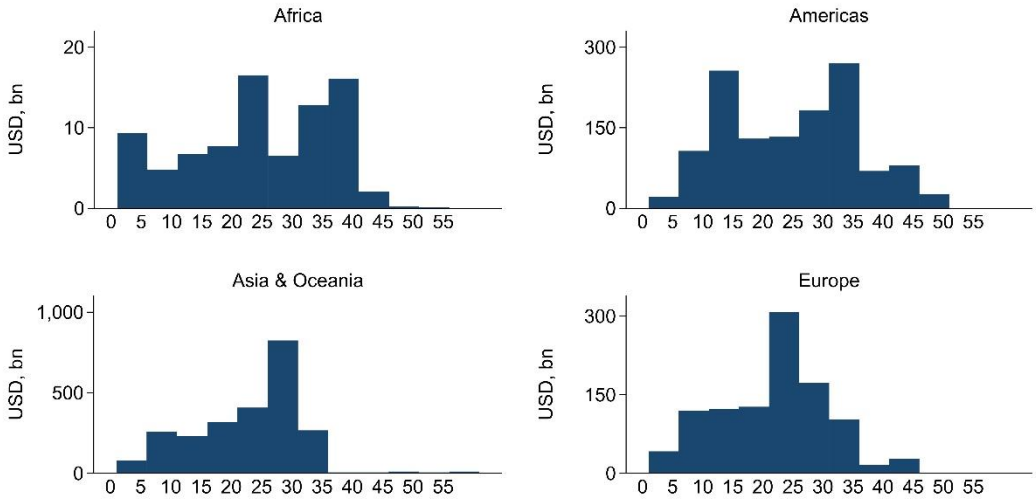
Note: Distribution of profit of large MNEs across regional groups (Panel A), and STR groups (Panel B) Values shown are weighted averages across the years 2017-2020. Table D.2 shows the allocation of jurisdictions to income groups. The sum of global profits of large MNEs in the sample period is USD 23,715 billion over the sample period, or USD 5,929 billion per year.

Figure A.18. Distribution of ETRs over MNE profit by STR group



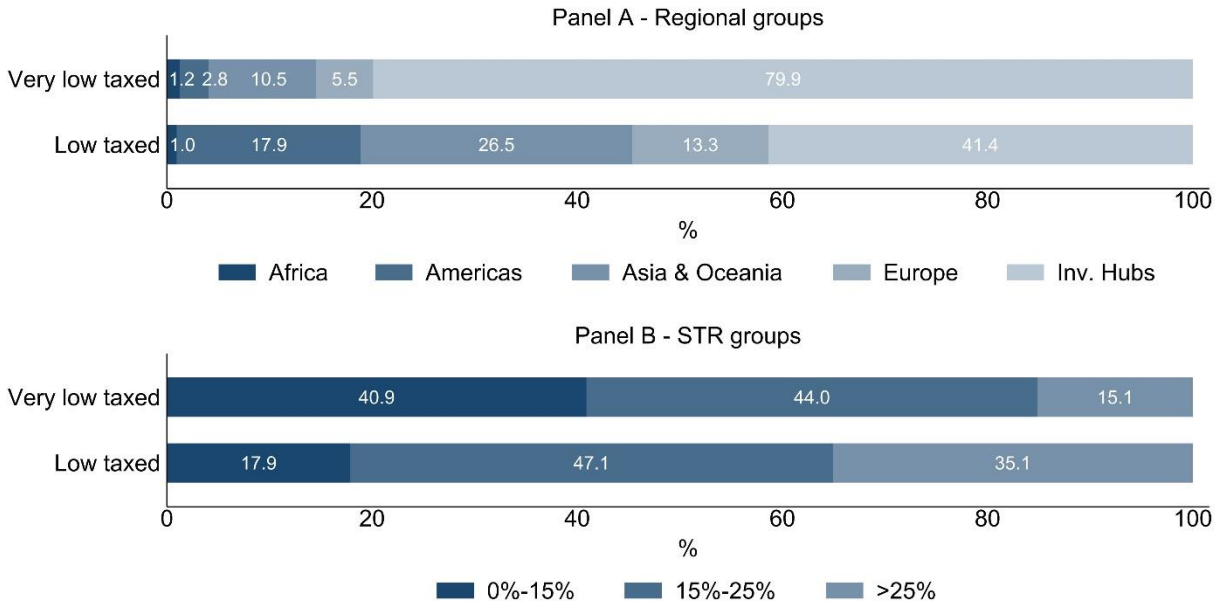
Note: Distribution of profit of large MNEs across ETR bins, averaged over the period 2017-2020, by STR group. Table D.3 shows the allocation of jurisdictions to STR groups. Bins have a width of five percentage points. The average sum of global profits of large MNEs is USD 5,929 billion per year.

Figure A.19. Distribution of ETRs over MNE profit by regional group



Note: Distribution of profit of large MNEs across ETR bins, averaged over the period 2017-2020, by regional group. Table D.2 shows the allocation of jurisdictions to regional groups. Bins have a width of five percentage points. The average sum of global profits of large MNEs is USD 5,929 billion per year.

Figure A.20. Distribution of very low-taxed profit across regions and STR groups



Note: Distribution of very low and low-taxed profit over regional groups (Panel A) and STR groups (Panel B). Table D.2 shows the allocation of jurisdictions to regional groups; Table D.3 shows the allocation of jurisdictions to STR groups. Very low-taxed is defined as all profit taxed at ETRs < 5%; low-taxed profit is defined as all profit taxed at ETRs < 15% and includes very low-taxed profit.

Annex B. Imputations of average ETRs and median ETRs

B1. Imputing average ETRs

67. **To develop the dataset on average ETRs, we first use CbCR data where available, complemented with other data sources as described in Section 2.1.** Where data from these sources in unavailable, we use a regression to fill in the gaps. The regression model takes the following form:

$$ETR_{it} = \alpha + \beta_1 STR_{it} + \beta_2 ZeroTax\ Incentive_i + \beta_3 FDI\ ratio_{it} + \beta_4 STR_{it} * FDI\ ratio_{it} + \beta_5 logGDP_{it} + \beta_6 logPopulation_{it} + \vartheta(i) + \theta_t + \varepsilon_{it}$$

The dependent variable is the profit weighted average CbCR ETR of jurisdiction i in year t. On the right-hand side, the STR and the dummy $TaxIncentive$ capture key features of the CIT system of jurisdiction i in year t. The dummy $ZeroTax\ Incentive$ is equal to 1 if there exists a tax holiday or a full exemption regime with broad availability that can result in zero CIT rates (i.e., not restricted to small subset of sectors). A list of jurisdictions which are considered to offer such incentives is provided in Table D.4 of Annex D. The $FDI\ ratio$ measures the inflow of foreign direct investment relative to GDP. The variable is winsorised at the 95th percentile to account for outliers. The interaction term between $FDI\ share$ and STR captures that the STR may not be the most relevant feature of the tax system in many jurisdictions with high FDI to GDP ratios such as investment hubs, and may not drive ETRs.[31] The logs of population and GDP account for the fact that jurisdictions with larger markets and economies may be able to maintain a higher tax burden (Haufler and Wooton, 1999[21]). A set of region dummies $\vartheta(i)$ account for potential differences across four broad world regions. Table D.2 summarises the allocation of jurisdictions to regional groups. Year dummies θ_t account for potential changes over time that similarly affect ETRs in all jurisdictions. Jurisdiction-year observations are weighted by the number of MNE subgroups that the respective ETR is based on. This assigns higher weights to observations with more informational content. Since all covariates used in the model are available for all 222 jurisdictions in our sample, the coefficients can be used to impute an ETR for all observations. Details of the regression results are reported in column (1) of Table B.1 for our key tax variable based on loss-adjusted profits. Column (2) shows results when estimating the ETR based on data for all subgroups used in the robustness check presented in Section 2.

B2. Imputing the median ETRs

68. **The regression model used to estimate missing data on median ETRs follows a very similar approach to the regression for the averages.** The dependent variable is the 50th percentile of the ETR distribution of jurisdiction i in year t. The jurisdictional average ETR for year t determined in Section 2 enters as a covariate resulting in a regression model of the following form:

[31] See OECD (2020[20]) for more details on the compilation of the FDI data. The ratio of FDI to GDP is also used to classify investment hubs where a threshold of 150% is applied (see Annex D).

$$p50\ ETR_{it} = \alpha + \beta_1 STR_{it} + \beta_2 ZeroTax\ Incentive_i + \beta_3 FDI\ ratio_{it} + \beta_4 STR_{it} * FDI\ ratio_{it} + \beta_5 logGDP_{it} + \beta_6 logPopulation_{it} + \beta_7 avgETR_{it} + \vartheta_i + \theta_t + \varepsilon_{it}$$

All other covariates are defined as above in the description of the regression model for average ETRs. Observations are weighted by the total number of subgroups that the respective 50th percentile is based on. Regression results for the median ETR are summarised in column (3) of Table B.1.

Table B.1. Regression results for average and median ETRs

	(1) Avg. ETR (loss adj.)	(2) Avg. ETR (net profits)	(3) Median ETR (pos.)
STR	0.571***	0.622***	0.372***
	(0.029)	(0.032)	(0.037)
Tax Incentive	-0.025***	-0.027***	0.002
	(0.005)	(0.005)	(0.004)
FDI ratio	0.012***	0.011***	-0.001
	(0.003)	(0.003)	(0.003)
STR x FDI ratio	-0.154***	-0.140***	-0.020
	(0.017)	(0.017)	(0.017)
Log(GDP)	-0.009***	-0.005***	0.005**
	(0.002)	(0.002)	(0.002)
Log(population)	0.020***	0.017***	-0.005**
	(0.002)	(0.002)	(0.002)
Avg. ETR (pos.)			0.527***
			(0.045)
constant	-0.073***	-0.071***	-0.054***
	(0.017)	(0.019)	(0.017)
Region FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	800	796	604
R^2	0.721	0.714	0.743

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

Annex C. Methodology underlying the preparation of profit data

69. **The general approach to construct the global distribution of profits of large MNEs for the years 2017-2020 follows OECD** (2020[20])**.** In this economic impact assessment (EIA) of the two-pillar solution, matrices on profits, revenues, assets, and employees were constructed for the year 2016. These cover MNE profits and activities at the UPE-affiliate level. 222 affiliate jurisdictions form the rows of the matrices. Profits and activities within each affiliate jurisdiction are broken down across 222 ultimate parent entity jurisdictions, as recorded in *columns*. For this paper, we focus on profits and the affiliate level only, meaning that while we construct full bilateral matrices for each year, the data is collapsed at the row level. At the same time, the methodology of OECD (2020[20]) has been updated to take advantage of additional data that has become available recently, particularly in the form of new vintages of anonymised and aggregated CbCR statistics. The CbCR data is combined with additional information from Bureau van Dijk's Orbis database on MNE activities to maximise coverage of hard data. While the two data sources of hard data are to some degree complementary in terms of geographical coverage, some information in the profit matrices is based on extrapolations. These rely on macroeconomic data, in particular on FDI stocks and returns taken from OECD and IMF databases, making use of the hard data available to ensure consistency within the matrices. The extrapolations ensure that all cells of the matrices are filled. The main changes in the preparation of underlying data and methodology relative to OECD (2020[20]) are summarised below along with a high-level overview on the data sources used.

C1. Anonymised and aggregated CbCR data

70. **Country-by-Country reporting data summarises the global activities of MNEs, broken down by jurisdiction. Aggregated CbCR data is our preferred data source as was the case in OECD** (2020[20])**.** It is available for up to 52 UPE jurisdictions per year and used to fill columns of the profit matrices. To further improve the data quality of this key data source, we have made several adjustments to the data cleaning and preparation methodology. We focus on data recorded in Panel AI of Table I in the aggregated CbCR data, which contains information on profitable subgroups following the approach of OECD (2020[20]). To expand the coverage of the CbCR data, we have added imputations of missing information in Panel AI using data on all subgroups (Panel A of Table I) and loss-making subgroups (Panel AII of Table I). If both, Panel A and AII are available, values for profitable MNEs are imputed by combining this information. If only values for all subgroups are available – which is the more frequent case – the median ratio of values for profitable subgroups to all subgroups by affiliate jurisdiction and year from other CbCRs is used to scale data on all subgroups. If information is available from less than three UPE jurisdictions, the global median by year is used for the scaling. Before the scaling, we exclude outliers and winsorise the resulting ratios at the 5% level.

71. **Responding to research on double counting issues in aggregate data on MNE activities due to double counting of intra-company dividends, we now adjust UPE profits recorded in CbCR.** These downward corrections are based on additional information provided by UPE jurisdictions as

available.[32] If no such additional information is available, the double-counting correction is based on the comparison between ETRs of domestic MNEs with ETRs of foreign MNEs in the same jurisdiction. Foreign entities are less likely to be impacted by double counting issues, such that their ETRs are likely to be unaffected by the double counting of dividends.[33] In contrast, double counting in parent entities will result in lower ETRs due to an inflated denominator. Since the general tax system applicable to affiliates of domestic and foreign MNEs within one jurisdiction is likely to be similar, lower ETRs amongst domestic affiliates located in the UPE jurisdiction can point to double counting issues.[34] In these cases, we apply a downward correction to the profits of domestic affiliates such that the resulting ETR aligns with the average ETR paid by foreign-owned affiliates in the same jurisdiction. The percentage reduction in the profit of domestic affiliates is capped at the maximum percentage increase provided to the OECD by those tax authorities of UPE jurisdictions who submitted corrections to double counting based on their own analyses (55.5%, this value roughly corresponds to the 80th percentile of the distribution of corrections calculated based on the ETR comparisons). For zero-tax jurisdictions, inflated profits due to double counting do not impact ETRs since the numerator in the ETR calculation (tax accrued) is zero. However, profits in zero-tax jurisdictions may still be inflated due to double counting of dividends. For this reason, we apply the median downward correction calculated across all other CbCR-submitting jurisdictions to UPE profits reported in zero-tax jurisdictions. Downward corrections are applied to around two thirds of the UPE jurisdiction cells in the profit matrices filled with CbCR data across the 4 years. The resulting downward corrections from both the estimated corrections based on ETR comparisons and the adjustments provided by jurisdictions are of similar magnitude (see Section 2.1). Overall, profits are reduced by USD 2420 billion over the 4 years using corrections with jurisdictional data, and USD 2110 billion due to the estimated double counting corrections.

72. **We have also incorporated additional information from jurisdictions that do not host any ultimate parent entity of a large MNE group.** Reflecting on this information which exclusively relates to small economies, we further assume that this applies to all non-hub jurisdictions with an average GDP below USD 10 billion over the period 2017-2020. All cells in the matrix-columns of these jurisdictions are set to zero. Cells are also set to zero if there is no information of any MNE activities in the aggregate CbCR data of a UPE jurisdiction for which the sum of data reported equals the foreign jurisdiction total.

73. **This foreign jurisdiction total is further used to scale all imputed data, including data taken from Orbis, in columns of UPE jurisdictions where some CbCR data is available.** This ensures that the column total matches the total reported in aggregate CbCR. Stateless income is now excluded from the foreign jurisdiction total for this scaling. To avoid large relative changes in cells with small absolute amounts, the multipliers resulting from the column scaling are winsorised at the 10th and 90th percentiles across all jurisdictions.

74. **The availability of several vintages of aggregate CbCR data allowed to add forward and backward extrapolations within CbCR based on residence jurisdictions-specific yearly growth rates in cases where a UPE jurisdiction only provided aggregate CbCR data for a subset of years (2017-2020).** Drawing on additional data collected on the global distribution of revenues following the

[32] Detailed information on the corrections provided by individual jurisdictions are linked in the OECD's general disclaimer regarding aggregated CbCR data, available at https://www.oecd.org/tax/tax-policy/anonymised-and-aggregated-cbcr-statistics-disclaimer.pdf. All these corrections only apply to profits of MNEs with their UPE in the jurisdiction.

[33] Horst and Curatolo (2020[22]) and Aliprandi and von Zedlitz (2023[23]) provide attempts to quantify the degree of double counting in CbCR data also stressing the concentration of double counting in UPE jurisdictions.

[34] Anecdotal evidence from tax administrations suggests that there are no systematic differences in the tax treatment of domestic and foreign-owned entities. ETRs of foreign MNEs from CbCR data are calculated following the procedure used for average jurisdictional ETRs which includes data cleaning and exclusion of outliers.

approach outlined in OECD (2020[20]), we have also set profits for UPE-affiliate jurisdiction pairs to zero if we do not observe any revenues recorded for the same UPE-affiliate pair. Since there are additional sources available for revenues that do not contain profit information such as the OECD AMNE and Analytical AMNE databases or Eurostat FATS, this revenue information is likely to be more reliable than imputed profit data. Lastly, improved data cleaning to exclude implausible data points based on the benchmarking of aggregate CbCR data against macroeconomic indicators further strengthens data quality.

C2. Orbis data

75. **The Orbis database is provided by Bureau van Dijk (BvD) and provides extensive information on ownership structures and financial accounts of firms at the consolidated and unconsolidated level.** The coverage of consolidated data of ultimate parents is mostly good. Accordingly, this consolidated data is used to scale column totals of profit matrices for each year based on a comparison of the column totals with the sum of consolidated profits of firms with UPE in the jurisdiction. Coverage of the unconsolidated data varies across countries. It is aggregated and used to fill individual cells of the matrices of the coverage is deemed sufficient.

76. **The data used has been updated compared to OECD** (2020[20]) **to cover 2017-2020 and a more comprehensive version of Orbis has been used to improve coverage.** The year definition was shifted from July-June to the calendar year to better match the year definition in most macro data and further improved the duplicate and outlier cleaning procedure. Additional imputations at the firm level in case of individual missing variables reduce the need for revenue-based scaling of aggregate totals used for matrix cells. The removal of observations where the ultimate parent can be identified and has revenues below EUR 750m ensures a closer alignment with CbCR data. The summed-up unconsolidated Orbis is now used more broadly if the coverage is deemed good enough at the cell level.

77. **The scaling of columns using consolidated Orbis data was adapted. Firms with negative profits are excluded before the column total from consolidated Orbis is calculated, to align with the use of profitable subgroups from CbCR.** The scaling itself now proportionally affects all estimated cells, not just the cell of the UPE jurisdiction. It is not applied for columns for which we have CbCR information, since the column total is defined by the sum of domestic and foreign jurisdiction total values on CbCR in these cases. The Orbis-based column scaling is also not applied when the UPE jurisdiction is an investment hub, since the coverage of Orbis is not deemed reliable enough for these jurisdictions.

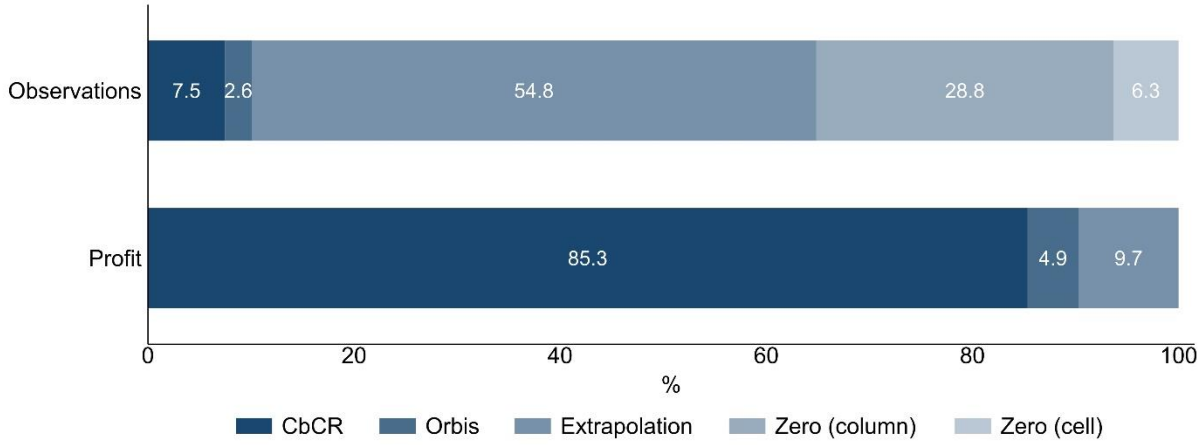
C3. Further remarks on data preparation

78. **The general approach to impute missing data points based on macroeconomic data closely follows OECD** (2020[20]) **with some updates.** The move towards a panel dataset covering 4 years allowed for a more thorough cleaning of outliers in the extrapolations used. Wherever possible, absolute cut-offs used in OECD (2020[20]) were replaced by distributions points to exclude outliers. Extrapolations regarding the profitability of FDI stocks were also adapted to better account for differences across jurisdictions from different income groups. Reflecting the focus on profitable subgroups, negative returns to FDI are now replaced with zeros resulting in a profit matrix without negative entries.

C4. Coverage of data sources

79. **Figure C.1 summarises the data sources used as well as the share of totals and number of cells filled with each data source.**[35] To assess the relative importance of the different data sources, we consider the first measure to be more informative. Since the matrices contain almost 50,000 cells for each year reflecting the wide range of jurisdictions covered, many cells contain very small absolute values or zeros. This can be because there is no large MNE with a UPE in a jurisdiction, or because there is little economic relationship for a UPE-affiliate jurisdiction pair, e.g., because of a large geographic distance. As shown in Figure C.1, cells filled with CbCR data represent most of the totals in the profit matrices, even though this primary source of data is only available for 7.5% of all cells. Yet, CbCR contributes 85.3% of total MNE profit recorded in the matrices. In contrast, extrapolations fill 54.8% of cells in the matrices, but only account for a very small share of total profits. It is important to note that the share of cells filled with extrapolations is typically higher for lower income jurisdictions than for higher income jurisdictions reflecting the gaps in the existing hard data in lower income jurisdictions.

Figure C.1. Sources of profit data



Note: Coverage of data sources for profit data at the UPE-affiliate jurisdiction level relative to the number of observations and total profit Labels for values <0.5% are supressed to improve for readability.

C5. Loss adjustment

80. **The profit data used reflects the global distribution of positive profits at the UPE-affiliate level.** To get values of net profits, we apply a loss adjustment to each cell based on the typical share of losses in positive profits observed in aggregated CbCR data at the affiliate jurisdiction level. The aggregated and anonymised CbCR data separately report profits and losses at the subgroup level allowing the calculation of a profit-weighted average ratio of MNE losses to profits by affiliate jurisdiction. For a small share of jurisdictions (around10%), there is little or no information on the share of losses available in aggregated CbCR. In these cases, we combine the jurisdiction-specific information with profit-weighted averages by income group. The approach taken ensures that the tax base is positive or zero and does not create issues in the subsequent averaging at the jurisdictional level.

81. **CbCR data would also allow for yearly loss adjustments at the subgroup level, e.g., by using net profits at the subgroup level.** However, this would create many observations with negative profits,

[35] Since the underlying data is bilateral at the UPE-affiliate jurisdiction level, shares are not shown relative to GDP of affiliate jurisdictions as compared to the summary of data sources shown in Sections 2 and 3.

substantially reducing the observations available for the calculation of ETRs. The loss shares observed at this lower level of aggregation would also not necessarily be representative for the typical share of losses in a jurisdiction due to the volatility of losses. Since we are aiming for the typical tax burden of MNEs in a jurisdiction, the more aggregate approach appears better suited.

82. **The loss adjustments are applied to the tax base in the estimation of average ETRs of Section 2 as well as to the profits of large MNEs estimated in Section 4.** This ensures that our tax base estimation is in line with the estimated ETRs. In total, the loss adjustment of the tax base account for 16.5% of total positive profit, or around USD 1,180 billion per year.

Annex D. Definition of jurisdiction groups

83. **Jurisdictions are classified into different groups to facilitate the presentation of results. In some cases, groups are also used in the imputation of missing data.** Jurisdictions are grouped based on their GNI per capita (income groups), geographic region (regional groups), statutory corporate tax rates (STR groups), and average ETRs (ETR groups). Moreover, some of the data preparation differentiates between jurisdictions with and without tax incentives that can create zero-rates. All groupings are kept stable over the sample period of 2017-2020 to avoid changing group compositions affecting the results. The following tables show the resulting groupings. Details of the ETR groups are not provided for confidentiality reasons. Methodological details are explained in the respective table notes.

Table D.1. Income groups

High income	Upper middle income	Lower middle income	Low income	Investment hub
Andorra	Albania	Algeria	Afghanistan	Anguilla
Antigua and Barbuda	American Samoa	Angola	Burkina Faso	Bahamas
Aruba	Argentina	Bangladesh	Burundi	Bailiwick of Guernsey
Australia	Armenia	Benin	Central African Republic	Barbados
Austria	Azerbaijan	Bhutan	Chad	Bermuda
Bahrain	Belarus	Bolivia	Democratic People's Republic of Korea	British Virgin Islands
Belgium	Belize	Cabo Verde	Democratic Republic of the Congo	Cayman Islands
Bonaire	Bosnia and Herzegovina	Cambodia	Eritrea	Curaçao
Brunei Darussalam	Botswana	Cameroon	Ethiopia	Cyprus
Canada	Brazil	Comoros	Gambia	Gibraltar
Chile	Bulgaria	Congo	Guinea	Hong Kong (China)
Chinese Taipei	China (People's Republic of)	Côte d'Ivoire	Guinea-Bissau	Hungary
Cook Islands	Colombia	Djibouti	Haiti	Ireland
Croatia	Costa Rica	Egypt	Madagascar	Isle of Man
Czechia	Cuba	El Salvador	Malawi	Jersey
Denmark	Dominica	Eswatini	Mali	Liberia
Estonia	Dominican Republic	Ghana	Mozambique	Luxembourg
Faroe Islands	Ecuador	Honduras	Niger	Malta
Finland	Equatorial Guinea	India	Rwanda	Marshall Islands
France	Fiji	Kenya	Sierra Leone	Mauritius
French Polynesia	Gabon	Kiribati	Somalia	Netherlands
Germany	Georgia	Kyrgyzstan	South Sudan	Puerto Rico
Greece	Grenada	Lao People's Democratic Republic	Sudan	Singapore
Greenland	Guatemala	Lesotho	Syrian Arab Republic	Switzerland
Guam	Guyana	Mauritania	Tajikistan	
Iceland	Indonesia	Micronesia	Togo	
Israel	Iran	Moldova	Uganda	
Italy	Iraq	Mongolia	Yemen	

High income	Upper middle income	Lower middle income	Low income	Investment hub
Japan	Jamaica	Morocco		
Korea	Jordan	Myanmar		
Kuwait	Kazakhstan	Nepal		
Latvia	Kosovo*[36]	Nicaragua		
Liechtenstein	Lebanon	Nigeria		
Lithuania	Libya	Pakistan		
Macau (China)	Malaysia	Palestinian Authority		
Monaco	Maldives	Papua New Guinea		
Montserrat	Mexico	Philippines		
Nauru	Montenegro	Sao Tome and Principe		
New Caledonia	Namibia	Senegal		
New Zealand	North Macedonia	Solomon Islands		
Northern Mariana Islands	Paraguay	Sri Lanka		
Norway	Peru	Tanzania		
Oman	Russia	Timor-Leste		
Palau	Saint Lucia	Tunisia		
Panama	Saint Vincent and the Grenadines	Ukraine		
Poland	Samoa	Uzbekistan		
Portugal	Serbia	Vanuatu		
Qatar	South Africa	Viet Nam		
Romania	Suriname	Zambia		
Saint Kitts and Nevis	Thailand	Zimbabwe		
San Marino	Tonga			
Saudi Arabia	Turkmenistan			
Seychelles	Tuvalu			
Sint Maarten	Türkiye			
Slovak Republic	Venezuela			
Slovenia				
Spain				
Sweden				
Trinidad and Tobago				
Turks and Caicos Islands				
United Arab Emirates				
United Kingdom				
United States				
United States Virgin Islands				
Uruguay				

Note: The classification of income groups is based on the World Bank classification of 2019. Investment hubs are generally defined as jurisdictions with a total inward FDI position above 150% of GDP on average across 2017-2020. The FDI information used primarily comes from the OECD International Direct Investment Statistics database and the IMF Coordinated Direct Investment Survey (CDIS) database, complemented with extrapolations as described in OECD (2020[20]). Three manual changes are made to the resulting list of investment hubs: Mozambique and Mongolia are removed from the list since their high FDI ratios are primarily driven by natural resource investment. Puerto Rico is added to the list of investment hubs since their FDI ratio does not adequately reflect US investment.

[36] This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.

Table D.2. Regional groups

Africa	Americas	Asia & Oceania	Europe
Algeria	Anguilla	Afghanistan	Albania
Angola	Antigua and Barbuda	American Samoa	Andorra
Benin	Argentina	Armenia	Austria
Botswana	Aruba	Australia	Bailiwick of Guernsey
Burkina Faso	Bahamas	Azerbaijan	Belarus
Burundi	Barbados	Bahrain	Belgium
Cabo Verde	Belize	Bangladesh	Bosnia and Herzegovina
Cameroon	Bermuda	Bhutan	Bulgaria
Central African Republic	Bolivia	Brunei Darussalam	Croatia
Chad	Bonaire	Cambodia	Cyprus
Comoros	Brazil	China (People's Republic of)	Czechia
Congo	British Virgin Islands	Chinese Taipei	Denmark
Côte d'Ivoire	Canada	Cook Islands	Estonia
Democratic Republic of the Congo	Cayman Islands	Democratic People's Republic of Korea	Faroe Islands
Djibouti	Chile	Fiji	Finland
Egypt	Colombia	French Polynesia	France
Equatorial Guinea	Costa Rica	Georgia	Germany
Eritrea	Cuba	Guam	Gibraltar
Eswatini	Curaçao	Hong Kong (China)	Greece
Ethiopia	Dominica	India	Hungary
Gabon	Dominican Republic	Indonesia	Iceland
Gambia	Ecuador	Iran	Ireland
Ghana	El Salvador	Iraq	Isle of Man
Guinea	Greenland	Israel	Italy
Guinea-Bissau	Grenada	Japan	Jersey
Kenya	Guatemala	Jordan	Kosovo*
Lesotho	Guyana	Kazakhstan	Latvia
Liberia	Haiti	Kiribati	Liechtenstein
Libya	Honduras	Korea	Lithuania
Madagascar	Jamaica	Kuwait	Luxembourg
Malawi	Mexico	Kyrgyzstan	Malta
Mali	Montserrat	Lao People's Democratic Republic	Moldova
Mauritania	Nicaragua	Lebanon	Monaco
Mauritius	Panama	Macau (China)	Montenegro
Morocco	Paraguay	Malaysia	Netherlands
Mozambique	Peru	Maldives	North Macedonia
Namibia	Puerto Rico	Marshall Islands	Norway
Niger	Saint Kitts and Nevis	Micronesia	Poland
Nigeria	Saint Lucia	Mongolia	Portugal
Rwanda	Saint Vincent and the Grenadines	Myanmar	Romania
Sao Tome and Principe	Sint Maarten	Nauru	Russia
Senegal	Suriname	Nepal	San Marino
Seychelles	Trinidad and Tobago	New Caledonia	Serbia
Sierra Leone	Turks and Caicos Islands	New Zealand	Slovak Republic
Somalia	United States	Northern Mariana Islands	Slovenia
South Africa	United States Virgin Islands	Oman	Spain
South Sudan	Uruguay	Pakistan	Sweden
Sudan	Venezuela	Palau	Switzerland
Tanzania		Palestinian Authority	Türkiye

Africa	Americas	Asia & Oceania	Europe
Togo		Papua New Guinea	Ukraine
Tunisia		Philippines	United Kingdom
Uganda		Qatar	
Zambia		Samoa	
Zimbabwe		Saudi Arabia	
		Singapore	
		Solomon Islands	
		Sri Lanka	
		Syrian Arab Republic	
		Tajikistan	
		Thailand	
		Timor-Leste	
		Tonga	
		Turkmenistan	
		Tuvalu	
		United Arab Emirates	
		Uzbekistan	
		Vanuatu	
		Viet Nam	
		Yemen	

Note: Regional groups are defined based on the geographical location of jurisdictions.

Table D.3. STR groups

STR <=15%	STR > 15% & STR <= 25%	STR > 25%
Albania	Afghanistan	Algeria
Andorra	Antigua and Barbuda	American Samoa
Anguilla	Armenia	Angola
Bahamas	Aruba	Argentina
Bahrain	Austria	Australia
Bailiwick of Guernsey	Azerbaijan	Belgium
Barbados	Bangladesh	Benin
Bermuda	Belarus	Bhutan
Bonaire	Belize	Brazil
Bosnia and Herzegovina	Bolivia	Burkina Faso
British Virgin Islands	Botswana	Burundi
Bulgaria	Brunei Darussalam	Cameroon
Cayman Islands	Cabo Verde	Canada
Cyprus	Cambodia	Central African Republic
Democratic People's Republic of Korea	China (People's Republic of)	Chad
Georgia	Chinese Taipei	Chile
Gibraltar	Cook Islands	Colombia
Hungary	Croatia	Comoros
Iraq	Curaçao	Congo
Ireland	Czechia	Costa Rica
Isle of Man	Côte d'Ivoire	Cuba
Jersey	Denmark	Democratic Republic of the Congo
Kosovo*	Djibouti	Dominican Republic
Kuwait	Dominica	El Salvador
Kyrgyzstan	Ecuador	Equatorial Guinea
Liechtenstein	Egypt	Eritrea

STR <=15%	STR > 15% & STR <= 25%	STR > 25%
Lithuania	Estonia	Eswatini
Macau (China)	Faroe Islands	Ethiopia
Maldives	Fiji	France
Marshall Islands	Finland	French Polynesia
Mauritius	Ghana	Gabon
Moldova	Guam	Gambia
Montenegro	Guatemala	Germany
North Macedonia	Guinea-Bissau	Greece
Oman	Honduras	Greenland
Palau	Hong Kong (China)	Grenada
Palestinian Authority	Iceland	Guinea
Paraguay	Indonesia	Guyana
Qatar	Iran	Haiti
Serbia	Israel	India
Somalia	Jamaica	Italy
Timor-Leste	Jordan	Japan
Turkmenistan	Kazakhstan	Kenya
Turks and Caicos Islands	Lao People's Democratic Republic	Kiribati
Tuvalu	Latvia	Korea
United Arab Emirates	Lebanon	Luxembourg
Uzbekistan	Lesotho	Malawi
Vanuatu	Liberia	Mali
	Libya	Malta
	Madagascar	Mexico
	Malaysia	Monaco
	Mauritania	Montserrat
	Micronesia	Morocco
	Mongolia	Mozambique
	Myanmar	Namibia
	Nauru	New Caledonia
	Nepal	New Zealand
	Netherlands	Nicaragua
	Northern Mariana Islands	Niger
	Norway	Nigeria
	Panama	Pakistan
	Poland	Papua New Guinea
	Romania	Peru
	Russia	Philippines
	San Marino	Portugal
	Sao Tome and Principe	Puerto Rico
	Saudi Arabia	Rwanda
	Singapore	Saint Kitts and Nevis
	Slovak Republic	Saint Lucia
	Slovenia	Saint Vincent and the Grenadines
	South Sudan	Samoa
	Spain	Senegal
	Sweden	Seychelles
	Switzerland	Sierra Leone
	Tajikistan	Sint Maarten
	Thailand	Solomon Islands
	Tonga	South Africa
	Tunisia	Sri Lanka

STR <=15%	STR > 15% & STR <= 25%	STR > 25%
	Türkiye	Sudan
	Ukraine	Suriname
	United Kingdom	Syrian Arab Republic
	Uruguay	Tanzania
	Viet Nam	Togo
	Yemen	Trinidad and Tobago
		Uganda
		United States
		United States Virgin Islands
		Venezuela
		Zambia

Note: Jurisdictions are assigned to STR groups based on their average standard statutory tax rate in the period 2017-2020.

Table D.4. Jurisdictions with tax incentives delivering a zero tax rate ("zero-tax" incentives)

Afghanistan	Congo	Jersey	Philippines
Algeria	Costa Rica	Kazakhstan	Puerto Rico
Anguilla	Cuba	Kenya	Qatar
Antigua and Barbuda	Curaçao	Kuwait	Russia
Armenia	Côte d'Ivoire	Kyrgyzstan	Rwanda
Aruba	Democratic Republic of the Congo	Lebanon	Saint Kitts and Nevis
Azerbaijan	Djibouti	Libya	Saint Lucia
Bahamas	Dominica	Lithuania	Saint Vincent and the Grenadines
Bahrain	Dominican Republic	Macau (China)	Sao Tome and Principe
Bailiwick of Guernsey	Egypt	Malaysia	Serbia
Bangladesh	El Salvador	Mauritius	Singapore
Barbados	Eswatini	Moldova	Slovak Republic
Belarus	Ethiopia	Monaco	South Sudan
Benin	Fiji	Montenegro	Sudan
Bermuda	Gabon	Morocco	Tajikistan
Bhutan	Gambia	Mozambique	Tanzania
Bolivia	Georgia	Myanmar	Thailand
Bonaire	Grenada	Namibia	Togo
Botswana	Guatemala	Nicaragua	Tunisia
British Virgin Islands	Guinea	Nigeria	Uganda
Brunei Darussalam	Guinea-Bissau	North Macedonia	United Arab Emirates
Burkina Faso	Guyana	Northern Mariana Islands	United States Virgin Islands
Burundi	Haiti	Oman	Uruguay
Cambodia	Honduras	Palau	Viet Nam
Cayman Islands	Indonesia	Panama	Zambia
Central African Republic	Isle of Man	Peru	

Note: Jurisdictions are considered to offer a "zero-tax" incentive if they have tax holidays or full exemption regimes with broad availability (i.e., not restricted to small subset of sectors) that can result in zero CIT rates. The classification is based on data from the OECD Investment Tax Incentives Database (Celani, Dressler and Wermelinger, 2022[8]), and EY Worldwide Corporate Tax Guides. PwC Worldwide Tax Summaries, and other publicly available sources.