Revenue Effects of the Global Minimum Tax under Pillar Two[1]

Online Appendix

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Appendix A: Complementary Analyses

A.1. Split of Revenue Gains by Type of Partner Jurisdiction for EU Member States

Consistent with the European Commission's directive proposal of December 2021, under the 'headquarters scenario' in which top-up taxes are assumed to be collected exclusively through the income inclusion rule (IIR), it is assumed that EU Member States impose a minimum rate of 15% not only on the foreign affiliate of their multinational companies but also on domestic profits, i.e. in the country where the headquarters are located (in the following referred to as headquarters countries). For these countries, the revenues presented in Table 1 thus arise from three types of partners: from foreign tax haven jurisdictions (from tax havens), from foreign non-tax haven jurisdictions (from foreign non-tax havens and regional aggregates) and from the headquarters location country of the multinational (from domestic profits).

Table A.1.1. Revenue gains from a 15% minimum tax for EU Member States divided by type of partner jurisdiction (foreign non-haven, foreign tax haven, domestic) in 2021 EUR billion.

Parent country	Total revenue gains	From tax havens	From foreign non-havens and regional aggregates	From domestic profits
Austria	2,3	0,0	0,5	1,8
Belgium	3,4	1,1	1,4	0,9
Cyprus	0,2	0,1	0,1	0,0
Czech Republic	0,1	0,0	0,0	0,0
Denmark	1,6	0,4	0,2	1,0
Estonia	0,1	0,0	0,0	0,1
Finland	1,3	0,0	0,4	0,9
France	3,6	3,5	0,1	0,0
Germany	10,1	3,4	1,6	5,1
Greece	1,7	0,0	1,7	0,1
Hungary	0,4	0,0	0,0	0,4
Ireland	11,7	0,0	9,2	2,5
Italy	2,7	0,6	1,3	0,8
Latvia	0,1	0,0	0,0	0,1
Luxembourg	5,1	1,1	2,3	1,7
Malta	0,1	0,0	0,0	0,1
Netherlands	2,0	0,0	0,0	2,0
Poland	2,7	0,0	0,0	2,6
Portugal	0,0	0,0	0,0	0,0
Romania	0,1	0,0	0,0	0,1
Slovakia	0,0	0,0	0,0	0,0
Slovenia	0,0	0,0	0,0	0,0
Spain	3,6	0,4	2,2	1,1
Sweden	2,3	0,0	2,2	0,1
EU total	**55,2**	**10,7**	**23,2**	**21,2**
As a % of the total	…	19,4%	42,1%	38,5%

This table presents estimations for the tax deficit collected by EU Member States under the headquarters scenario. The tax deficit is decomposed in this table depending on whether the undertaxed profits are reported in foreign tax havens, in foreign non-haven partners, or domestically. Foreign non-havens include regional aggregates. Long-run carve-outs of 5% of tangible assets and 5% of payroll expenses are applied.

A.2. Effect of the Minimum Rate on Expected Revenue Gains

In this study's initial report (Baraké et al., 2021), estimates were presented of the revenue gains from a minimum tax without substance-based carve-outs for different minimum effective tax rates (ETRs): 15%, 21%, 25%, and 30%. The corresponding results are depicted below, applying long-run substance-based carve-outs (5% of tangible assets and payroll expenses).

Table A.2.1. Revenue gains from the headquarters scenario with long-run carve-outs, varying the minimum effective tax rate in 2021 EUR billion.

Parent country	**Revenue gains (in 2021 € bn) depending on the minimum effective tax rate retained**			
	15%	**21%**	**25%**	**30%**
Austria	2,3	3,8	4,9	6,2
Belgium	3,4	5,4	7,0	9,1
Cyprus	0,2	0,3	0,7	1,1
Czech Republic	0,1	0,2	0,8	1,5
Denmark	1,6	4,1	5,8	8,0
Estonia	0,1	0,2	0,3	0,4
Finland	1,3	2,8	3,8	5,0
France	3,6	13,5	21,2	31,4
Germany	10,1	24,6	35,5	49,6
Greece	1,7	2,7	3,3	4,1
Hungary	0,4	1,0	1,4	1,9
Ireland	11,7	18,0	22,2	27,5
Italy	2,7	7,1	10,2	14,1
Latvia	0,1	0,2	0,3	0,5
Luxembourg	5,1	7,8	9,7	12,2
Malta	0,1	0,1	0,2	0,3
Netherlands	2,0	6,6	11,1	16,7
Poland	2,7	5,9	8,1	10,9
Portugal	0,0	0,1	0,4	1,4
Romania	0,1	0,1	0,1	0,1
Slovakia	0,0	0,0	0,0	0,3
Slovenia	0,0	0,0	0,0	0,0
Spain	3,6	7,1	9,7	13,4
Sweden	2,3	6,3	9,0	12,3
EU total	**55,2**	**117,9**	**165,7**	**228,0**
Change in %		*114%*	*40%*	*38%*
Argentina	0,1	0,1	0,2	0,2
Australia	1,6	2,7	3,7	5,0
Bermuda	1,2	2,8	3,9	5,4
Brazil	1,4	2,1	2,7	3,6
Canada	7,6	14,2	18,6	24,1
Chile	0,0	0,0	0,1	0,2
China	4,4	7,5	9,7	12,5
India	0,4	0,9	1,2	1,6
Indonesia	0,1	0,1	0,1	0,2
Isle of Man	0,1	0,1	0,1	0,2
Japan	5,2	14,9	21,7	30,6
Korea	0,0	1,0	3,5	6,5
Malaysia	0,3	0,6	0,8	1,0
Mexico	0,4	0,7	1,0	1,4
Norway	0,2	0,6	0,8	1,2
Peru	0,1	0,3	0,6	1,0
Singapore	0,6	1,3	1,9	2,8
South Africa	2,6	4,0	5,0	6,3
Switzerland	3,2	5,0	6,4	8,3

United Kingdom	5,9	16,1	24,3	34,5
United States	54,4	88,7	114,3	149,4
OECD	**141,2**	**273,6**	**374,0**	**505,6**
Change in %		*94%*	*37%*	*35%*
Full sample	**154,5**	**295,5**	**417,0**	**575,6**
Change in %		*91%*	*41%*	*38%*

This table presents estimations for the tax deficits collected under the headquarters scenario for different minimum effective tax rates (15%, 21%, 25%, 30%). Long-run carve-outs of 5% of tangible assets and 5% of payroll expenses are applied. The more-than-proportional increase in additional revenues with the minimum rate is due to the combination of two mechanisms, i.e. when the minimum rate increases, top-up taxes levied on profits already in the scope of the rule increase, and more profits are deemed undertaxed thereby falling into the scope of the rule.

Estimated revenue gains are almost doubled when moving from a minimum effective tax rate of 15% to 21% (+91%). The non-linear relationship that explains such a disproportional increase was already identified by Devereux et al. (2020). When the minimum rate is increased, two mechanisms indeed operate: Top-up taxes levied on profits already in the scope of the rule increase, and more profits are deemed undertaxed thereby falling into the scope of the rule.

A.3. Revenue Gains as Shares of Tax Revenues and Healthcare Expenditures

The following table shows a comparison of the revenue gains estimated under the headquarters country scenario with the corporate income tax revenues currently collected by countries and with their current healthcare expenditures. The information on corporate income tax revenues compiled by Tørsløv et al. (2019) is used which is itself based on the OECD's revenue statistics. Current healthcare expenditures are primarily obtained from Eurostat. For non-EU countries, the health expenditures provided by the World Health Organization (WHO) are utilized as a share of the current GDP. 'NA' values indicate cases in which either corporate income tax revenues or the current healthcare expenditures could not be found.

Table A.3.1. Revenue gains from the headquarters scenario with long-run carve-outs expressed as shares of corporate income tax revenues and current healthcare expenditures

Parent country	Revenue gains (2021 € billion)	As a share of corporate tax revenues (%)	As a share of current healthcare expenditures (%)
Austria	2,3	22,3	5,3
Belgium	3,4	16,7	6,3
Cyprus	0,2	14,4	12,3
Czech Republic	0,1	0,6	0,3
Denmark	1,6	14,6	4,7
Estonia	0,1	17,2	4,0
Finland	1,3	19,1	5,7
France	3,6	5,9	1,2
Germany	10,1	13,6	2,4
Greece	1,7	43,8	10,7
Hungary	0,4	14,7	4,4
Ireland	11,7	127,2	49,0
Italy	2,7	6,6	1,6
Latvia	0,1	22,8	6,0
Luxembourg	5,1	157,7	153,2
Malta	0,1	11,5	8,1
Netherlands	2,0	7,4	2,4
Poland	2,7	26,8	7,8
Portugal	0,0	0,7	0,2
Romania	0,1	NA	0,5
Slovakia	0,0	0,3	0,2

Slovenia	0,0	1,1	0,2
Spain	3,6	12,1	3,1
Sweden	2,3	15,5	4,0
EU total	**55,2**	**15,9**	**3,8**
Argentina	0,1	NA	NA
Australia	1,6	2,1	1,2
Bermuda	1,2	3533,4	NA
Brazil	1,4	2,4	0,7
Canada	7,6	12,4	4,3
Chile	0,0	0,0	0,0
China	4,4	1,0	0,7
India	0,4	0,6	0,5
Indonesia	0,1	0,2	0,3
Isle of Man	0,1	52,9	NA
Japan	5,2	2,9	1,0
Korea	0,0	0,0	0
Malaysia	0,3	NA	NA
Mexico	0,4	1,0	0,6
Norway	0,2	1,2	0,5
Peru	0,1	0,0	0,0
Singapore	0,6	3,8	3,8
South Africa	2,6	14,0	9,2
Switzerland	3,2	15,5	NA
United Kingdom	5,9	8,0	2,3
United States	54,4	16,2	1,6
OECD	**141,2**	**7,6**	**2,0**

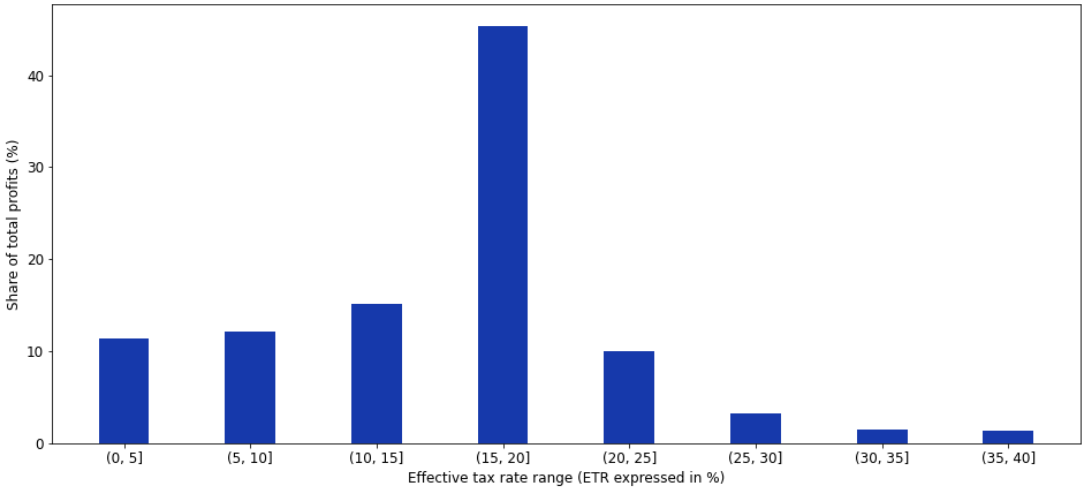
This table presents estimations for the tax deficits collected under the headquarters scenario shown in absolute amounts as shares of corporate income taxes currently collected and as shares of current healthcare expenditures. Long-run carve-outs of 5% of tangible assets and 5% of payroll expenses are applied.

Appendix B: Detailed Methodology and Robustness Checks

B.1. Computation of Average Effective Tax Rates

In the model rules released by the OECD, effective tax rates are computed as the ratio of covered taxes to adjusted accounting income. Three remarks are relevant regarding the methodology in this study. First, the 'income taxes paid (on cash basis)' variable of tabulated country-by-country report statistics is used for the numerator rather than 'income taxes accrued – current year'.[2] Importantly, none of the two variables include deferred taxes which add up to covered taxes in the model rules. Second, without further information on their composition in country-by-country data, profits before tax are used as the denominator. In some cases, effective tax rates may notably be distorted by the inclusion of intra-group dividends; this issue is discussed more at length in the following. Third, as inter-temporal adjustments may involve substantial variations in effective tax rates from one fiscal year to another, the effective tax rates averaged over the sample period is computed, i.e. with 2016 and 2017 data.

Figure B.1.1. Distribution of Pre-tax Profits Across Effective Tax Rate Brackets



This graph shows the distribution of pre-tax profits (before any carve-out is applied) across effective tax rate brackets of 5 percentage points each in 2017 country-by-country report statistics. Effective tax rates are averaged over the two available income years of 2016 and 2017. The 'problematic' parent-partner pairs in 2017, Belgium-United Kingdom and Singapore-Cayman Islands, are replaced by 2016 values.

B.2. Accounting for Substance-Based Carve-Outs

The tax base to which Pillar Two applied can be reduced by substance-based carve-outs which amount to a percentage of the carrying value of tangible assets and payroll expenses that the multinational company records in the subsidiary country. Over a transition period of ten years, carve-out rates will decrease from 8% of the value of tangible assets and 10% of payroll to a long-run rate of 5% on payroll and tangible assets. This provision reduces the tax burden in countries with substantial activity while the full top-up tax of 15% applies in countries with no real economic activity. Therefore, information on multinational companies' tangible assets and payroll expenses is needed to model the substance-based income exclusion.

[2] This is consistent with Clausing et al. (2021) or Garcia-Bernardo et al. (2021). Garcia-Bernardo and Janský (2021) report effective tax rates computed from 2016 country-by-country statistics with either taxes paid and taxes accrued as the numerator, and no clear pattern emerges from their comparison.

(i) The OECD's country-by-country report statistics include a 'tangible assets other than cash and cash equivalents' variable which is used in this study to compute the tangible asset component of carve-outs.

(ii) The payroll component is approximated by multiplying the number of employees in country-by-country statistics with local mean earnings drawn from the International Labour Organisation (ILO) data. More specifically, the average monthly earnings data of the ILO are edited. Information is obtained on mean monthly earnings for countries in the sample, and all values are multiplied by 12 to move from monthly to annual earnings. Further, earnings are linearly interpolated for the year 2017 if earnings for adjacent years are provided. Finally, missing values are imputed based on regional averages of national mean earnings. Using national mean earnings might underestimate the average earnings of multinational companies' employees, therefore, the final payroll estimates are upgraded by a 20% premium.

The substance-based income exclusion is obtained as the sum of tangible assets and payroll components times their respective carve-out rates. The resulting amount is subsequently subtracted from pre-tax profits.

Due to different levels of real economic activity, the impact of carve-outs differs for profits booked in countries where the headquarters are located (in the following headquarters countries), non-havens, and tax havens. On average, in the positive-profit sub-sample of country-by-country report statistics and with the long-run carve-out rates (5% for payroll expenses and tangible assets), the following is found:

- 28% of the pre-tax profits reported domestically are carved-out;
- 21% of the pre-tax profits booked in foreign non-haven jurisdictions are carved-out;
- 10% of the pre-tax profits booked in foreign tax havens are carve-out.

The discrepancy between foreign tax havens and foreign non-havens may reflect, at least to some extent, the fact that profits shifted 'artificially' to low-tax jurisdictions are generally not associated with a significant economic presence (limited tangible assets, low number of employees). On the contrary, multinational firms tend to have a significant economic presence in their headquarters country which is reflected by the large impact of carve-outs on domestic profits. As detailed below, these average shares of carved-out profits are used to extend the substance-based income exclusion to Tørsløv, Wier, and Zucman (2019) data.

B.3. Extension of the Sample with Tørsløv et al. (2018, 2019) data

The original sample of CbCR reporting countries comprises 36 headquarters countries providing information in the positive-profits sample. Several European countries have not, until now, reported CbC information to the OECD, among them, Cyprus, Malta, Portugal and many Eastern European countries such as Latvia and Poland (which have provided CbCR but not a positive-profits sample) as well as the Czech Republic, Estonia, Hungary, and Slovakia.

To extend the sample in this study to all EU countries and beyond, the OECD's CbCR data is complemented with the database compiled by Tørsløv, Wier, and Zucman (2019, hereafter TWZ). This dataset has a larger geographical coverage albeit with fewer details for each country. CbCR data provide information on profits reported and taxes paid and thus the effective tax rate for each parent-partner jurisdiction pair, including in the headquarters country or in foreign tax havens and non-haven jurisdictions. The TWZ database only provides data on the profits reported by subsidiaries in tax haven jurisdictions and profits booked and taxes paid

of firms in the headquarters jurisdiction. Last, there is no information on the profits booked nor on taxes paid in non-haven jurisdictions in the TWZ sample. Due to this lower degree of detail in the dataset by TWZ, a simplified methodology is applied.

- Effective tax rate in tax havens jurisdictions: In the absence of information on the effective tax rates for tax haven jurisdictions, it is assumed that these jurisdictions exhibit a uniform ETR of 10%.

- The tax base in tax haven jurisdictions: For each parent country, the aggregate of positive profits booked in tax havens is utilized. However, the TWZ data lack information on tangible assets and payroll to determine the carve-outs. Therefore, the effect of carve-outs is imputed using the average effect of substance-based carve-outs observed for foreign tax haven jurisdictions in country-by-country report statistics. In 2017, an average reduction of the tax base in tax havens by 9.9% for the long-run carve-out rates of 5% on tangible assets and payroll is estimated. This average is based on 247 parent-partner pairs.

- For clarity, in the following an example is described of how the revenue gains from foreign tax haven jurisdictions for TWZ countries are estimated. The TWZ data show that Czech MNEs have reported approximately EUR 0.5 billion in tax havens in 2017. When applying the reduction of the tax base due to carve-outs, a tax base of EUR 0.45 billion remains. An ETR of 10% in tax havens is assumed. Thus, the resulting tax deficit of Czech MNEs in tax havens (based on the TWZ data) is (15% - 10%) x 0.45 = EUR 0.023 billion in 2017.

- Imputation of non-tax haven revenue gains: The TWZ database does not provide any information on profits reported or taxes paid in non-tax haven jurisdiction. This means, e.g. for Czechia, that there is no indication of how much profit Czech MNEs book in countries such as Canada, France, and Germany as well as other non-tax haven jurisdictions. Therefore, it is necessary to impute the revenue gains from foreign non-tax haven jurisdictions. This is done in the following manner. First, the ratio of non-tax haven to tax haven profits observed in the OECD's country-by-country report statistics is computed. For 2017, this yields a ratio of 3.96: there are approximately four times more profits booked in non-tax haven than in tax haven jurisdictions. Next, it is assumed that the effective tax rate in tax haven jurisdictions amounts uniformly to 10% while the ETR in non-tax haven jurisdictions is 20%. The ratio below is computed:

$$\frac{max(Minimum\ tax\ rate - 20\%, 0)\ \times\ Profits\ in\ non-havens}{max(Minimum\ tax\ rate - 10\%, 0) \times\ Profits\ booked\ in\ tax\ havens}$$

  In 2017, this factor amounts to 0.36 for a 21% minimum tax rate and to 1.3 for a 25% minimum tax rate. To impute the revenue gains from foreign non-tax haven jurisdictions for the parent countries that are only covered in the TWZ data, each parent jurisdiction's estimated revenue gains from tax havens is multiplied with this resulting ratio. For Czechia and a 25% minimum tax rate, revenue gains of (25% - 10%) x 0.45 = EUR 0.075 billion (current 2017) from tax havens are found. Applying the ratio of 1.3, revenue for Czechia from non-tax havens of about EUR 0.099 billion is imputed.

- For the benchmark rate of 15%, this method does not generate any revenues from profits reported in foreign non-havens (the numerator is null). This is not realistic considering the results obtained from country-by-country data. This limitation is corrected for. First,

each TWZ country's foreign non-haven revenue gain under a 25% minimum rate is calculated as above. Second, again examining countries that report country-by-country data, the ratio of their non-tax haven revenue gains for a 15% and a 25% minimum rate is computed. This yields a ratio of about 0.297 in 2017, meaning that non-tax haven revenue gains under a 15% rate should represent approximately 30% of the non-tax haven revenue gains under a 25% rate. Third, that ratio is applied to the revenue gains estimated under a 25% rate, and an estimate for each TWZ country's foreign non-tax haven revenue gains for a 15% minimum rate is deduced. For the Czech Republic, this means that the revenue gains from non-tax haven jurisdictions under a 25% minimum rate, i.e. EUR 0.099 billion, are multiplied by 0.297. This yields an imputed revenue gain of EUR 0.029 billion (current 2017). This corresponds to the estimated revenue gains of the Czech Republic from foreign non-tax haven jurisdictions under a minimum rate of 15%.

- Revenue gains from domestic low-taxed profits based on the TWZ data: The TWZ database offers information on domestic corporate profits and ETRs in headquarters jurisdictions. For the benchmark scenario in this study, a 15% tax rate with carve-outs of 5% on tangible assets and payroll, the effect of carve-outs is imputed as described above for tax haven jurisdictions. The average effect of substance-based carve-outs on the tax base observed for domestic jurisdictions in country-by-country report statistics is used. In 2017, there is an average reduction of the tax base in the headquarters jurisdiction by 28.4% based on 34 domestic observations. For Czechia, the domestic profits of EUR 15.5 billion (current 2017) are reduced to EUR 11.1 billion (current 2017). The domestic ETR of Czechia is given as 19.99% in the TWZ database. The resulting domestic revenue gain estimate in the benchmark scenario in this study (15% tax rate with carve-outs of 5% on tangible assets and payroll) is then calculated as (15%-19.99%) x EUR 11.1 billion and results in no extra revenue domestically.

In the second scenario in which all host countries are assumed to implement the QDMTT and collect top-up taxes, the nature of the extension to the TWZ data and the underlying assumptions remain the same. However, the following additional steps must be taken for this scenario:

- First, the TWZ database provides a bilateral breakdown of the profits reported in tax havens by multinational companies for a few partner jurisdictions, e.g. the profits booked by Czech MNEs in the different EU tax havens and Switzerland. For these, the source country is identified, and the top-up taxes computed with the same assumption as above regarding the ETR (uniform 10% rate) can directly be attributed to them.

- Second, TWZ report the profits booked in the rest of the non-EU tax havens as an aggregate that is not further broken down on a jurisdictional basis. For these profits, the source country is not precisely identified. The amount of top-up taxes associated with these profits is calculated by adhering to the same steps as above. Then, these aggregate revenues are distributed across all other non-EU tax havens in this study's dataset (excluding EU tax havens and Switzerland). This is done proportionally to their country-specific QDMTT revenue gains observed in country-by-country data. In 2017, aggregate revenues of EUR 5.5 billion (2021 constant) were thus distributed to non-EU tax haven jurisdictions such as Andorra, Bahamas, Bermuda, the British Virgin Islands or the Cayman Islands proportionally to their revenues already estimated from CbCR data.

- Third, information on domestic corporate profits and ETRs allows estimating the revenues that countries included in the TWZ data collect from their own multinationals via the QDMTT as described for the IIR scenario above.

- Fourth, it is assumed that the global estimated revenue gains should be equal under the income inclusion rule and qualified domestic top-up tax scenarios. To achieve this equality, the non-tax haven tax deficit of TWZ countries' multinationals must be taken into account. As mentioned above, TWZ do not provide any indication of the profits reported in non-tax haven jurisdictions. Under the QDMTT scenario, this means that the revenues that Germany or Canada could collect from, e.g. the undertaxed profits of Czech multinationals that they potentially host, are missing. These revenues from the low-taxed profits booked by TWZ countries' multinationals in foreign non-tax haven jurisdictions (EUR 5.5 billion in 2017) are distributed proportionally to the revenues estimated for non-haven jurisdictions based on CbCR data. The assumption is that the missing parent-partner pairs, e.g. Czech MNEs in Germany, show the same geographical pattern for profits booked and ETRs as in the CbCR data.

Overall, the weight of the TWZ data in the estimated revenue gains is limited. With long-run carve-outs, typically, 91% of the top-up taxes collected are based on the OECD's country-by-country report statistics. However, the way the estimations are affected by the use of the TWZ data differs between both scenarios. Consider, for instance, the estimated revenue gains of Germany in Table 2. In the headquarters country collection scenario, the EUR 10.1 billion estimate corresponds to the top-up taxes that could be collected from the worldwide undertaxed profits of German multinational companies. The number is based exclusively on the information provided by the German tabulated country-by-country report about the activities of German multinationals. In the host country collection scenario (QDMTT), the EUR 5.5 billion estimate for Germany corresponds to the top-up taxes that could be collected from the undertaxed profits recorded in Germany by German and foreign multinational companies. This number combines observations from the OECD's country-by-country report statistics and imputations based on the TWZ data.

B.4. Adjustment for Intra-Group Dividends

One of the most discussed data limitations of the aggregate country-by-country report statistics is the double-counting of intra-firm dividends and other participation results, e.g. in the case of minority shares or joint ventures. Double-counting can occur when a multinational from country A owns an affiliate in country B. Dividends paid by B to A are not counted as part of A's revenue, but they are sometimes considered as part of A's profit. It arises when dividends are counted both at the affiliate level in country B (as profit) and in country A (as dividends included in profit). Thus, intrafirm dividends can substantially increase profits recorded in country-by-country data. Additionally, as these dividends are generally subject to no or light taxation, double-counting can lead to artificially low effective tax rates. This issue can apply at all levels of the ownership chain of an MNE. Nonetheless, it might be most pronounced at the headquarters level. The OECD (2021) points out that 'given that they are at the top of the ownership structure, they potentially receive a large amount of dividends from affiliates'. [3]

The initial guidelines of the Inclusive Framework did not specify the appropriate treatment of those intracompany dividends. Thus, they are treated heterogeneously across parent countries in the current country-by-country data. The Inclusive Framework has now clarified the

[3] The OECD maintains a disclaimer regarding country-by-country report statistics, notably discussing this issue.

exclusion of dividends from constituent entities from the profit before tax variable. This change, however, will only come into effect as of the data distribution of income year 2020.

There is no way to systematically address this issue at the current stage. However, Italy, the Netherlands, Sweden, and the United Kingdom have treated the issue of double-counted dividends in the headquarters jurisdiction in separate technical notes.[4]

(i) The Netherlands and the United Kingdom provide adjusted profits directly in the aggregate country-by-country data that are directly based on a comparison of country-by-country profits with corporate tax returns and multinationals' annual reports. These adjusted values do not account for other participation results from mergers and joint ventures nor for loss carry-forwards. They only provide information for the headquarters jurisdiction.

(ii) The Swedish note accounts for this phenomenon and estimates the magnitude of possibly double-counted dividends. It proposes an adjustment of domestic profits before tax for the years of 2016 and 2017 which is integrated manually to the computations in this study. For the income year of 2017, for instance, the note identifies SEK 266 billion of dividends that *may* be included in the SEK 512 billion pre-tax profits reported by Swedish multinational companies in their home country. Therefore, the profits observed in the OECD's country-by-country data are adjusted by multiplying them with the factor (512 – 266) / 512 = 0.48. The same methodology is used with the year-specific factor to correct the 2016 pre-tax profits of Swedish multinationals in Sweden.[5]

Table B.4.1 presents domestic profits before and after the corrections for the three countries concerned and the resulting adjustment factor.

Table B.4.1. Domestic profits of the Netherlands, Sweden, and the United Kingdom before and after corrections with resulting adjustment factors in current USD billion.

Parent country	Year	Unadjusted profits before tax ($bn)	Adjusted profits before tax ($bn)	Adjustment factor (%)
Sweden	2016	42,0	17,5	41,5
Sweden	2017	64,0	30,8	48,0
Netherlands	2017	41,5	35,0	84,4
United Kingdom	2017	182,7	108,0	59,1
Average 2017 adjustment factor (%)				**60,3**

This table shows the profits booked domestically by Swedish, UK, and Dutch multinational companies according to country-by-country report statistics, before and after the correction for intra-group dividends. The adjustment factor is computed as the ratio of adjusted profits to unadjusted profits.

Based on the information provided by the Netherlands, Sweden, and the United Kingdom, a rule-of thumb correction is proposed for the pre-tax profits recorded in all headquarters

[4] These notes are disseminated by the OECD through the following links: for the Netherlands, for the United Kingdom, for Italy, and for Sweden. Italy does not provide enough information for a specific adjustment; thus, it is not taken it into account here.

[5] Doing so excludes all of the dividends that were reported in the domestic tax returns of in-scope Swedish multinational companies from their domestic profits. These dividends have not necessarily been fully included in domestic country-by-country pre-tax profits and thus may not be entirely double-counted. This correction could therefore lead to lower-bound revenue estimates for Sweden.

countries. Taking the weighted average of the adjustments for the three countries for 2017, an adjustment factor of 0.6028 is calculated, i.e. a reduction of about 40% of pre-tax profits in headquarters jurisdictions. This factor is applied to all ultimate parent entity pairs, e.g. to German multinationals reporting profits in Germany. This correction affects not only the tax base but also the effective tax rates since these are computed as the ratio of taxes paid to profits booked.

Table B.4.2 depicts the revenue effects of a global minimum tax of 15% with long-run carve-outs (5% of tangible assets and payroll) after this adjustment. After the correction, the European Union would gain approximately EUR 42 billion of revenue from a minimum tax instead of about EUR 55 billion in the benchmark calculations in this study. The most affected country is Germany where the adjustment decreases projected revenues from EUR 10 billion to about EUR 5 billion. The revenues of several other EU Member States, i.e. Austria, Denmark, Finland, Ireland, and Spain decrease by about EUR 1 billion each in contrast to benchmark calculations.

Table B.4.2. Revenue gains from the headquarters scenario with long-run carve-outs after a rule-of-thumb adjustment for double-counted dividends in 2021 EUR billion.

Parent country	Without adjusting for dividends	Adjusting for intra-group dividends
Austria	2,3	1,1
Belgium	3,4	2,7
Cyprus	0,2	0,2
Czech Republic	0,1	0,1
Denmark	1,6	0,6
Estonia	0,1	0,1
Finland	1,3	0,5
France	3,6	3,6
Germany	10,1	5,0
Greece	1,7	1,7
Hungary	0,4	0,3
Ireland	11,7	10,4
Italy	2,7	1,9
Latvia	0,1	0,1
Luxembourg	5,1	4,4
Malta	0,1	0,1
Netherlands	2,0	2,0
Poland	2,7	2,1
Portugal	0,0	0,0
Romania	0,1	0,0
Slovakia	0,0	0,0
Slovenia	0,0	0,0
Spain	3,6	2,6
Sweden	2,3	2,3
EU total	**55,2**	**41,6**
Change in %		-24,6%

This table compares the estimated revenue gains before and after the rule-of-thumb adjustment for intra-group dividends is applied (multiplying domestic profits before tax by approximately 0.6). Only the results for EU Member States are shown as non-EU countries are not assumed to collect their domestic tax deficit by default. The long-run carve-outs of 5% of tangible assets and payroll are applied.

Revenue accruing in the headquarters country is included. As the phenomenon of intra-firm dividends might be particularly pronounced in the ultimate parent entity's country, there is a closer examination of the robustness of the estimates in the headquarters country. Table B.4.3. shows the estimated revenues that accrue from the ultimate parent entity and possible further

affiliates in the headquarters jurisdiction. In this study's benchmark estimation, a 15% minimum tax rate with long-run carve-out rates of 5% on tangible assets and payroll, the European Union countries receive about EUR 20 billion, which is almost 40% of their overall revenue under the IIR, from the headquarters jurisdiction. The countries driving the high share of domestic revenue are, above all, Austria (EUR 1.8 billion), Germany (EUR 5 billion in domestic revenue), Ireland (EUR 2.5 billion), Luxembourg (EUR 1.7 billion), the Netherlands (EUR 2 billion), and Poland (EUR 2.6 billion).[6]

The effective tax rates of those largest contributors can be counterchecked with national accounts data, e.g. as collected by Tørslov, Wier, and Zucman (2020, TWZ). TWZ compute ETRs by dividing aggregate tax revenue by corporate profits. Further data sources can be statutory and forward-looking effective tax rates by the European Commission (2021) and backward-looking ETRs from García-Bernardo and Jansky (2021).[7] The following briefly discusses each jurisdiction and the possible reasons for significant tax revenues in the headquarters country.

For Luxembourg, the statutory tax rate amounts to 24.94% while the European Commission estimates 21.8% for their model-based forward-looking ETR. However, the LuxLeaks investigation uncovered special agreements between the tax authorities and individual multinationals on how to define the taxable profit thereby significantly reducing their tax payments, i.e. what is referred to as 'sweetheart deals" (Wayne et al., 2014).[8] Additionally, García-Bernardo find a very low backward looking tax rate of only 1.8% for Luxembourg. Tørslov, Wier, and Zucman (2020, Appendix Tables A6) calculate a domestic ETR of 3% based on National Accounts.

Ireland exhibits a statutory tax rate of 12.5%, a forward-looking ETR of 14.1% (European Commission 2021) and a backward-looking ETR of 8.1% (see Garcia-Bernardo and Jansky, 2021). Tørslov, Wier, and Zucman (2020, Appendix Tables A6) find a domestic ETR of 4% based on national accounts. Similar to Luxembourg, Ireland is known for tax deals with certain big MNEs (e.g. the Apple case, see INSEAD, 2022[9]). Therefore, special tax deals make a significant breach between a moderate statutory tax rate and a low ETR plausible for Ireland and Luxembourg and can explain the relatively high domestic revenue potential.

Poland has a statutory tax rate of 19% and a forward-looking ETR of 16.6% (European Commission, 2021). The backward-looking ETR as computed by García-Bernardo and Jansky amounts to 10.3% for Poland. Similarly, Tørslov, Wier, and Zucman (2020, Appendix Table A6) find a domestic ETR of 10% based on the national accounts. This would afford substantial opportunities for revenue gains from the minimum tax.

The case of Germany is particular. An effective tax rate of 11.4% is estimated in the CbCR data. This is much lower than the statutory tax rate of 29.9% and the forward-looking tax rate of 28.9% estimated by the European Commission (2021). However, Tørslov, Wier, and Zucman (2020, Appendix Table A6) compute from the national accounts an effective tax rate of 11% for the year 2015 by dividing aggregate corporate tax revenue by profits of the corporate sector.

[6] For all of those countries, except for Poland, CbCR data is used and the ETRs are computed by dividing taxes paid by profits (before tax). To stabilize the ETR, the average over both available income years is used.
[7] García-Bernardo and Jansky (2021): Profit-shifting of multinational corporations worldwide. IES Working Papers 14/2021. Charles University.
[8] Wayne, L. et al. (2014): Leaked Documents Expose Global Companies' Secret Tax Deals in Luxembourg. URL: https://www.icij.org/investigations/luxembourg-leaks/leaked-documents-expose-global-companies-secret-tax-deals-luxembourg/ (23.06.2022).
[9] INSEAD (2022): The Implications of the EU vs. Apple case. URL: https://knowledge.insead.edu/node/5481/pdf (23.06.2022).

Jansky (2019)[10] finds one of the biggest gaps between statutory and effective corporate tax rates for Germany among many European countries. Huber and Maiterth (2019)[11] discuss possible reasons for this phenomenon, particularly that intra-firm dividends and also tax exemptions for specific legal forms or in certain sectors might play a role. Thus, the result might be influenced by double-counting of intra-firm dividends particularly for Germany that raises EUR 5 billion yearly from its headquarters jurisdiction.

When the rule-of thumb correction for double-counting of intra-firm dividends is taken into account, revenues in the headquarters country decrease for several countries, particularly for Germany from EUR 5 billion to EUR 0 revenue, for Austria from EUR 1.8 billion to EUR 0.6 billion, for Luxembourg from EUR 1.7 billion to EUR 0.9, and for Poland from EUR 2.6 billion to EUR 2 billion. The Netherlands' profits are already corrected for intra-firm dividends in the benchmark estimate. Overall, the share of revenue from the headquarters country would decrease from 39% to 18% under this rule-of-thumb adjustment. However, please note that the rule-of-thumb correction is very broad and assumes that all countries double-count intra-firm dividends in 2017 which is probably not the case as the guidelines were ambiguous. Further, as emphasized, low ETRs are plausible in several of these countries, particularly Ireland, Luxembourg, and Poland.

Table B.4.3. Revenue gains from the headquarters scenario accruing to the headquarters jurisdiction in 2021 EUR billion.

	Headquarters' revenue		
Parent country	**15% tax without carve-out**	**with 5% carve-out**	**with 15% carve-out and dividend correction**
Austria	2.4	1.8	0.6
Belgium	1.3	0.9	0.2
Cyprus	0.0	0.0	0.0
Czech Republic	0.0	0.0	0.0
Denmark	1.1	1.0	0.0
Estonia	0.1	0.1	0.1
Finland	1.1	0.9	0.1
France	0.0	0.0	0.0
Germany	7.3	5.1	0.0
Greece	0.1	0.1	0.0
Hungary	0.5	0.4	0.3
Ireland	2.9	2.5	1.2
Italy	1.0	0.8	0.0
Latvia	0.2	0.1	0.1
Luxembourg	1.9	1.7	0.9
Malta	0.1	0.1	0.0
Netherlands	2.4	2.0	2.0

[10] Jansky (2019): Effective tax rate of multinational enterprises in the EU. Report commissioned by the Greens? EFA group in the European Parliament. URL: https://www.greens-efa.eu/files/doc/docs/356b0cd66f625b24e7407b50432bf54d.pdf (23.06.2022).
[11] Hubert, H.-P. and MAiterth, R. (2019): Steuerbelastung deutscher Kapitalgesellschaften von lediglich 20% - Fakt oder Fake News? Arqus Discussion Paper No. 246.

Poland	3.7	2.6	2.0
Portugal	0.0	0.0	0.0
Romania	0.1	0.1	0.0
Slovakia	0.0	0.0	0.0
Slovenia	0.0	0.0	0.0
Spain	2.2	1.1	0.0
Sweden	0.1	0.1	0.1
EU Total	**28.4**	**21.2**	**7.6**
percentage of total	**42.3%**	**38.5%**	**18.4%**

B.5. Comparison of Results Based on 2016 and 2017 Data

Comparing the revenue gain estimates for the two income years of availability of the OECD's country-by-country report statistics, it is observed that the revenue estimates in this study have increased substantially with the latest data distribution. For instance, for the EU, while there is approximately EUR 36 billion of revenue based on the 2016 data, there is about EUR 55 billion based on the 2017 data. This amounts to an increase of about 53% and is due to several reasons. The overlap in the fiscal years covered by the two waves of country-by-country report statistics may also make the comparison of the two sets of results difficult. Note that all results discussed in this sub-section and presented in Table B.5.1 account for carve-outs with long-term rates.

Several countries including Germany, Greece, and Spain reported aggregate country-by-country data for the first time in the 2017 distribution. For the year 2016, their revenues are estimated using the TWZ data, and these are rather cautious estimates. For Germany, there are approximate additional revenues of about EUR 5 billion for 2016 based on the TWZ (2018) database data while revenues of EUR 10 billion are estimated based on the more detailed 2017 country-by-country data. Similarly, for Spain, revenues of less than EUR 1 billion are projected for 2016 based on TWZ (2018) while there is almost EUR 4 billion of extra revenue for 2017. All in all, the change in the coverage of country-by-country report statistics drives a EUR 10 billion increase in the estimated revenue gains of the EU between 2016 and 2017 (more than half of the overall change). Nonetheless, this must be carefully interpreted as several data issues such as the unequal treatment of intra-firm dividends are not resolved.

Other countries that have released tabulated country-by-country report statistics in both 2016 and 2017 explain the increase of the EU's estimated revenue gains. In particular, Ireland moves from an estimated EUR 7.0 billion based on 2016 data to EUR 11.7 billion with 2017 statistics.

Table B.5.1. Revenue gains from the headquarters scenario with long-run carve-outs based on 2016 and 2017 data in 2021 EUR billion.

Parent country	Based on 2017 data (2021 € bn)	Based on 2016 data (2021 € bn)
Austria°	2,3	2,3
Belgium°	3,4	2,8
Cyprus	0,2	0,2
Czech Republic	0,1	0,1
Denmark°	1,6	0,8
Estonia	0,1	0,1
Finland°	1,3	1,3
France°	3,6	3,7

Germany+	10,1	4,6
Greece+	1,7	0,1
Hungary	0,4	0,4
Ireland°	11,7	7,0
Italy°	2,7	2,7
Latvia	0,1	0,1
Luxembourg°	5,1	3,0
Malta	0,1	0,1
Netherlands°	2,0	1,5
Poland	2,7	2,5
Portugal	0,0	0,1
Romania+	0,1	*NA*
Slovakia	0,0	0,0
Slovenia°	0,0	0,0
Spain+	3,6	0,5
Sweden°	2,3	2,1
EU total	**55,2**	**36,0**
Change in %		*-53,4%*
Argentina+	0,1	*NA*
Australia°	1,6	1,6
Bermuda°	1,2	4,2
Brazil°	1,4	0,9
Canada°	7,6	5,0
Chile°	0,0	0,0
China°	4,4	3,6
India+	0,4	0,6
Indonesia°	0,1	0,0
Isle of Man+	0,1	0,0
Japan°	5,2	3,9
Korea°	0,0	0,0
Malaysia+	0,3	*NA*
Mexico°	0,4	0,4
Norway°	0,2	0,3
Peru+	0,1	*NA*
Singapore°	0,6	0,5
South Africa°	2,6	0,3
Switzerland+	3,2	*NA*
United Kingdom+	5,9	7,3
United States°	54,4	39,6
OECD total	**141,2**	**100,7**
Change in %		*-40,3%*

This table compares the estimated revenue gains based respectively on 2016 and 2017 data. The long-run carve-outs of 5% of tangible assets and payroll are applied, and effective tax rates are the same for both income years as they are averaged over the full sample period. ° indicates countries with OECD country-by-country report statistics in 2016 and 2017. + indicates headquarters countries entering country-by-country data in 2017.

This comparison is beneficial for testing the robustness of the imputations based on the TWZ data that seem to yield rather cautious estimates for EU countries and for detecting potential data anomalies. For instance, the effect of the 2017 Singapore-Cayman Islands observation was particularly striking as it generated revenue gains of more than EUR 10 billion versus EUR 0.5 billion based on the 2016 data.

B.6. Excluding Inventories from the Tangible Assets Component of Carve-Outs

In this study's benchmark estimates, the 'Tangible Assets other than Cash and Cash Equivalents' variable provided in the OECD's country-by-country report statistics is used to

estimate the tangible asset component of substance-based carve-outs. The OECD's Economic Impact Assessment of October 2020 underlines the fact that this variable may include inventories. They develop an adjustment of the variable because previous versions of the rules explicitly excluded inventories from the tangible asset component of carve-outs.

The treatment of inventories was not specified in the joint agreements of July and October 2021. These only mentioned 'the carrying value of tangible assets' when defining carve-outs. However, the model rules of December 2022 have provided a more precise definition of the tangible asset component of the substance-based income exclusion in Article 5.3.4:

> *The tangible asset carve-out for a Constituent Entity located in a jurisdiction is equal to 5% of the carrying value of Eligible Tangible Assets located in such jurisdiction. Eligible Tangible Assets means:*
>
> *a) property, plant, and equipment located in that jurisdiction;*
> *b) natural resources located in that jurisdiction;*
> *c) a lessee's right of use of tangible assets located in that jurisdiction; and*
> *d) a licence or similar arrangement from the government for the use of immovable property or exploitation of natural resources that entails significant investment in tangible assets.*
>
> *For this purpose, the tangible asset carve-out computation shall not include the carrying value of property (including land or buildings) that is held for sale, lease or investment. The tangible asset carve-out computation shall not include the carrying value of tangible assets used in the generation of a Constituent Entity's International Shipping Income and Qualified Ancillary International Shipping Income (i.e. ships and other maritime equipment and infrastructure). The carrying value of tangible assets attributable to a Constituent Entity's excess income over the cap for Qualified Ancillary International Shipping Income under Article 3.3.4 shall be included in the tangible asset carve-out computation.*

Although further guidance might be needed on that particular aspect, the interpretation of the model rules points to an exclusion of inventories from the tangible asset component of the substance-based income exclusion. With this in mind, Table 2 is reviewed while applying a simplified version of the adjustment proposed in the OECD's Economic Impact Assessment. Based on the US Bureau of Economic Analysis' data on the activities of US multinationals,[12] the OECD (2020) finds that on average in 2016 and 2017, inventories accounted for 24% of the total of inventories and property, plant and equipment. In the OECD's impact assessment, the tangible assets variable of country-by-country report statistics is thus downgraded by 24%, except for US multinational companies for which they apply a more granular adjustment at the country pair level. In this study, only the 24% downgrade is applied as a simplification. The results presented in Table B.6.1 and below are obtained.

Table B.6.1. Revenue gains from the headquarters scenario with various carve-out rates, downgrading tangible assets to exclude inventories in 2021 billion EUR.

Parent country	No carve-out	Year 1: 8% of tangible assets, 10% of payroll	After year 10: 5% of tangible assets & payroll
Austria	3,1	2,0	2,5

[12] More precisely, Table II.B 1-2 which provides information on the balance sheet of US multinational companies' affiliates by partner country.

Belgium	4,0	3,2	3,5
Cyprus	0,2	0,2	0,2
Czech Republic	0,1	0,0	0,1
Denmark	1,8	1,5	1,6
Estonia	0,1	0,1	0,1
Finland	1,5	1,2	1,4
France	4,0	3,5	3,6
Germany	13,3	9,0	10,8
Greece	2,2	1,6	1,8
Hungary	0,6	0,4	0,5
Ireland	12,6	11,4	11,9
Italy	3,1	2,5	2,8
Latvia	0,2	0,1	0,1
Luxembourg	5,9	4,9	5,3
Malta	0,1	0,1	0,1
Netherlands	2,4	1,9	2,1
Poland	3,8	2,4	2,9
Portugal	0,1	0,0	0,0
Romania	0,1	0,0	0,1
Slovakia	0,0	0,0	0,0
Slovenia	0,0	0,0	0,0
Spain	5,3	3,2	4,0
Sweden	2,7	2,2	2,4
EU total	**67,1**	**51,3**	**57,6**
Change in %		*-23,5%*	*-14,1%*
Argentina	0,1	0,1	0,1
Australia	1,8	1,5	1,6
Bermuda	1,3	1,1	1,2
Brazil	1,5	1,3	1,4
Canada	9,1	7,2	7,9
Chile	0,0	0,0	0,0
China	6,2	4,1	4,8
India	0,6	0,4	0,5
Indonesia	0,1	0,1	0,1
Isle of Man	0,1	0,1	0,1
Japan	6,0	5,0	5,4
Korea	0,0	0,0	0,0
Malaysia	0,5	0,3	0,3
Mexico	0,4	0,4	0,4
Norway	0,3	0,2	0,2
Peru	0,1	0,1	0,1
Singapore	0,7	0,6	0,6
South Africa	3,0	2,5	2,7
Switzerland	3,5	3,1	3,3
United Kingdom	7,0	5,5	6,1
United States	58,1	53,4	55,2
OECD	**162,6**	**135,0**	**145,7**
Change in %		*-17,0%*	*-10,4%*
Full sample	**179,1**	**147,3**	**159,7**
Change in %		*-17,7%*	*-10,8%*

This table reproduces the results from Table 2 (i.e. it presents the estimated revenue gains from a 15% minimum tax for different applications of the substance-based income exclusion), but inventories are excluded from the tangible asset component of carve-outs. This exclusion is achieved by reducing the tangible assets observed in country-by-country data by 24% consistently with the OECD's Economic Impact Assessment (2020).

In Table 2, it is shown that substance-based carve-outs would reduce EU revenue gains by 18% to 29% considering the long-term and first-year rates, respectively. The impact of substance-

based carve-outs is lower when inventories from the tangible asset component are excluded: EU revenue gains are reduced by 14% and 24% with long-term and first-year rates, respectively. A similar conclusion can be drawn when examining the impact of carve-outs over the full sample, moving from a 22% (14%) reduction in aggregate revenue gains to a 18% (11%) reduction when excluding inventories with first-year (long-run) rates.[13]

Again, due to different levels of real economic activity, the impact of carve-outs differs for profits reported in headquarters countries, non-havens, and tax havens. On average, in the positive-profit sub-sample of country-by-country report statistics, it is found that:

- 22% of the pre-tax profits reported domestically are carved-out;
- 17% of the pre-tax profits booked in foreign non-haven jurisdictions are carved-out; and
- 8% of the pre-tax profits booked in foreign tax havens are carved-out.

[13] Regardless of the treatment of inventories, a substantially greater impact of carve-outs was found on EU revenue gains than on aggregate revenue gains. This is due to the fact that, in this study's simulation, only the EU Member States are assumed to collect top-up taxes on the profits booked domestically by their multinational companies. Indeed, the impact of carve-outs is particularly for domestic profits as multinationals often have significant real economic activity in their headquarters country.

Appendix C: Extension to EU Large-Scale Purely Domestic Groups

C.1. Methodology

Consistent with the December 2021 proposal for a council directive of the European Commission, estimates are proposed in this study of the revenue gains from the 15% minimum effective tax rate that EU Member States are expected to impose on 'large-scale purely domestic groups'. These companies were included in the scope of the proposal to ensure its compliance with the non-discrimination principle and that 'an entity that belongs to a group with cross-border activities and a group with purely domestic activities' are treated equally. These purely domestic firms located in a single Member State must also meet the EUR 750 million threshold applied to multinational companies.

The first-best approach to estimate the revenue gains from these large-scale purely domestic groups would consist of (i) identifying these groups, (ii) obtaining the unconsolidated financials of all of their constituent entities, (iii) summing the GloBE income or loss and the adjusted covered taxes of each group's constituent entities to obtain a group/jurisdiction-level effective tax rate, and (iv) deduce the top-up taxes to be paid by the purely domestic group if any (accounting for substance-based carve-outs). This study adopts a second-best approach in which the EU large-scale purely domestic groups are similarly identified, but their consolidated financial statements are used to obtain pre-tax profits, taxes paid, and the effective tax rate. This approach significantly simplifies the collection of the relevant data while differences may arise from the use of consolidated variables instead of aggregated variables.

The estimation in this study of the revenue gains from the EU large-scale purely domestic groups first requires identifying these purely domestic firms. The ORBIS database is used which is provided commercially by Bureau Van Dijk Electronic Publishing (BvD). It gathers microdata on firms' financial and productive activities as well on their domestic and international ownership structure from public business registries. The empirical literature on corporate tax planning, including studies on the revenue potential of the global minimum tax (Devereux et al., 2020; OECD 2020), has extensively used this database. The search strategy for this study proceeds as follows:

(i) Companies are excluded that are known to be inactive in the database;

(ii) The focus is on companies located in EU Member-States;

(iii) The sample is restricted to companies that display an annual operating revenue above USD 750 million for at least one year between 2016 and 2021.[14] In the Pillar Two model rules and the EU directive, in-scope companies must have a consolidated turnover above EUR 750 million for at least two years in the last four financial years. This study's filter is therefore less restrictive for two reasons: The threshold is expressed in USD million, and a firm that exceptionally registers an above-threshold turnover in one financial year is included in the ORBIS sample but would not be subject to Pillar Two. The more refined filtering is applied in the code used to treat the data;

(iv) In terms of legal forms, any type of company is included;

[14] The set of relevant firms is later restricted using the EUR 750 million (and not USD) revenue threshold as per the directive proposal and the model rules. There is no economic or rule related motivation for this procedure. The ORBIS query was operated in this way in order to adjust the exchange rates in the code.

(v) The focus is on the following types of entities: Banks, insurance companies, corporate entities, and foundations/research institutes. Certain entity types are excluded consistently with the list of excluded entities[15] provided in the proposal;

(vi) To eliminate multinational corporate groups, the firms that own at least 51% of a company located in any foreign (but identified) country are dropped. In the model rules and the EU directive proposal, an entity is considered as part of a corporate group if it is consolidated into the financial statements of an ultimate parent entity. This is why purely domestic firms are allowed to hold minority stakes in foreign companies that are not likely to lead to accounting consolidation;

(vii) Companies are excluded when between 50% and 100% of the shares are owned by a bank, an insurance company, a corporate entity, a foundation or research institute, or a public authority (whether domestic or foreign). Indeed, before this step and for a specific large-scale purely domestic group, the sample includes not only the ultimate parent entity of the group but also all of its affiliates. This filter eliminates subsidiaries in order to solely include ultimate parents in the sample.[16] However, the firms in the sample can be owned with a majority stake by an investment firm (private equity firm, hedge fund, venture capital fund, pension fund), an individual, or a family or by the general public for listed companies. Indeed, as mentioned above, accounting consolidation defines corporate groups, and the financial accounts of the company are consolidated in the owner's financial statements in a priori none of these cases; and

(viii) A similar rule is applied for ultimate ownership and excludes companies that depend directly or indirectly on a bank, an insurance firm, a corporate company, a foundation or research institute, or a public authority via a minimum ownership path of 50.01%.

Table C.1.1 below summarizes these search steps:

[15] 'For various policy reasons, such as to preserve the tax neutrality principle and in line with the OECD Model Rules, the following entities are excluded from the scope of the Directive: governmental entities, international organisations, non-profit organisations, pension funds and, provided that they are at the top of the group structure, investment entities and real estate investment vehicles.' (European Commission, 2021)

[16] Subsidiaries are filtered out so that all of the firms in the sample are group heads. However, since the financial variables are drawn from firms' consolidated financial statements, the activities of the subsidiaries are still accounted for which is necessary for applying the revenue threshold and computing top-up tax revenue gains. Eliminating the subsidiaries from the sample avoids double-counting profits, taxes paid, etc.

Table C.1.1. Summary of the ORBIS query used to identify EU large-scale purely domestic groups

Search step	Criterion	Nb. of firms	Cumul. filtering
(i) Status	Active companies, unknown situation	321,188,040	~320,000,000
(ii) World region / Country / Region in country	European Union [27]	77,736,809	~55,000,000
(iii) Operating revenue (Turnover) (m USD)	min=750, 2021, 2020, 2019, 2018, 2017, 2016 for at least one of the selected periods, exclusion of companies with no recent financial data and Public authorities/States/Governments	61,878	~8,200
(iv) Standardised legal form	Public limited company, Private limited company, Partnership, Sole trader/proprietorship, Other legal form	332,412,433	~7,500
(v) Entity type	Bank, Insurance company, Corporate, Foundation/Research institute	410,221,765	~7,200
(vi) Shareholders with foreign subsidiaries	located anywhere (excluding unknown countries) not ultimately owned but at least 51% owned; may have other shareholder in the foreign country; Def. of the UO: min. path of 50.01%, known or unknown shareholder	617,235	~3,400
(vii) Subsidiaries with shareholders by profile	of one of the following types: Banks and Financial companies, Insurance companies, Corporate companies, Foundations/Research Institutes, Public authorities, States, Governments, owning between 50% and 100%	11,779,706	~620
(viii) Subsidiaries with Ultimate Owners by profile	UO of one of the following types: Banks and Financial companies, Insurance companies, Corporate companies, Foundations/Research Institutes, Public authorities, States, Governments; GUO and DUO;Def. of the UO: min. path of 50.01%, known or unknown shareholder	9,840,823	**458**
Boolean search	**1 and 2 and 3 and 4 and 5 and not 6 and not 7 and not 8**	/	/

This table summarizes the search criterion used in ORBIS to identify EU large-scale purely domestic groups. Each step is explained in more detail above. The cumulative filtering column is slightly approximative because it was obtained based on another version of the database than the benchmark data extract which may involve small differences in the number of firms obtained. Note that one firm is included twice in the final sample which means that there are eventually 457 unique groups.

The ORBIS extract resulting from the query is not restricted based on consolidation criteria. In the extract with 458 companies (of which 457 are unique), 295 companies are associated with consolidated financials (64%), 136 companies with unconsolidated financials (30%), and 27 companies with limited financials (6%).[17] For the latter, only information on turnover and the number of employees is available while the estimation of their tax deficit would at least require pre-tax profits and corporate income taxes. The companies associated with unconsolidated financials are also problematic. The approach in this study relies on the consolidated financials of the parent companies of the EU large-scale purely domestic groups for two reasons. First, the turnover threshold of EUR 750 million that determines whether a group falls into the scope of the minimum tax is based on consolidated revenues. Second, with unconsolidated financial statements, the revenue gain estimates could be biased in any direction depending on the effective tax rates encountered by the parent company and its affiliates.[18]

As such, in this study's benchmark computations, companies associated with limited financials and those related to unconsolidated financials are excluded. This leaves a restricted set of 295 (unique) companies among which the EU large-scale purely domestic groups are identified. In practice, anecdotal evidence suggests that the quality of the information provided by ORBIS on ownership structures and the classification across consolidation codes is imperfect: It is likely that consolidated financials are classified as unconsolidated in the dataset in some cases. Table C.2.4 thus provides alternative results that include the financials classified as unconsolidated in the sample (limited financials being still excluded).

Furthermore, the three last steps of the ORBIS query have proved to be limited. In step (vi), the objective is filtering out the companies that directly or indirectly own a majority stake in any foreign firm, but the filter only applies to direct ownership links. Similarly, (vii) and (viii), respectively, allow eliminating companies with certain types of direct and ultimate parents. However, the corporate structures of multinational companies are more complex, and some affiliates of well-known multinational companies could still be found in the sample.[19] For each

[17] For most of the unconsolidated accounts, consolidated statements are explicitly unavailable on ORBIS ('U1' consolidation code). For 16 of them, consolidated statements are theoretically available ('U2' consolidation code), but it could be retrieved for only one company in the database. For this company, using the consolidated or the unconsolidated financials consistently yields no tax deficit and thus does not impact the estimates. Therefore, it is ensured that the precision of the estimates cannot be improved by retrieving the consolidated financials of companies associated with unconsolidated accounts in the sample.

[18] First, unconsolidated financials may bias the revenue gain estimates upwards. To illustrate this, consider a large-scale purely domestic group with two constituent entities. One is the ultimate parent, and the other is a fully-owned affiliate. Both register pre-tax profits of EUR 50 million. The parent company encounters an ETR of 5% (income taxes of EUR 2.5 million), and the affiliate faces an ETR of 25% (income taxes of EUR 12.5 million). As per the model rules, the relevant ETR would be computed as (2.5 + 12.5) / (50 + 50) = 15%, and there would be no top-up taxes to collect. What is the estimate with, respectively, the unconsolidated and the consolidated accounts of the parent company? The consolidated statements would indicate profits before tax of up to EUR 100 million (in the absence of intra-group profits being netted out for consolidation) and income taxes of EUR 15 million such that the ETR would be 15%, and there would be no top-up tax. With the unconsolidated statements, there would be profit before tax of EUR 50 million and income taxes of EUR 2.5 million such that the ETR would be 5%, and there would be positive top-up taxes to collect. Second, unconsolidated financials may bias the revenue gain estimates downwards. To illustrate this, the previous example is taken and assumed that the affiliate now faces an ETR of 5% (versus 25% above) like the parent company. The true top-up taxes to be collected from this group would be (15% - 5%) * (50 + 50) = EUR 10 million. Consolidated statements would yield an ETR of (2.5 + 2.5) / (50 + 50) = 5% assuming intra-group profits being netted out (or consolidated profits would be below 100, and the ETR would be larger than 5%) and top-up taxes of EUR 10 million (or less). Eventually, unconsolidated statements would yield top-up taxes of (15% - 5%) * 50 = EUR 5 million.

[19] Typically, if both the direct and ultimate parents of the company are investment vehicles, steps (vii) and (viii) do not exclude it from the sample. On the contrary, if either the direct or the ultimate parent is, for instance, a corporate company, then it is eliminated. This filtering does not allow eliminating subsidiaries of larger corporate groups that are, for instance, owned directly by an investment vehicle, which is itself owned by a corporate group, with another investment vehicle as the ultimate owner of the whole structure.

selected company, the list of all subsidiaries and parents is outputted. Subsequently, it is ensured directly in the code that parents of foreign affiliates and subsidiaries of banks, insurance firms, corporate companies, foundations or public bodies are excluded from the sample.

The ORBIS query results in a sample of 457 unique firms and 182 large-scale purely domestic firms are identified among the 295 companies associated with consolidated financials.[20] Their annual operating revenue, pre-tax profits, taxation, number of employees, costs of employees and tangible fixed assets from 2016 to 2021 are collected. The operating revenue is used to refine the application of the EUR 750 million threshold. Profits and taxes paid are utilized to compute effective tax rates, identify undertaxed profits with respect to the 15% minimum rate, and deduce the top-up tax to collect. The number or costs of employees and tangible assets are employed to estimate the effect of substance-based carve-outs depending on the estimation scenario. Financial variables are expressed in USD million.

Based on this dataset, the corporate income tax revenue gains from the application of the EU proposal to large-scale purely domestic groups is eventually estimated. This is initiated by computing effective tax rates averaged over the sample period. The primary interest in computing multi-year ETRs lies in the resulting effective tax rates that are more robust to the intertemporal adjustments of companies' tax liabilities and payments. For each company, the financial years between 2016 and 2021 are identified for which (i) both profit and tax data are available, (ii) pre-tax profits are positive, and (iii) taxes are positive. Nineteen companies never satisfy these three conditions, and thus reliable effective tax rates directly from the data for these cannot be computed.[21] Profits over the financial years satisfying the three conditions are summed. The same is done with taxes are done in a similar manner. All values are upgraded to 2021 based on the average growth rate of GDP in the European Union to ensure comparability between the different financial years in the sample. Average effective tax rates are obtained as the ratio of the latter sum to the former. Missing effective tax rates are imputed with the statutory tax rate of the country where the company is headquartered.

From there, the pervasive missing values that the dataset contains must be addressed. The goal is to approximate 2021 values for operating revenue, profits before tax, the number of employees or their related costs, and tangible assets for as many companies as possible. Combining this information with the average ETRs allows to estimate the tax deficit of each purely domestic group. The financial year closest to 2021 that is not associated with a missing value is sought for each firm and for each of these three variables. The corresponding value is selected and upgraded to 2021. Whenever this is possible, the compound annual growth rate (CAGR) of the firm's turnover over the period is computed and used for the upgrade; otherwise, the upgrade is based on the average growth rate of GDP in the European Union. Two remarks are relevant. First, the value that is selected for each variable is not necessarily associated with the same financial year: for a specific company, if profits are available in 2020 but tangible

[20] Two of the 295 firms are excluded because of their controlling shareholders, and 70 are excluded because they indirectly control foreign subsidiaries (there is no overlap between these two filters). Among the 223 remaining unique firms, 40 do not meet the EUR 750 million turnover threshold and are omitted on that basis. This yields a sub-sample of 183 large-scale purely domestic groups. One more company, Seagate Technology Holdings Public Limited Company headquartered in Ireland (parent company of a multinational company), is excluded manually from the sample. Data available in ORBIS did not allow eliminating it from the sample.

[21] Out of these 19 companies, nine only display missing values for taxes which makes it impossible to compute any effective tax rate from the data. Among the ten remaining firms, two never report both profits and taxes in the same financial year. Among the eight remaining firms, six never report positive profits. Among the two remaining firms, one never reports positive taxes. Eventually, the remaining company (which displays relatively small profits before tax) is excluded because it never reports positive profits and positive taxes in any financial year of the sample period. For all of these companies, no reliable effective tax rate could be estimated from the data.

assets are not available after 2017, the 2020 profits and 2017 tangible assets are upgraded.[22] Second, some companies only display missing values for one or more of these variables; in such cases, it is not possible to obtain a reliable 2021 value for the variable(s) in question, thus the company is excluded from the sample (either the number of employees or the costs of employees entirely missing is tolerated). A sub-sample is obtained of 170 EU large-scale purely domestic groups for which the top-up taxes to be collected under the extended minimum tax can be estimated.[23]

Eventually, the computation of the tax deficit of each firm is relatively straightforward based on these 2021 values for operating revenue, profits before tax, the costs or the number of employees and tangible assets. Companies with a turnover below about USD 900 million are excluded which corresponds to the conversion of the EUR 750 million threshold into USD based on the 2021 average exchange rate. If relevant, substance-based carve-outs are applied: Typically, with the long-term carve-out rates of the model rules, profits before tax are reduced by 5% of tangible assets and 5% of the costs of employees. When the costs of employees are not available, the usual payroll proxy is used, i.e. the number of employees multiplied with the mean wage in the country where the firm is located and a 20% premium. The focus is then on observations with positive profits ex-post the applicable carve-outs, adding the average effective tax rates computed beforehand, and deducing the tax deficit of each firm with the usual formula.

That being stated, the dataset might not be exempt from errors and inconsistent values. When the alternative results are considered that include unconsolidated financials in the sample, the same preparatory steps as above are applied, and one additional firm is manually excluded (as it is likely the affiliate of a multinational company). However, the financials of two companies must also be edited:

- Computing tax deficits for the data that are obtained from the steps above without any further adjustment attributes a very high tax deficit to a Luxembourg company, Joint Allocation Office SA. Indeed, in ORBIS, the company's profits before tax in 2020 are as high as USD 4.3 billion while they are of circa USD 520,000 in 2019 and USD 365,000 in 2018. There is no immediate explanation for this value, but it creates a substantial tax deficit as it involves a very large tax base and a very low average effective tax rate (while the company faces effective tax rates well above 15% in the other financial years). In its 2020 annual report, the firm presents profits before tax of USD 376,000; this value is used to correct the ORBIS sample.

- Similarly for Cactus SA, another company headquartered and active in Luxembourg, the database displays very large profits before tax (USD 717 million in 2019) compared with the operating revenues of the firm (profitability margin over 80%) and with the profits reported in this French-language press article (EUR 37 million; USD 42 million with the exchange rate used in ORBIS). The issue seems specific to the pre-tax profit variable as the after-tax profits recorded in the database are consistent with those of the press article. For the income years as of 2017, the pre-tax profits of Cactus SA are replaced in the sample by the sum of the after-tax profits and income taxes observed in ORBIS. The standard profitability margins are obtained for retail activities, and the average effective tax rate that is computed is also more credible.

[22] Among the 221 unique firms for which this manipulation occurs (beginning from the initial sample and excluding firms either based on their controlling shareholders, based on their subsidiaries, or manually), there is a lack of a proper CAGR for only 18 of them.
[23] For four of these firms, the average effective tax rate cannot be computed and must be imputed based on the statutory tax rate of the headquarters country.

C.2. Results

The directive proposed by the European Commission in December 2021 to implement the provisions of the GloBE proposal within the EU extends the scope of the 15% minimum tax to include large-scale purely domestic groups.

According to the proposal, this extension 'is expected to involve a limited number of taxpayers and is limited to the essential minimum for securing EU law compatibility'. Indeed, in the ORBIS database, 182 EU purely domestic groups are identified for which there are consolidated financials and their consolidated turnover meets the EUR 750 million threshold. Table C.2.1 depicts their distribution across Member States.

Table C.2.1. Distribution of EU large-scale purely domestic groups across headquarters location countries.

Country name	Number of purely domestic groups	Share of total
Germany	63	34.6%
Italy	42	23.1%
France	20	11.0%
Netherlands	18	9.9%
Spain	7	3.8%
Finland	7	3.8%
Poland	5	2.7%
Austria	4	2.2%
Belgium	4	2.2%
Denmark	4	2.2%
Greece	2	1.1%
Ireland	2	1.1%
Romania	2	1.1%
Luxembourg	1	0.5%
Sweden	1	0.5%
Total	**182**	**100%**

This table shows how the sample of large-scale purely domestic groups is distributed across EU Member States. In total, 182 such companies were identified from the ORBIS database based on consolidated financials. There is sufficient information to estimate a tax deficit for 170 of these.

There is sufficient information to compute tax deficits for 170 of them. From these companies, applying the long-term carve-out rates of 5% of payroll and 5% of tangible assets, it is estimated that seven Member States could collect additional tax revenues of circa EUR 35 million. This represents less than 0.1% of the EUR 55.2 billion that EU countries are expected to collect via the global minimum tax on multinational companies under the benchmark scenario.

The limited number of firms subject to the extension is the first factor that explains the low impact on EU Member States' revenues. Second, large-scale purely domestic groups encounter relatively high effective tax rates compared with that of some multinational firms. Over the sample in this study, the median effective tax rate and the mean effective tax rate weighted by pre-tax profits are 27% and 25%, respectively. Only 19 companies (out of 170) display an effective tax rate below the 15% minimum rate. Third, substance-based carve-outs have a significant impact on purely domestic groups that have fewer opportunities to disconnect taxable income and real economic activity. Out of the 157 firms with positive profits before tax in the sample, carve-outs at the long-run rates fully offset profits for 31 of them (73 with first

year rates). On average over the positive-profit sub-sample, substance-based carve-outs reduce the tax base by 22% (38%).

Table C.2.2. Potential revenue gains from EU large-scale purely domestic groups (in constant 2021 EUR)

Parent country	Revenue gains (€m)
France	0.1
Germany	3.0
Ireland	0.0
Italy	5.7
Netherlands	25.0
Spain	0.8
Sweden	0.5
Total	**35.1**

This table presents the estimated revenue gains from the application of the minimum tax to large-scale purely domestic groups for each EU Member State with positive tax deficits. A minimum rate of 15% and long-run carve-outs (5% of tangible assets and payroll) are assumed.

Regarding the distribution of the revenue gains from these purely domestic groups, the Netherlands (EUR 25 million) is clearly prominent as 71% of the total tax deficit is concentrated there. This is not necessarily connected to the repartition of firms in this study's sample across EU Member States. Although the Netherlands does display a substantial number of large-scale purely domestic groups (18; 10% of the total), its share of the revenue gains is rather disproportionate, and it is essentially driven by one company. On the contrary, over one third of the firms identified in the sample (63 out of 182) is in Germany but only 9% of the revenue gains; France has 11% of the firms but less than 1% of the revenue gains.

A potential concern regarding these results lies in the impact of the COVID pandemic over the sample period. In fact, the findings prove to be rather robust to the exclusion of the income years affected by the pandemic that correspond to the last two years in the sample period (2020 and 2021) based on the outbreak of the pandemic in Europe. While the set of taxing countries changes and some revenue gains are significantly affected (Sweden and Italy in particular), the total potential revenue gains remain marginal compared with the application of the global minimum tax to multinational companies.

Table C.2.3. Potential revenue gains from EU large-scale purely domestic groups, excluding the income years affected by COVID

Parent country	Revenue gains (€m)
Austria	0.6
Denmark	0.5
France	0.2
Germany	4.3
Italy	1.3
Netherlands	25.0
Spain	0.5
Sweden	13.9
Total	**46.3**

This table presents the estimated revenue gains from the application of the minimum tax to large-scale purely domestic groups for each EU Member State with positive tax deficits. A minimum rate of 15% and long-run carve-outs (5% of tangible assets and payroll) are assumed.

Eventually, alternative results are presented that include the individual financials of the parent companies of the large-scale purely domestic groups for which only unconsolidated data could be obtained. This extension of the sample from 170 to 249 companies leads to a 53% increase in the overall revenue gains (from around EUR 35 million to approximately EUR 54 million). As explained in the methodological section above, unconsolidated statements may bias the estimation of the top-up taxes to be paid by these groups upwards or downwards depending on the ETRs faced by parent companies and their affiliates. Additionally, the parent company's unconsolidated turnover being above EUR 750 million does not necessarily mean that the consolidated turnover of the group meets the threshold due to intra-group transactions.

Table C.2.4. Potential revenue gains from EU large-scale purely domestic groups, including individual financials of 79 parent companies in our sample

Parent country	Revenue gains (€m)
Bulgaria	0.5
Cyprus	1.3
Czech Republic	1.6
France	0.5
Germany	9.4
Ireland	0.0
Italy	5 .7
Luxembourg	5.5
Netherlands	25.0
Romania	2.2
Spain	1.6
Sweden	0.5
Total	**53.8**

This table presents the estimated revenue gains from the application of the minimum tax to large-scale purely domestic groups for each EU Member State with positive tax deficits. A minimum rate of 15% and long-run carve-outs (5% of tangible assets and payroll) are assumed.

Appendix D: Treatment of Partially-Owned Entities

D.1. Context on Partially-Owned Low-Taxed Constituent Entities

A possible source of over-estimation has been identified in the first scenario in which only the income inclusion rule (IIR) is assumed to apply. The goal of the following is to assess the potential magnitude of this bias.

The bias derives from the treatment of partially-owned subsidiaries (i.e. foreign affiliates that are owned partly by minority shareholders outside the multinational group) under the IIR. Consider the foreign affiliate of a multinational company with a tax base (profits before tax net of substance-based carve-outs) of USD 1,000 and an effective tax rate of 10%. The total amount of top-up tax associated with the low-taxed entity is therefore 5% * USD 1,000 = USD 50. The entire amount is collected by the headquarters location country under the IIR if the affiliate is fully owned by the head of the multinational group. However, if the group head only owns 80% of the shares, the top-up tax collected by the headquarters location country will only be 80% * USD 50 = USD 40. The 80% factor would correspond to the 'inclusion ratio' mentioned in the model rules.

How is such a partially-owned entity dealt with in the current computations? In theory, multinational companies treat subsidiaries in their annual country-by-country reports the same way as they do in their financial statements. Assume, from now on, that the affiliate is owned 80% by the corporate head group. The ultimate parent controls the subsidiary, and the latter is therefore fully consolidated in the financial accounts of the former. This means that 100% of the assets, liabilities, revenues, expenses, profits, etc. of the affiliate are added to that of the ultimate parent even though it is not entirely owned. Similarly, 100% of its profits before tax, taxes paid, etc. appear in country-by-country statistics. As a consequence, when the methodology is applied, the entire top-up tax amount (USD 50) associated with the low-taxed entity to the headquarters country is attributed to the headquarters country.

Two cases arise:

- Either the remaining top-up tax amount attributable to minority shareholders (i.e. USD 50 – USD 40 = USD 10) is collected through the undertaxed payments rule (UTPR). In that case, the estimation of the aggregate revenue gains remains correct, however, the distribution is distorted (since USD 50 is attributed to the headquarters country); or

- it is free from any top-up tax, in which case, the estimate for aggregate revenue gains under the first scenario is overestimated (and the distribution may be correct).

This issue is discussed more comprehensively by Noked (2022). Based on this analysis, it seems that the second case is more likely. The question thus arises if there is a sense of the magnitude of this upward bias.

Without financial micro-data at the subsidiary level and on the ownership structure of multinational corporate groups, estimating the share of top-up taxes that is attributable to minority shareholders is not feasible. However, there may possibly be a proxy for the share of after-tax profits that accrue to minority shareholders.

D.2. Assessing the Impact with Minority Interests

The full consolidation that is operated by the parent when it controls the subsidiary is described above.[24] One hundred percent of the subsidiary's assets, liabilities, revenues, costs, and profits appear in the parent's consolidated financial statements. However, to reflect the idea that not all of these actually accrue to the head of the corporate group because of minority shareholders, the balance sheet and the income statement (or profit & loss account (P&L)) both display 'minority interests' or 'noncontrolling interests'. Therefore, minority interests can give a sense of the share of profits that are attributable to the minority shareholders of the multinational company's subsidiary when observed at the level of the corporate group head and compared with the total after-tax income.

To proceed further in that direction, ORBIS was searched for the multinational companies in the scope of Pillar Two. Slightly fewer than 7,000 ultimate parent entities were found including around 1,400 US multinationals. Using Orbis, it is possible to have access to their consolidated financial statements, and a minority interests variable is available (the variable exists but the value can be missing) for most of them (a notable exception being financial companies that have specific accounting rules).

For all of the firms, it is possible thus output total after-tax profits and minority interests from 2016 to 2021. In the following, only the pairs of multinational company and year that display (i) non-missing minority interests and after-tax profits, (ii) positive after-tax profits, and (iii) positive minority interests are considered. For each year, the after-tax profits and the minority interests deemed 'valid' in the previous step are summed, and the ratio of the latter sum to the former is computed:

Year	**Over the whole sample**	**US multinational firms**
2016	7.9%	4.2%
2017	10.3%	5.2%
2018	8.1%	5.0%
2019	8.9%	5.5%
2020	8.7%	4.9%
2021	8.3%	5.7%
Average	**8.7%**	**5.1%**

It can be concluded from this table that minority shareholders account for 8-9% of the after-tax profits of the multinational groups in the scope of Pillar Two which is about 5% when focusing on US parents. Extrapolation may give an idea of the share of the top-up taxes that are attributable to minority shareholders and would not be collected under the IIR.

D.3. Additional Remarks

This result is likely to be an upper bound because of the way missing minority interests are addressed. Indeed, missing values can either be due to an absence of partially-owned entities within the group or to accounting requirements that could impose another form of reporting, for instance. The simplest option was to select and exclude all of the observations with missing minority interests from the ratios above. However, for instance, Apple is then excluded since its minority interests are all reported as missing.[25] In fact, this is most likely due to all of its subsidiaries being fully owned and, if that was true, it would rather be best to consider these missing values to be zeros and include them in the computation of average ratios.

[24] Control is generally but not systematically associated with an ownership share strictly above 50%.
[25] Indeed, its financial statements (available online) display no minority interests.

Furthermore, losses may perturbate the extrapolation from the above ratios to the share of top-up taxes attributable to minority shareholders. Assume a multinational group has only two subsidiaries. The parent itself generates positive profits taxed above the minimum rate. Both are owned at 80%, generate after-tax profits of, respectively, USD 1,000 and USD -1,000, and the profit-making entity is associated with a top-up tax of USD 50. The weight of minority shareholders in the total after-tax profits (as measured by the above ratio) is:

$$\frac{Non\text{-}controlling\ interests}{Total\ after\text{-}tax\ income} = \frac{1000\ \times 20\% + (-1000) \times\ 20\%}{Parent's\ after\text{-}tax\ \ income + 1000 - 1000} = 0$$

The share of the minority shareholders in the top-up tax amount of the group is instead:

$$\frac{Subsidiary\ top\text{-}up\ tax\ amount\ \times Minority\ shareholders'\ stake}{Subsidiary\ top\text{-}up\ tax\ amount} = \frac{50\ \times 20\%}{50} = 20\%$$

This stylized example shows that the distribution of losses across fully-owned and partially-owned subsidiaries can affect the extrapolation of the above ratios to the share of top-up taxes attributable to minority shareholders and thus not collected via the IIR.

Eventually, the distribution of corporate income taxes can also have a distortive effect if the profits of partially-owned entities are not taxed at the same rate as that of fully-owned entities. Remember that this work is considering after-tax profits when computing the above ratios (and minority interests are also net of the taxes imposed on partially owned affiliates).