



OECD Taxation Working Papers No. 50

The impact of the Pillar One  
and Pillar Two proposals  
on MNE's investment costs:  
An analysis using forward-  
looking effective tax rates

**Tibor Hanappi,**  
**Ana Cinta González**  
**Cabral**

<https://dx.doi.org/10.1787/b0876dcf-en>

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# Abstract

This working paper presents the analytical framework used by the Secretariat to estimate the direct effects of the Pillar One and Pillar Two proposals on MNE's investment costs. The analysis builds on the standard ETR framework and extends it in two important respects. First, ETRs are calculated for an investment performed by an entity belonging to an MNE group and account for the possibility that MNEs use their organisational structure to shift profits to low tax jurisdictions. Second, the model incorporates a stylised version of the tax provisions introduced under Pillar One and Pillar Two. The results, covering over 70 jurisdictions, account for differences in tax bases and rates, and are empirically calibrated to map MNE activities, i.e., the location of their profits, turnover and assets as well as the impact of the proposals. Overall, the results suggest that the Pillar One and Pillar Two proposals would lead to modest increases on global weighted ETRs. This paper feeds into the broader analysis of the investment impacts of the Pillar One and Pillar Two proposals.

# Acknowledgements

Both authors are from the OECD Centre for Tax Policy and Administration. The authors would like to thank David Bradbury, Alessandra Celani, Pierce O'Reilly and Kurt van Dender (all from the OECD Centre for Tax Policy and Administration), Asa Johansson, Valentine Millot, Stéphane Sorbe and Sebastien Turban (all from the OECD Economics Department), Ruud de Mooij, Michael Devereux, Pardis Nabavi, Tom Neubig, Gaëtan Nicodème, Michael Stimmelmayer and other seminar participants at the annual congress of the IIPF 2020 for their comments on earlier versions of this work. The authors would also like to thank delegates from the OECD Working Party No. 2 on Tax Policy Analysis and Tax Statistics for their valuable contributions. The work benefited also from valuable discussions with the IMF and the European Commission. Finally, the authors would like to thank Violet Sochay and Karena Garnier (both from the OECD Centre for Tax Policy and Administration) for excellent editorial support.

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# The Impact of the Pillar One and Pillar Two Proposals on MNE's Investment Costs: An Analysis using forward-looking effective Tax Rates

1. The OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) is currently discussing a number of proposals to reform the international tax rules in order to address the tax challenges arising from the digitalisation of the economy (OECD, 2019<sup>[1]</sup>). These proposals fall under two pillars: Pillar One that introduces revised profit allocation and nexus rules to reallocate some taxing rights to market jurisdictions; and Pillar Two that introduces new rules to ensure a minimum level of effective taxation to address remaining BEPS concerns. While the design features and parameters of the proposals are yet to be decided upon by the members of the Inclusive Framework on BEPS, the new rules would introduce a significant structural reform of the international tax system, which can be expected to have an impact on MNE investment decisions.

2. This working paper presents the analytical framework used by the OECD Secretariat to estimate the direct effects of the Pillar One and Pillar Two proposals on investment costs using forward-looking effective tax rates (ETRs). While this paper focusses only on technical aspects related to the modelling framework, the results derived in this paper feed into a broader analysis of the investment impacts of Pillar One and Pillar Two discussed in Chapter 4 of the Economic Impact Assessment report (OECD, 2020<sup>[2]</sup>). The latter forms part of the overall economic impact assessment of the Pillar One and Pillar Two proposals as described in the Pillar One and Pillar Two Blueprint reports (OECD, 2020<sup>[3]</sup>; OECD, 2020<sup>[4]</sup>).

3. Forward-looking effective tax rates provide a comparative framework to analyse the effect of corporate tax policy reforms on the taxation of a hypothetical investment, taking effects on tax rates and bases into account. As such, they are instrumental in understanding ex-ante how tax policy reforms are expected to shape international investment decisions.

4. The analysis covers over 70 jurisdictions that feature in OECD Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>) and builds on a stylised representation of MNE group structures that is calibrated empirically using data on the location of profits, turnover and tangible assets of MNEs

in over 200 jurisdictions (see Chapter 5 in OECD (2020<sup>[2]</sup>)). However, the policy parameters relating to Pillar One and Pillar Two that are used to model forward-looking ETRs in this paper are illustrative and, therefore, should not be seen as pre-judging any future decisions to be made by the Inclusive Framework.

5. The results suggest rather modest effects overall of the Pillar One and Pillar Two proposals, measured as global GDP-weighted averages, on effective average tax rates (EATRs) and effective marginal tax rates (EMTRs). MNEs that are out of the scope of the Pillar One and Pillar Two proposals would observe no change in their ETRs. The effects of Pillar One on ETRs are smaller, on average, than they are for Pillar Two, suggesting that changes to the overall investment levels due to Pillar One are likely to be limited. While the global weighted-average effects of Pillar Two on ETRs remain modest, the effects will be more significant for MNEs operating in jurisdictions with effective tax rates below the minimum tax threshold.<sup>1</sup> Taken together, Pillar One and Pillar Two would reduce the dispersion of effective tax rates on investment projects across jurisdictions, bringing to the fore the relevance of non-tax factors in shaping investment decisions.

6. The paper is organised as follows. Section 1.1 presents the conceptual approach underpinning the analysis. Section 1.2 reviews the standard framework, which is then extended in Section 1.3 to model the impact of the Pillar One and Pillar Two proposals on forward-looking ETRs. Section 1.4 covers the approach and data sources used to calibrate the theoretical model. Section 5 contains the results of the estimated impact of the two pillars on investment costs and Section 1.6 concludes.

## 1.1. Conceptual approach

### 1.1.1. Theoretical framework

7. The theoretical framework considers the impact of the proposals on the taxation of investments undertaken by a given entity belonging to a stylised MNE group in the location where it operates. Specifically, it assumes that the MNE group as a whole produces a final consumer good that is sold to a global consumer base, and that it has the possibility to shift profits to jurisdictions with lower taxation where the MNE has activity, thus reducing the cost of the investment. The theoretical framework generalises the function of the investing entity within the MNE group, i.e., it could be a subsidiary or the ultimate parent entity.<sup>2</sup> The analysis is static and does not consider changes in the behaviour of MNEs or governments,<sup>3</sup> with the exception of those outlined in Section 1.4.3

8. The analysis builds on the ETR framework developed by Devereux and Griffith (2003<sup>[6]</sup>) and extends it in two important respects. First, ETRs are calculated for a specific investment accounting for the possibility that MNEs use their organisational structure to obtain tax advantages through profit shifting. Different profit shifting channels have been identified in the literature, e.g., manipulation of transfer pricing rules in intra-group transactions or strategic

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<sup>1</sup> The Pillar Two proposal is defined in terms of backward-looking ETRs. The modelling in this paper considers the impact of the Pillar One and Pillar Two proposal on forward-looking ETRs as these are the most relevant rates to inform prospective investment decisions.

<sup>2</sup> As specified in Section 1.1.2, the empirical calibration assumes that the investing entity is located in the ultimate parent jurisdiction.

<sup>3</sup> Responses by governments in terms of changing parameters of their CIT system are generally not considered, unless a clear incentive from the government's perspective is identified.

location of intellectual property (Beer, Mooij and Liu, 2020<sup>[7]</sup>; Griffith, Miller and O'Connell, 2014<sup>[8]</sup>). Given the purpose of this analysis, profit shifting strategies are not modelled specifically, however, the approach is generic enough to incorporate the empirically most relevant profit shifting strategies.

9. Second, the model incorporates a stylised version of the proposed tax changes described in the Pillar One and Pillar Two Blueprint reports (OECD, 2020<sup>[3]</sup>; OECD, 2020<sup>[4]</sup>). A number of design elements and parameters of Pillar One and Pillar Two will be the subject of future decisions by the Inclusive Framework. For the purpose of this paper, a number of illustrative assumptions have been made, noting that these do not prejudice the final decisions that will be made by the Inclusive Framework. In this paper the modelling of Pillar One focuses on Amount A. Amount A would give market jurisdictions a new taxing right over in-scope MNEs, with revenues above a certain threshold. In this analysis Pillar One is considered to apply to businesses that perform activities within the definition of automated digital services (ADS) and consumer-facing businesses (CFB); though it should be noted that the scope of Amount A remains under discussion.<sup>4</sup> The modelling of Pillar Two considers only the impact of the Income Inclusion Rule and accounts for different income blending options as well as the potential impact of formulaic substance-based carve-outs. A revenue threshold of EUR 750 million is modelled for both pillars.

### **1.1.2. Empirical calibration**

10. The theoretical model is calibrated empirically to reflect the activities of MNE groups. Specifically, the analysis builds on a set of matrices that contain data on the location of profits, turnover and tangible assets of MNEs in over 200 jurisdictions by ultimate parent entity (UPE) (see Chapter 5 in OECD (2020<sup>[2]</sup>)); these data sets are the same as those used for the analysis of the revenue impact of Pillar One and Pillar Two (see Chapter 2 and 3 in OECD (2020<sup>[2]</sup>)).

11. Using these datasets, the model is calibrated to reflect the case of an investment in the location of the UPE, i.e., the ultimate parent jurisdiction.<sup>5</sup> Accordingly, the investment is assumed to be subject to the tax provisions available in the ultimate parent jurisdiction, e.g., regarding statutory CIT rates, depreciation allowances or allowances for corporate equity, as indicated in OECD Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>; OECD, 2020<sup>[9]</sup>). The analysis covers all jurisdictions in OECD Corporate Tax Statistics with the exception of Latvia and Estonia, who have corporate income tax systems that only apply to distributed profits.

12. The extent to which MNEs shift profits from the location where the investment takes place to low tax jurisdictions is also calibrated empirically, based on the data matrices and profit shifting elasticities obtained from the literature (cf. Section 1.4). In addition, the same data matrices are also used to calibrate other specific features of the proposals, e.g., the location of assets underlying the substance-based carve-outs, or the location of sales used as a key for reallocation under Pillar One Amount A.

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<sup>4</sup> Amount B and any new processes to improve tax certainty through effective dispute prevention and resolution mechanisms are not modelled due to methodological constraints. Modelling Amount B would require a comprehensive cross-country dataset of entity level data combining information on (i) the nature of the activities of each entity (to identify which entities would be affected by Amount B) and (ii) their financial information (to quantify the effect of applying Amount B).

<sup>5</sup> In general, it would be possible to calibrate the model differently, e.g., reflecting investments in jurisdiction A by MNEs with a UPE in jurisdiction B, depending on the purpose of the analysis.

### 1.1.3. Scenarios of reform

13. Table 1 summarises the different scenarios relevant to assess the impact of the reform. The standard framework in the literature assumes that firms do not engage in profit shifting (Scenario *NPS*, developed in Section 1.2). Given the empirical support for the presence of profit shifting activity and given that the ability to profit shift translates into reductions in investment costs for MNEs, it needs to be accounted for in the baseline pre-implementation case against which the impact of the Pillar One and Pillar Two proposals is assessed (Scenario *PS*, developed in Section 1.3.1).

14. Two reform scenarios are analysed with the implementation of Pillar One Amount A and Pillar Two (Scenarios *PS – P1* and *PS – P2*, developed in Sections 1.3.2 and 1.3.3). The two pillars are modelled independently, i.e. neither interaction nor ordering effects are considered. By comparing the pre- and post-implementation ETRs, the impact of the proposals on ETRs can be gauged, i.e., the post-implementation scenarios *PS – P1* and *PS – P2* vs the pre-implementation scenario *PS*.

**Table 1. Matrix of different cases for analysis**

	MNEs do not engage in Profit shifting	MNEs engage in Profit shifting
<b>Current International Tax System</b>	<i>Standard Model (NPS)</i>	<i>Baseline Scenario (PS)</i>
<b>International Tax System with Pillar One</b>	<i>Not analysed</i>	<i>Reform Scenario Pillar One (PS-P1)</i>
<b>International Tax System with Pillar Two</b>	<i>Not analysed</i>	<i>Reform Scenario Pillar Two (PS-P2)</i>

Note: Pillars 1 and 2 are modelled independently and therefore neither interactions nor ordering effects are considered.  
Source: OECD Secretariat.

### 1.1.4. Modelling assumptions

15. In order to focus the analysis on the margins of interest, the standard model is stylised using the following simplifying assumptions:

- The firm is in a profit position.
- The investment is financed by retained earnings.
- Personal income taxation and other taxes at the international level, e.g., withholding taxes, are not considered.

16. Several additional assumptions follow from the simplified representation of MNE organisational structures:

- The analysis considers a specific MNE location and production structure; it studies the effective taxation on new investments in an existing entity holding the MNE structure constant.<sup>6</sup>

<sup>6</sup> For the purpose of the empirical calibration, the investing entity within the MNE group is considered to be the UPE; i.e., it corresponds to an investment in the ultimate parent jurisdiction.

- The ETRs calculated in this analysis take into consideration the tax payments that the new investment raises at the level of the investing entity<sup>7</sup> as well as in other entities of the same MNE group to which profits are shifted.
- There is some cost associated with profit shifting, but optimisation over the amount of profit shifted is not explicitly modelled.<sup>8</sup>

## 1.2. The Standard ETR Framework

17. The model underlying this analysis follows the methodology proposed by Devereux and Griffith (2003<sup>[6]</sup>) and considers the effective taxation of a hypothetical investment in the form of a one-period increase in the capital stock.<sup>9</sup>

18. Different measures of the effective tax rate are typically presented. The EATR measures the average tax liability a firm faces on an inframarginal investment, i.e., one that earns economic profit; and it has several desirable properties. It is bounded on the upper limit by the statutory tax rate (STR) as the profitability of the investment tends to infinity; and on the lower limit by the EMTR, associated with a marginal investment, i.e., one that earns no economic profit.

19. In general, the indicator of interest will depend on the policy question. To evaluate the impact of taxation on decisions that affect the extensive margin, e.g. location decisions, measures that evaluate the inframarginal investment are of interest. In this case, the EATR is the leading indicator. To evaluate the impact of taxation on decisions that affect the intensive margin, e.g., extent of investment, measures that evaluate the marginal investment are of interest. In this case, the cost of capital and the EMTR are the leading indicators.<sup>10</sup>

20. In line with the notation introduced in Table 1, the main variables derived in this section for the baseline case without profit shifting and with the current international tax rules are denoted with the superscript *NPS*. Table 2 lists key parameters used in the equations in the text.

21. The EATR can be calculated as the difference between the net present value (NPV) of the economic profit generated by an inframarginal investment before and after tax,  $R^*$  and  $R^{NPS}$ ,

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<sup>7</sup> See footnote 7.

<sup>8</sup> The optimal amount of profit shifting can be derived given a certain cost function associated with it. These costs are assumed to be associated with setting up the structure necessary to shift profits and to cover the risk and penalties of potential audits. The assumption on these cost functions vary across studies with Grubert and Altshuler (2013<sup>[23]</sup>) and Grubert and Slemrod (1994<sup>[24]</sup>) considering that the cost of shifting is a quadratic function of the amount shifted.

<sup>9</sup> In other words, the firm invests at the beginning of the first period and the investment generates a return that accrues during that period; at the end of the first period, a disinvestment is required to return the capital stock to its original level.

<sup>10</sup> In this paper, the impact of the proposals at the extensive and intensive margin is analysed for an MNE structure that is held constant across the pre-implementation and reform scenarios. Measures of the EATR and the EMTR and cost of capital are derived for that purpose. However, MNEs can also react to the proposals by rearranging their organisational structure, a reaction that is out of the scope of this paper.

respectively. This difference is scaled by the NPV of pre-tax income net of depreciation.<sup>11</sup> Future cash flows are discounted using the real interest rate,<sup>12</sup>  $r$ .

22. Taking  $p$  as the expected pre-tax rate of return on the investment, the EATR is defined as follows.

$$EATR^{NPS} = \frac{R^* - R^{NPS}}{p/(1+r)} \quad (1)$$

23. The pre-tax economic profit,<sup>13</sup>  $R^*$ , is defined as  $(p - r)/(1 + r)$ . However, the key parameter for the calculation of the EATR is the post-tax economic profit earned over the lifetime of the investment,  $R^{NPS}$ ; it can be decomposed into three different terms, as shown in equation (2).

- **Term 1:** The firm invests one unit in period  $t$ , implying an increase in the capital stock of 1. The cost of the investment is effectively reduced by the NPV of tax allowances and deductions,  $A$ . The first term,  $1 - A$ , thus represents the net cost of one unit of investment in period  $t$ .
- **Term 2:** The investment generates positive returns in period  $t + 1$ , consisting of the pre-tax rate of return,  $p$ , gross of economic depreciation,  $\delta$ ; this total profit is taxed at the statutory rate,  $\tau$ .
- **Term 3:** In period  $t + 1$ , the disinvestment occurs such that the value of the capital stock returns to its prior level.

$$R^{NPS} = \underbrace{-(1 - A)}_{\text{Term 1}} + \underbrace{\frac{1}{1+r} [(p + \delta)(1 - \tau)]}_{\text{Term 2}} + \underbrace{\frac{1}{1+r} (1 - \delta)(1 - A)}_{\text{Term 3}}. \quad (2)$$

24. The user cost of capital net of depreciation — instrumental in calculating the EMTR — is defined as the pre-tax real rate of return necessary to generate a zero post-tax economic profit. Setting  $R$  equal to zero in (2) and solving for the pre-tax rate of return yields the cost of capital,  $\tilde{p}^{NPS}$ .

$$\tilde{p}^{NPS} = \frac{(1 - A)(r + \delta)}{(1 - \tau)} - \delta \quad (3)$$

25. The EMTR, associated with a marginal investment, can be expressed as follows.

$$EMTR^{NPS} = \frac{\tilde{p}^{NPS} - r}{r} \quad (4)$$

<sup>11</sup> Another possible choice would be to scale by the pre-tax economic profit,  $R^*$ , however, this assumption would imply that the EATR is not defined for a pre-tax economic profit that is equal to zero.

<sup>12</sup> The real interest rate and the nominal interest rate are related according to Fisher's equation as,  $(1 + r)(1 + \pi) = 1 + i$

<sup>13</sup> As is the case for other profit measures defined in this and the following sections, it can be interpreted equivalently as a profit measure or as a return on investment, given that the analysis considers a capital investment of one unit.

26. The expression of the EMTR in (4) is tax-exclusive, i.e. divided by  $r$ , as opposed to the more conventional tax-inclusive definition in which the denominator is the cost of capital. The representation in (4) is preferred in this context due to the discontinuity in the EMTR around zero when it is formulated using the cost of capital as the denominator.

27. The EATR can also be written as a function of the cost of capital. Starting with equation (2), taking the common factor  $(1 - A)$  and dividing by  $(1 - \tau)$  yields the following expression for the post-tax economic profit.

$$R^{NPS} = \frac{(1-\tau)(p-\tilde{p}^{NPS})}{1+r} \quad (5)$$

28. Substituting (5) back into (1) yields an alternative expression of the EATR.

$$EATR^{NPS} = \frac{\frac{p-r}{1+r} - \frac{(1-\tau)(p-\tilde{p}^{NPS})}{1+r}}{p/(1+r)} = \frac{\tilde{p}^{NPS} - r + \tau(p-\tilde{p}^{NPS})}{p} \quad (6)$$

29. The first component of the right hand term in equation (6) represents the tax liability related to the marginal investment,  $(\tilde{p}^{NPS} - r)$ . The second component represents the tax liability related to the economic profit, derived by multiplying the statutory rate,  $\tau$ , with the economic profit,  $(p - \tilde{p}^{NPS})$ .

### 1.3. Extending the Standard Framework

30. In order to analyse the impact of the Pillars 1 and 2 proposals, the standard framework needs to be adapted to consider an investment performed by an entity belonging to an MNE group. As opposed to a standalone firm, entities within an MNE group have the ability to use their organisational structure to shift profits to other jurisdictions where the MNE operates, reducing their tax payments and thereby investment costs. The first part of this section covers the introduction of profit shifting into the ETR framework given the MNE structure presented in Section 1.1.1. This will form the basis of the baseline pre-implementation scenario, i.e.  $PS$  in Table 1. The second part of the section covers the stylised modelling of the Pillar One Amount A and Pillar Two provisions which would represent the post-implementation scenarios, i.e.  $PS - P1$  and  $PS - P2$  in Table 1.

31. The modelling of Pillar One and Pillar Two reflects in a stylised manner the latest status of the policy discussions but does not seek to prejudge any decisions to be made by the Inclusive Framework. The reform scenarios are assessed independently, i.e. the interaction and ordering effects are not evaluated. Expressions for the effect of the Pillar One and Pillar Two proposals are provided in the text.

32. The key parameter for the derivation of the respective results is the post-tax economic profit,  $R$ , i.e. equation (2) in the standard model. This parameter feeds into the numerator of the EATR, the tax rate that refers to inframarginal investments, i.e. those for which  $R > 0$ . It also feeds into the calculation of the EMTR, which is the rate that refers to marginal investments, i.e. those that derive a zero post-tax economic profit,  $R = 0$ . For each of the relevant scenarios, formal expressions for the post-tax economic profit, the cost of capital are derived in the text and for the EMTR and the EATR in Annex A. Table 2 defines key modelling parameters.

Table 2. Parameter Definition

Parameter	Description
$p$	Pre-tax rate of return
$\tau$	Statutory CIT rate (applicable in the standard model)
$\pi$	Inflation
$i$	Nominal interest rate
$\delta$	Economic depreciation
$A$	Net present value of total tax deductions
$\tau_{LT}$	Statutory CIT rate of the low-tax jurisdiction (calibrated as weighted average)
$\tau_{HT}$	Statutory CIT rate of the high-tax jurisdiction
$\tau_R$	Statutory CIT rate of the market jurisdictions (calibrated as weighted average)
$\lambda$	Share of profit shifted to the low-tax jurisdiction (calibrated as weighted average)
$\varphi_i$	Firm's profitability ratio
$\bar{\varphi}$	Profitability threshold under Pillar One
$\hat{r}$	Routine profit under Pillar One
$\theta$	Share of profits reallocated to market jurisdictions
$\bar{\tau}$	Minimum tax threshold under Pillar Two
$x$	Rate of the formulaic substance-based carve-out

Source: OECD Secretariat.

### 1.3.1. Introducing Profit Shifting

33. As discussed above, the effects of profit shifting are captured by introducing the possibility that MNEs shift a share of their profits from higher- to lower-tax jurisdictions. In the theoretical model discussed in this section,  $\tau_{HT}$  and  $\tau_{LT}$  denote the statutory rates in a stylised high- and low-tax jurisdiction, respectively (cf. Table 2).<sup>14</sup>

34. The analysis considers an investment in an entity located in a high-tax jurisdiction. The firm invests one unit in the high-tax jurisdiction that generates tax deductions. Tax allowances and deductions measured in NPV terms,  $A$ , are a function of the statutory rate in the jurisdiction where the deductions arise, i.e.,  $A = f(\tau_{HT})$ . A high statutory tax rate will imply a higher value of tax deductions, except for the case of tax credits, and consequently a lower effective cost to the investment. As before, this effect is captured in term 1 of equation (7).

35. The second term in equation (7) captures the fact that the investment generates returns and the firm has now the possibility to shift a fraction  $\lambda$  of its total profit, given by  $p + \delta$ , to a low-tax jurisdiction with  $\tau_{LT} < \tau_{HT}$ .<sup>15</sup> Shifting thus implies that a fraction  $\lambda$  of total profits is taxed at the lower rate,  $\tau_{LT}$ , of the jurisdiction to which it is shifted, and the remaining fraction,  $1 - \lambda$ , is taxed in the high-tax jurisdiction at the rate  $\tau_{HT}$ . The taxation of total profits is captured in term 2 of equation (7). The third term in equation (7) remains unchanged compared to equation (2), capturing the disinvestment is necessary in order to revert the capital stock back to its original level.

<sup>14</sup> The model discusses shifting to a low-tax jurisdiction and summarises its tax rate by  $\tau_{LT}$ . This is, however, a stylised representation for simplification purposes, and  $\tau_{LT}$  can be thought of as a weighted average of the tax rates of all low-tax jurisdictions where profits are shifted to.

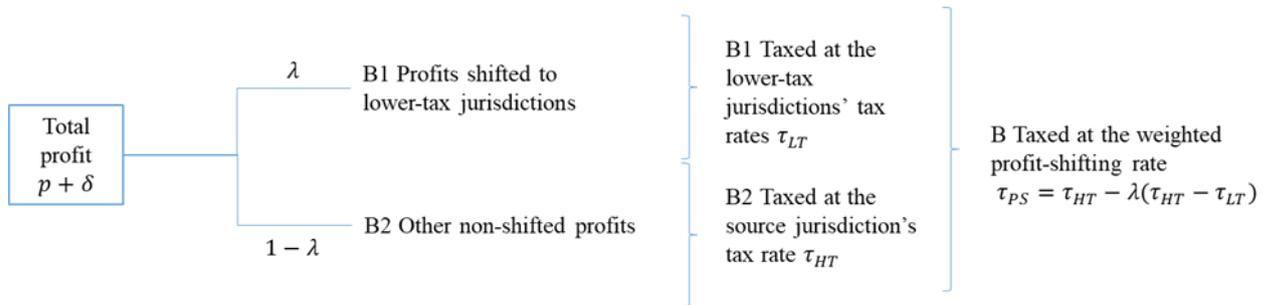
<sup>15</sup> Equally the share of profits that are shifted  $\lambda$  will depend on the jurisdiction pairs, but it is stylised to the case of one jurisdiction in order to simplify the notation.

36. Comparing the *PS* case with the *NPS* case shows that if no profit shifting occurs,  $\lambda = 0$ , and equation (7) equals equation (2). The case of full profit shifting is given when  $\lambda = 1$  while partial profit shifting occurs when  $0 < \lambda < 1$ .

$$R^{PS} = \underbrace{-(1-A)}_{\text{Term 1}} + \underbrace{\frac{1}{1+r} [\lambda(p+\delta)(1-\tau_{LT}) + (1-\lambda)(p+\delta)(1-\tau_{HT})]}_{\text{Term 2}} + \underbrace{\frac{1}{1+r}(1-\delta)(1-A)}_{\text{Term 3}}. \quad (7)$$

37. Figure 1 presents a schematic representation of the assumptions taken with respect to the taxation of total profits if profit shifting is possible. In particular, it follows from term 2 in equation (7) that, in the *PS* case, the applicable tax rate is a weighted average of the statutory tax rates in the high- and low-tax jurisdictions, with the respective weights determined by the share of profits shifted. Figure 1 illustrates the derivation of the weighted tax rate under profit shifting,  $\tau_{PS} = \lambda\tau_{LT} + (1-\lambda)\tau_{HT} = \tau_{HT} - \lambda(\tau_{HT} - \tau_{LT})$ ,

**Figure 1. Schematic Representation of the Taxation of Total Profits under Profit Shifting**



Source: OECD Secretariat.

38. Substituting  $\tau_{PS}$  in equation (7) the post-tax economic profit under profit shifting,  $R^{PS}$ , can be simplified to the following expression.

$$R^{PS} = \underbrace{-(1-A)}_{\text{Term 1}} + \underbrace{\frac{1}{1+r}(p+\delta)(1-\tau_{PS})}_{\text{Term 2}} + \underbrace{\frac{1}{1+r}(1-\delta)(1-A)}_{\text{Term 3}}. \quad (8)$$

39. Setting  $R^{PS}$  in equation (8) equal to zero and solving for  $p$ , the cost of capital in the *PS* case,  $\tilde{p}^{PS}$ , is given by the following expression.

$$\tilde{p}^{PS} = \frac{(1-A)(r+\delta)}{1 - (\tau_{HT} - \lambda(\tau_{HT} - \tau_{LT}))} - \delta = \frac{(1-A)(r+\delta)}{1 - \tau_{PS}} - \delta. \quad (9)$$

40. As opposed to the cost of capital for the *NPS* case shown in equation (3), the cost of capital in the presence of profit shifting is now a function of both statutory tax rates, i.e., the rate in the high-tax jurisdiction as well as the low-tax jurisdiction to which profits are shifted to.

41. In the absence of profit shifting,  $\lambda = 0$ , and the cost of capital is a function of the tax rate of the jurisdiction where the investment takes place, corresponding to the standard case described in the previous section.

42. Substituting equation (7) into equation (1) yields an expression for the EATR given the possibility of profit shifting, i.e.  $EATR^{PS}$ . The expression of the EMTR in this case, i.e.  $EMTR^{PS}$

is given by substituting the cost of capital of equation (9) into the value in equation (4). Annex A provides the expressions for both effective tax rates as a function of the cost of capital following equation (6) and (4) respectively.

### 1.3.2. Pillar One: Amount A

43. The new rules envisaged under Amount A of Pillar One<sup>16</sup> involve the creation of a new nexus, which is not dependent on physical presence, and the reallocation of a share of residual profits determined at the MNE group (or segment) level to market jurisdictions (see Pillar One Blueprint report (OECD, 2020<sub>[3]</sub>)). The analysis presented in this working paper is based on a model that builds on the economic concepts of normal returns and economic profit. The Pillar One proposal, however, is based on the concept of routine and residual profits used in a transfer pricing context. Box 1 summarises the differences between the two.

44. To see how Pillar One can be implemented in the ETR framework, consider first the following four steps summarising the proposed procedure to determine new taxing rights in market jurisdictions.

- I. Determination of the total profit at the MNE group level.
- II. Application of a profitability threshold to isolate the residual profit potentially subject to reallocation, based on simplifying conventions.
- III. Calculation of the amount of residual profits that is within the scope of the new taxing right to be allocated to market jurisdictions based on a reallocation percentage, based on simplifying conventions.
- IV. Allocation of (iii) to market jurisdictions based on an allocation key.

45. More specifically, this approach isolates residual profits on the basis of a profitability threshold, e.g., defined in terms of returns on sales. For modelling purposes, this profitability threshold is defined as  $\bar{\varphi}$  and treated as an exogenous parameter to be determined by a consensus-based decision of the Inclusive Framework.

#### Box 1. Key concepts and definitions

In the economic literature, the impact of taxation on investment decisions is examined by looking at the taxation of the marginal and inframarginal investment. Marginal investments are defined as those earning zero economic profit (or rent) and are relevant to examine decisions at the intensive margin, e.g. whether to invest more or less. Inframarginal investments, by contrast, earn an economic profit and are relevant to examine decisions at the extensive margin, e.g. where to invest. However, economic profit is not the same as accounting profit. Accounting profit includes only the explicit costs of running a business, e.g., labour costs or raw materials; it is typically calculated on the basis of accepted accounting principles. Economic profit is defined as the profit earned in excess of the normal return to capital, which includes opportunity costs, and possibly risk adjustments, associated with production.

<sup>16</sup> Amount B and any new processes to improve tax certainty through effective dispute prevention and resolution mechanisms are not modelled. See footnote 5.

Both concepts, normal returns and economic profit, are well defined in the economic literature. However, neither of these concepts is directly comparable to the concepts of routine and residual profits as used in the transfer-pricing context.

- Transfer pricing rules require that for tax purposes transactions between different entities of the same multinational group are priced as if the entities were independent. This is known as the “arm’s length principle”.
- In transfer pricing, routine profits are those that can be reliably benchmarked based on reliable comparable transactions. In contrast, residual profits are the profits (or losses) that remain after remunerating activities that can be reliably benchmarked using comparables.
- In general, it is possible that routine profits allocated to low-value adding activities exceed the cost of performing an activity. For example, many low-value adding services are remunerated based on a cost-plus methodology. Therefore, in a transfer pricing context, routine profits could include some element of economic profit; however, the economic concepts used in this paper are not identical with transfer pricing concepts and the analysis should thus be interpreted accordingly.

Source: OECD Secretariat.

46. As the new taxing rights apply only to a share of residual profits, i.e., profits above  $\bar{\varphi}$ , two observations follow directly. Consider a situation where each firm  $i$  is characterised by a firm-specific profitability ratio  $\varphi_i$ .

- Firms with a profitability ratio below  $\bar{\varphi}$  are not affected by the new taxing right. If  $\varphi_i \leq \bar{\varphi}$ , the firm’s ETRs will remain unchanged under Pillar One, as defined for the standard case by equation (9).
- Firms with profitability ratios above  $\bar{\varphi}$  will be subject to the new taxing right. If  $\varphi_i > \bar{\varphi}$ , the firm’s ETR may change, compared to the baseline case, due to the introduction of Pillar One.

47. Since nothing changes for the firms in the first group, the following analysis concentrates on firms in the second group, i.e., the case where  $\varphi_i > \bar{\varphi}$ , before discussing general insights at the end of the section.

48. While its exact definition is still to be determined, the profitability threshold,  $\bar{\varphi}$ , can be applied to estimate routine profit<sup>17</sup>,  $\hat{r}$ , which is the required parameter for modelling purposes. Section 1.4.2 presents a more detailed description of the approach used to calibrate these parameters empirically, using firm-level data from ORBIS.

49. This approach implies that, for firms above the profitability threshold, the routine profit is not affected by the new taxing right. However, a fraction  $\theta$  of residual profit,  $p + \delta - \hat{r}$ , is now, subject to new taxing rights in market jurisdictions under Pillar One.

50. The share of residual profits,  $\theta(p + \delta - \hat{r})$ , subject to Pillar One is reallocated to  $N$  market jurisdictions based on an allocation key (e.g., sales). In the model presented below, the applicable tax rate to the reallocated profit is thus a weighted average of the tax rates in the respective market jurisdictions, using the allocation key, in this case destination-based sales, to determine the corresponding weights. More formally, the weighted tax rate on reallocated

<sup>17</sup> As is the case for other profit measures discussed in this note, routine profit can be interpreted equivalently as a profit measure or as a return on investment, given that the analysis considers a capital investment of one unit.

profits will be given by  $\tau_R = \sum_{i=1}^N \psi_i \tau_i$  where  $\psi_i$  defines the weight of each jurisdiction  $i$  in total destination-based sales and  $\tau_i$  denotes the respective statutory tax rate in jurisdiction  $i$ .

51. As in the previous section, it is assumed that MNEs can exploit profit shifting opportunities. In particular, in the model all profits can be shifted, including routine and residual profit, except for profits that are subject to reallocation,  $\theta(p + \delta - \hat{r})$ . As described in the previous section, firms can shift a share  $\lambda$  of the total, non-reallocated profits to low-tax jurisdictions; this profit will again be taxed at  $\tau_{LT}$ , while the remainder is taxed in the high-tax jurisdiction, at the rate  $\tau_{HT}$ , similar to equation (7).

52. This approach allows for routine and residual profit to be potentially shifted. The profit shifting share,  $\lambda$ , is assumed to be the same for both types of profit; however, this assumption could be generalised in future work assigning different profit shifting propensities to routine and residual profit. Figure 2 presents a schematic representation of the assumptions taken with respect to the taxation of total profits under Pillar One.

53. Using the relevant parameters under Pillar One,  $\hat{r}$ ,  $\theta$  and  $\tau_R$ , and acknowledging that only firms with profitability above the threshold,  $\bar{\varphi}$ , are affected, the post-tax economic profit can be written as follows.

$$\begin{aligned}
 R^{PS-P1} = & -(1 - A) \\
 & + \hat{r}(1 - \tau_{HT} + \lambda(\tau_{HT} - \tau_{LT})) \left( \frac{1}{1 + r} \right) \\
 & + (p + \delta - \hat{r})[\theta(1 - \tau_R) + (1 - \theta)(1 - \tau_{HT} + \lambda(\tau_{HT} - \tau_{LT}))] \left( \frac{1}{1 + r} \right) \\
 & + (1 - \delta)(1 - A) \left( \frac{1}{1 + r} \right)
 \end{aligned} \tag{10}$$

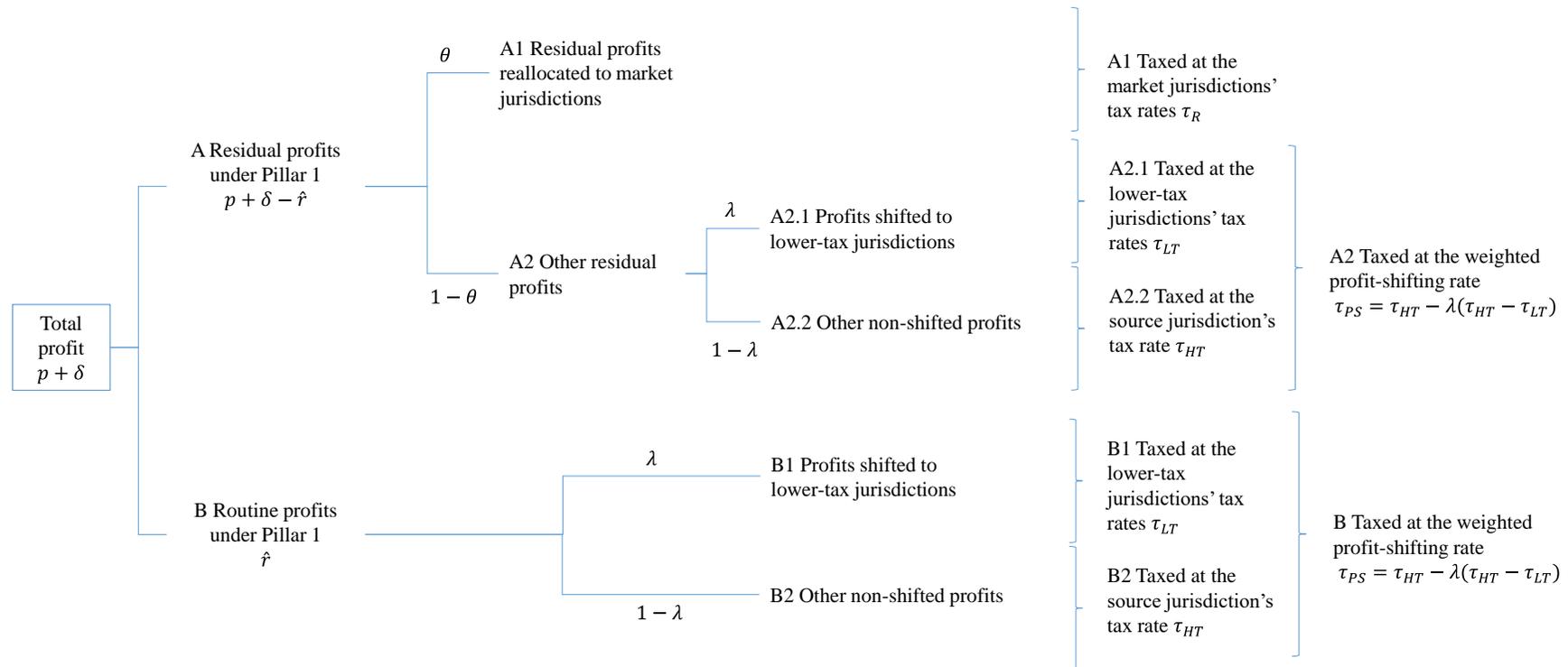
54. As before, the first and last term on the right-hand side in equation (10) represent the investment and the disinvestment, respectively.

55. The second term on the right-hand side of equation (10) shows the taxation of the routine profit,  $\hat{r}$ . As this profit is not part of the reallocated tax base, it can be subject to profit shifting and it is thus taxed at the weighted tax rate under profit shifting, determined by the profit shifting share  $\lambda$ .<sup>18</sup>

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<sup>18</sup> In this specification, the share of profits that are shifted from the routine and residual components are assumed to be the same. However, it is possible to consider a case where routine profits are less prone to profit shifting than non-routine profits.

Figure 2. Graphic representation of the taxation of profits under Pillar One and profit shifting



Note: In this case, the share of routine profits under Pillar One is assumed to face the same weighted profit shifting tax rate as residual profits for ease of interpretation. Results are however generalizable to different profit shifting propensities on the routine and residual components.

Source: OECD Secretariat.

56. The third term on the right-hand side shows the taxation of the residual profit,  $p + \delta - \hat{r}$ . The first term in square brackets shows the taxation of the residual profit allocated to market jurisdictions, taxed at the weighted reallocation tax rate,  $\tau_R$ . The second term in the square brackets shows the taxation of the residual profit that is *not* subject to reallocation. Since these profits are not reallocated, a share  $\lambda$  of these profits can still be shifted to low-tax jurisdictions, where it is taxed at rate  $\tau_{LT}$ ; the remaining residual profit is taxed in the high-tax jurisdiction at rate  $\tau_{HT}$ .

57. In line with the assumptions taken in the revenue analysis, this approach assumes that residual profit is reallocated proportionally from where they are currently located (Figure 2).

58. Substituting  $\tau_{PS} = \tau_{HT} - \lambda(\tau_{HT} - \tau_{LT})$  in equation (10) and simplifying yields the following expression.

$$R^{PS-P1} = -(1-A)(r+\delta)\left(\frac{1}{1+r}\right) + [\hat{r}(1-\tau_{PS}) + (p+\delta-\hat{r})(1-\tau_{PS} + \theta(\tau_{PS}-\tau_R))]\left(\frac{1}{1+r}\right) \quad (11)$$

59. As equation (11) shows, the economic profit for firms affected by reallocation includes a correction for the fact that not all economic profit is taxed at the weighted profit shifting tax rate,  $\tau_{PS}$ ; instead, a share  $\theta$  of the residual profit,  $(p + \delta - \hat{r})$ , is now taxed at the weighted reallocation tax rate,  $\tau_R$ .

60. Equation (11) is general enough to capture all four scenarios defined in Table 1. If Pillar One is not implemented and no reallocation occurs,  $\theta = 0$  and equation (11) collapses to equation (7), representing the *PS* case. If  $\lambda = 0$  and  $\theta = 0$ , equation (11) reverts to the standard case without profit shifting or reallocation; i.e. equation (2). If  $\lambda = 0$ , then  $\tau_{PS} = \tau_{HT}$  and equation (11) defines the *NPS - P1* case with no profit shifting but with reallocation.

61. Defining the weighted tax rate under profit shifting and reallocation as  $\tau_{PS-P1} = \tau_{PS} - \theta(\tau_{PS} - \tau_R)$ , the cost of capital can be likewise derived by setting  $R = 0$ .

$$\begin{aligned} \tilde{p}^{PS-P1} &= \frac{(1-A)(r+\delta) + \hat{r}\theta(\tau_{PS}-\tau_R)}{1-\tau_{PS} + \theta(\tau_{PS}-\tau_R)} - \delta \\ &= \frac{(1-A)(r+\delta) + \hat{r}\theta(\tau_{PS}-\tau_R)}{1-\tau_{PS-P1}} - \delta \end{aligned} \quad (12)$$

62. Substituting equation (11) into equation (1) yields an expression for the EATR given the possibility of profit shifting, i.e.  $EATR^{PS-P1}$ . The expression of the EMTR in this case, i.e.  $EMTR^{PS-P1}$  is given by substituting the cost of capital of equation (12) into the value in equation (4). Annex A provides the expressions for both effective tax rates as a function of the cost of capital following equation (6) and (4) respectively.<sup>19</sup>

63. However, it is important to emphasise that these expressions of the ETRs only apply to the subset of firms that is subject to Pillar One, i.e. that are in-scope and have profitability over the Pillar One profitability threshold. All other firms will not be affected by Pillar One and thus they would face the same ETRs as in the pre-implementation case, with the expressions of the ETRs following those outlined in Section 1.3.1.

<sup>19</sup> Note that the cost of capital will be affected by Pillar One if the routine return defined by the proposal is sufficiently low that it bites into the gross normal return.

64. To derive a measure of the cost of capital, EMTR and EATR at the level of the jurisdiction, a weight  $\vartheta^{P1}$  that represents the share of firms affected by Pillar One could be used. The cost of capital for a specific jurisdiction would then be given by the following expression.

$$\tilde{p}^{PS-P1} = \vartheta^{P1} \left[ \frac{(1-A)(r+\delta) + \hat{\theta}(\tau_{PS} - \tau_R)}{1 - \tau_{PS} + \hat{\theta}(\tau_{PS} - \tau_R)} \right] + (1 - \vartheta^{P1}) \left[ \frac{(1-A)(r+\delta)}{1 - \tau_{PS}} \right] - \delta \quad (13)$$

65. In equation (13), the first term would represent the cost of capital faced by firms affected by Pillar One and the second term, the cost of capital of those not affected by the proposal, weighted by the share of firms under each group.<sup>20</sup>

66. The weighted effect of Pillar One for a given jurisdiction can then be found as a departure from the baseline treatment in the absence of reform. For the cost of capital this would yield:

$$\Delta \tilde{p}^{PS-P1} = \vartheta^{P1} (\tilde{p}^{PS-P1} - \tilde{p}^{PS}). \quad (14)$$

67. The same approach could be used to derive similar expressions for the EATR and the EMTR. Taking the empirical distribution of firm-specific profitability into account could, therefore, provide further insights regarding the overall effects Pillar One on jurisdiction-level ETRs.

### 1.3.3. Pillar Two

68. Pillar Two comprises a number of interlocking rules that seek to address remaining BEPS challenges and ensure that large internationally operating businesses pay a minimum level of tax regardless of where they are headquartered or the jurisdictions they operate in, as described in the Pillar Two Blueprint report (OECD, 2020<sub>[4]</sub>). The principal mechanism to achieve this outcome is the income inclusion rule (IIR) together with the undertaxed payment rule (UTPR) acting as a backstop. These are complemented by the subject-to-tax rule and the switch-over-rule that contribute to the objective of ensuring minimum effective taxation. This paper concentrates on the modelling of the IIR.

69. The IIR would allow jurisdictions where the UPEs are located to top-up taxes on low-taxed profits earned by subsidiaries in other jurisdictions such that effective tax rates are brought up to a given minimum rate. Different options of tax rate blending, defined as the ability of taxpayers to combine high- and low-tax profits to arrive at a blended tax rate on all foreign profits can be considered. In this note, two blending options are explored: global blending and jurisdictional blending of all foreign profits. Another feature of relevance is the potential introduction of substance carve-outs as discussed in the Pillar Two Blueprint report (OECD, 2020<sub>[4]</sub>). The impact of blending and the potential introduction of a formulaic substance-based carve-out are discussed in turn in this section.

#### *Blending option: Global*

70. In the case of global blending (*GB*), the taxation of foreign profits is topped-up to the minimum rate if the effective tax rate of all foreign profits combined falls below the minimum tax threshold,  $\bar{\tau}$ . After the introduction of global blending, the effective tax rates will remain the same

<sup>20</sup> See Section 1.4.2 for the calibration of this parameter.

for those MNEs for which foreign profit is taxed, on average across all jurisdictions and entities, above the minimum tax threshold. Only those MNEs for which the blended rate on foreign profit falls below the minimum tax threshold will be affected, and their foreign profit will then be taxed at the minimum tax level. This implies that foreign profits will be taxed at the maximum between the two rates.

$$\tau_{LT}^{gb} = \text{Max}(\tau_{LT}, \bar{\tau}) \quad (15)$$

71. In line with the definition used in the previous section, the weighted average tax rate, accounting for shifted profits and the impact of global blending, is now given by  $\tau_{PS}^{gb} = \tau_{HT} - \lambda(\tau_{HT} - \tau_{LT}^{gb})$ ; the corresponding post-tax economic rent is expressed as follows.

$$R^{PS-GB} = -\frac{(1-A)(r+\delta)}{1+r} + \frac{(p+\delta)(1-\tau_{PS}^{gb})}{1+r} \quad (16)$$

72. Note that in (16), as the modelling framework considers an investment in the UPE, any deductions and allowances related to the investment are only granted in the jurisdiction where the investment takes place. Fiscal depreciation and other tax provisions determining the tax base in other jurisdictions do not affect the overall economic profit associated with the investment. This assumption implies that the minimum tax increases the taxation of foreign profits if the weighted average statutory rate across all jurisdictions to which profits are shifted is below the minimum tax rate<sup>21</sup>.

73. Setting (16) to zero yields an expression of the cost of capital given there is a minimum tax with global blending,  $\tilde{p}^{PS-GB}$ .

$$\tilde{p}^{PS-GB} = \frac{(1-A)(r+\delta)}{1-\tau_{PS}^{gb}} - \delta \quad (17)$$

74. Substituting equation (16) into equation (1) yields an expression for the EATR given the possibility of profit shifting, i.e.  $EATR^{PS-GB}$  in Annex A. The expression of the EMTR in this case, i.e.  $EMTR^{PS-GB}$  is given by substituting the cost of capital of equation (17) into the value in equation (4).

75. As for Pillar One, the expressions derived in this section display the impact of Pillar Two on ETRs and the cost of capital for firms affected by the proposals. However, certain firms might be out of scope depending on the design of Pillar Two. The overall impact of Pillar Two on ETRs can be estimated as a deviation from the baseline, i.e., the pre-implementation scenario, weighted by the share of firms that would be subject to Pillar Two,  $\vartheta^{P2}$ . The expression for the effect of Pillar Two with global blending on the cost of capital can be derived as:

$$\Delta\tilde{p}^{P2-GB} = \vartheta^{P2}(\tilde{p}^{PS-GB} - \tilde{p}^{PS}). \quad (18)$$

<sup>21</sup> In the empirical part discussed below, it is assumed that profits can potentially be shifted to any jurisdiction with a statutory rate below the statutory rate in the domestic jurisdiction.

*Blending option: Jurisdictional blending*

76. In the case of jurisdictional blending (*JB*) the taxation of foreign profits is topped-up to the minimum rate in a given jurisdiction if the effective tax rate faced in this jurisdiction is below the minimum tax threshold,  $\bar{\tau}$ . As discussed in more detail in Section 1.3.1, the tax rate applicable in the lower-tax jurisdiction,  $\tau_{LT}$ , can be understood as a weighted average rate across all the jurisdictions to which profits are shifted; i.e., those with statutory rates below the rate applicable in the jurisdiction where production takes place. This approach implies that for any given jurisdiction the weighted low-tax rate,  $\tau_{LT}$ , is given by the average tax rate in all jurisdictions  $i$  with tax rates  $\tau_{LT_i} < \tau_{HT}$ , i.e.  $N_{LT}$ , using the profits in each jurisdiction,  $\varpi_i$ , as weights.

$$\tau_{LT} = \varpi_1 \tau_{LT_1} + \varpi_2 \tau_{LT_2} + \dots + \varpi_i \tau_{LT_i} = \sum_i^{N_{LT}} \varpi_i \tau_{LT_i}. \quad (19)$$

77. After the introduction of jurisdictional blending, the weighted average low-tax rate  $\tau_{LT}^{jb}$  is topped-up as follows.

$$\begin{aligned} \tau_{LT}^{jb} &= \varpi_1 \text{Max}(\tau_{LT_1}, \bar{\tau}) + \varpi_2 \text{Max}(\tau_{LT_2}, \bar{\tau}) + \dots + \varpi_i \text{Max}(\tau_{LT_i}, \bar{\tau}) \\ &= \sum_i^{N_{LT}} \varpi_i \text{Max}(\tau_{LT_i}, \bar{\tau}) \end{aligned} \quad (20)$$

78. The weighted average tax rate accounting for profit shifting in the presence of a minimum tax with jurisdictional blending, yields  $\tau_{PS}^{jb} = \tau_{HT} - \lambda(\tau_{HT} - \tau_{LT}^{jb})$ . The post-tax economic profit when Pillar Two with jurisdictional blending applies is given by the following expression,

$$R^{PS-JB} = -\frac{(1-A)(r+\delta)}{1+r} + \frac{(p+\delta)(1-\tau_{PS}^{jb})}{1+r}. \quad (21)$$

79. Setting (21) to 0, yields the cost of capital with Pillar Two and jurisdictional blending.

$$\tilde{p}^{PS-JB} = \frac{(1-A)(r+\delta)}{1-\tau_{PS}^{jb}} - \delta \quad (22)$$

80. Substituting equation (21) into equation (1) yields an expression for the EATR given the possibility of profit shifting, i.e.  $EATR^{PS-JB}$ . The expression of the EMTR in this case, i.e.  $EMTR^{PS-JB}$  is given by substituting the cost of capital of equation (22) into the value in equation (4). Annex A provides the expressions for both effective tax rates as a function of the cost of capital following equation (6) and (4) respectively.

81. The expressions derived in this section display the impact of Pillar Two on ETRs and the cost of capital for firms affected by the proposals. However, certain firms might be out of scope depending on the design of Pillar Two. The impact of Pillar Two on ETRs can be estimated as a deviation from the baseline weighted by the share of firms that would be subject to Pillar Two,  $\vartheta^{P2}$ . The expression for the effect of Pillar Two with jurisdictional blending on the cost of capital can be derived as:

$$\Delta \tilde{p}^{P2-JB} = \vartheta^{P2} (\tilde{p}^{PS-JB} - \tilde{p}^{PS}) \quad (23)$$

### Substance-based carve-outs

82. In jurisdictions where Pillar Two is binding, i.e.  $(\tau_{LTi}, \bar{\tau}) = \bar{\tau}$ , the introduction of a carve-out implies that a share of the profits located in the respective jurisdiction would not be subject to taxation under Pillar Two. In general, the amount of profits that would be carved out could be determined by reference to tangible assets or employment located in the respective jurisdiction. For modelling purposes, only the carve-out on tangible assets is currently captured.<sup>22</sup>

83. Building on equation (21), the post-tax economic rent under Pillar Two with jurisdictional blending and a carve-out is given by the following expression, where  $x$  represents the percentage of tangible assets that is carved-out and  $k_i$  represents the tangible asset stock in jurisdiction  $i$ .

$$R^{PS-JB-CO} = -\frac{(1-A)(r+\delta)}{1+r} + \frac{(p+\delta)(1-\tau_{PS}^{jb})}{1+r} - \sum_i^{N_{LT}} \frac{\varpi_i x k_i (\tau_i - \text{Max}(\tau_i, \bar{\tau}))}{1+r} \quad (24)$$

84. In this equation  $\tau_{PS}^{jb}$  represents the weighted average tax rate applying to profits under the application of Pillar Two with jurisdictional blending. It is defined as  $\tau_{PS}^{jb} = \tau_{HT} - \lambda(\tau_{HT} - \tau_{LT}^{jb})$ , with  $\tau_{LT}^{jb}$  representing the weighted average low-tax rate under Pillar Two in equation (20). The first two terms in the post-tax economic rent correspond to the case of Pillar Two without a carve-out, equivalent to equation (21). The third term introduces the correction needed to model the carve-out, implying that a share of the profits in jurisdiction  $i$  equal to  $x$  per cent of the tangible assets in jurisdiction  $i$ ,  $k_i$ , will not be subject to the minimum tax,  $\bar{\tau}$ , but will be taxed at the tax rate applicable in jurisdiction  $i$ , i.e.,  $\tau_i$ . This effect is aggregated based on the share of profits located in each lower-tax jurisdiction,  $\varpi_i$ , for all jurisdictions where profits are shifted to, i.e.  $N_{LT}$ . The more generous the carve-out, the higher the share of profits that would not be subject to taxation<sup>23</sup> under Pillar Two; i.e., the closer the ETRs get to the value obtained under the baseline and consequently the lower the impact of Pillar Two.

85. Setting the post-tax economic rent equal to zero and solving for  $p$  yields the cost of capital for the case with a carve-out.

<sup>22</sup> The carve-out can be defined as a percentage of tangible assets and/or payroll. For this modelling approach, the nature of the carve-out does not matter as long as it can be translated into an equivalent percentage on the asset that is modelled.

<sup>23</sup> The presence of a carve-out may induce behavioural responses to locate the respective factor, e.g., tangible assets or employees, in jurisdictions with lower tax rates. For example, a carve-out for Pillar Two based on tangible assets might induce MNEs to locate tangible assets in low-tax jurisdiction to obtain a larger carve-out. However, relocating tangible assets (or employment) to jurisdiction with low tax rates would also result in a lower value of standard deductions in high tax jurisdictions, thus providing a countervailing incentive. The extent of the carve-out is another important factor, relocation might be less significant if the carve-out is not as generous and might not outweigh the costs of relocating. Finally, certain factors are less mobile and therefore relocation might be more costly.

$$\tilde{p}^{PS-JB-CO} = \frac{(1-A)(r+\delta) + \sum_i^{N_{LT}} \omega_i x k_i (\tau_i - \text{Max}(\tau_i, \bar{\tau}))}{1 - \tau_{PS}^{jb}} - \delta \quad (25)$$

86. Following equation (23), the impact of Pillar Two for the cost of capital and ETRs will be given by equation (25) in the presence of substance-based carve-outs.

$$\Delta \tilde{p}^{P2-JB-CO} = \vartheta^{P2} (\tilde{p}^{PS-JB-CO} - \tilde{p}^{PS}) \quad (26)$$

## 1.4. Empirical calibration

87. This section describes the empirical calibration of the theoretical model outlined in Section 1.3. The model is calibrated to reflect differences in the tax base and rate across jurisdictions using data from the OECD Corporate Effective Tax Rate survey. It also draws from microdata to inform the impact of the different design features of the provisions across jurisdictions. The analysis is consistent with the underlying data that feeds into the fiscal estimates for Pillars 1 and 2 discussed in Chapter 2 and Chapter 3 in (OECD, 2020<sub>[2]</sub>). Section 1.4.1 describes the calibration of the pre-implementation scenario, corresponding to case *PS* in Table 1. Sections 1.4.2 and 1.4.3 describe the post-reform scenarios for Pillar One and Pillar Two respectively, corresponding to the case *PS – P1* and *PS – P2* in Table 1.

### 1.4.1. Calibration of the Baseline Case

#### *General economic and model parameters*

88. The inflation rate is set to 1% and the real interest rate to 3% in line with the low interest rate and inflation scenario in Corporate Tax Statistics (OECD, 2020<sub>[9]</sub>). The pre-tax rate of return of the investment,  $p$ , is set to 20%, which is the standard value in the modelling of forward-looking ETRs (ZEW, 2015<sub>[11]</sub>; Hanappi, 2018<sub>[12]</sub>).

#### *Basic tax parameters*

89. Statutory CIT rates refer to the year 2019. Data is obtained from OECD Corporate Tax Statistics for 70 jurisdictions and from IBFD for two jurisdictions, i.e. Cyprus and Papua New Guinea.<sup>24</sup> The analysis covers the same set of jurisdictions, as for Corporate Tax Statistics (OECD, 2020<sub>[5]</sub>), excluding Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. This makes a total of 72 jurisdictions covered in the analysis.

<sup>24</sup> The statutory CIT rate for Saudi Arabia is considered to be 20%, which is the statutory CIT rate faced by non-Saudi investors. This corresponds to the rate a 100% foreign-owned company would face in Saudi Arabia. This rate can be higher in certain sectors of activity. While Saudi Arabia levies a zero-rate CIT on the share of profits owned by Saudi investors in sectors other than oil and gas, other tax liabilities arise for domestic investors, i.e., Zakat. Given the focus of the proposals on the taxation of foreign profits and given data limitations, the analysis abstracts from modelling of Zakat liabilities.

### *Asset depreciation*

90. The model takes into consideration four asset types: non-residential structures, tangible assets acquired intangibles and inventories; which are equally weighted to form a compound country-specific rate.<sup>25</sup> The fiscal depreciation rules refer to the year 2019 and are provided by country delegates through the OECD corporate effective tax rates data collection. The methodology is in line with that underlying Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>; OECD, 2020<sup>[9]</sup>). The financing of these investments is considered to be retained earnings, and for the purpose of simplification personal income taxation is not accounted for. Economic depreciation rates are in line with those in Corporate Tax Statistics. These are 2.69% for non-residential structures, 14.76% for tangible<sup>26</sup> assets and 25.48% for intangible assets.

### *Weighted average low-tax rate: $\tau_{LT}$*

91. The weighted average low-tax rate is calculated on the basis of equation (19), taking into account the statutory tax rates of all jurisdiction with a rate lower than the respective high-tax jurisdiction. This assumption corresponds to the idea that there may be incentives to shift profits even if statutory tax rate differential make up only a few percentage points. To arrive at a weighted average low-tax rate for each jurisdiction, each rate is weighted by the respective share of profits in total profits currently located in lower-tax jurisdictions.

92. The share of profits located in jurisdictions with lower tax rates is obtained from the empirical analysis underlying the revenue estimates for Pillars 1 and 2, as discussed in Chapter 2 and Chapter 3 in OECD (2020<sup>[2]</sup>). This analysis builds on a bilateral profit matrix by UPE, containing measures of MNE profits across around 200 jurisdictions based on an array of data sources, including Country-by-Country Reporting (CbCR), ORBIS, the OECD Activities of Multinationals (AMNE) dataset and other macroeconomic datasets (see Chapter 5 in OECD (2020<sup>[2]</sup>) for a description of these data sources). This ensures consistency between the ETR and revenue analyses.

### *Share of shifted profits: $\lambda$*

93. The empirical approach builds on the economic literature to approximate the share of shifted profits at the jurisdictional level. In particular, recent empirical studies have used financial account data to estimate the semi-elasticity of observed profits with respect to changes in tax rate differentials (Heckemeyer and Overesch, 2017<sup>[13]</sup>; Beer, Mooij and Liu, 2020<sup>[7]</sup>). In this literature, there are different ways in which tax differentials are computed. For instance, some papers use a weighted average across jurisdictions (Huizinga and Laeven, 2008<sup>[14]</sup>) and others use an unweighted average (Johansson et al., 2017<sup>[15]</sup>). This approach uses the semi-elasticity estimate from Johansson et al. (2017<sup>[15]</sup>) to calibrate the profit shifting parameter,  $\lambda_i$ , in the model based on equation (27).

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<sup>25</sup> It would be possible to aggregate these assets based on their average weight in jurisdictions' capital stock. This would be pursued as part of future work. The equal averaging used in this paper ensures alignment with the methodology in Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>).

<sup>26</sup> The economic depreciation rate of tangible assets is a weighted average rate of the economic depreciation of movable and immovable tangible assets using 2018 US capital stocks.

$$\lambda_i \cong \frac{\text{Shifted Profits}_{j,i}}{\text{Total Profits}_j} \cong \hat{\beta} \cdot \left( \tau_j - \frac{\sum_{i=1}^{N_{LT}} \tau_i}{N_{LT}} \right) \cdot \left( \frac{\sum_N \text{Assets}}{\sum_N \text{Profits}} \right) \quad (27)$$

94. The first term on the right-hand side of equation (27) is the tax sensitivity of observed profit, where profitability is proxied by the profit-to-assets ratio ( $\hat{\beta}$ ). This parameter is estimated to be around -0.1 in Johansson et al. (2017<sup>[15]</sup>). The second term is the tax rate differential computed as the difference between the parent jurisdiction and the average tax rate of all tax jurisdictions  $N_{LT}$  with a lower tax rate; this calculation of the tax rate differential aligns with the assumptions in this model, considering only outward shifting.<sup>27</sup> The third term is a calibration average from the sample, i.e. the average profit-to-assets ratio of 6.2%.

95. In typical firm-level datasets coverage with respect to jurisdictions and profit figures is known to suffer from limitations, especially in relation to investment hubs (Tørsløv, Wier and Zucman, 2018<sup>[16]</sup>). Despite the attempts to complement these with alternative data sources, estimates of the tax semi-elasticity of observed profits may be biased downwards in the literature, to the extent that particular jurisdictions where profits are likely to be shifted to or held in are not well covered. Likewise, it should be noted that profit shifting can be non-linear in nature, with more profit shifting directed towards lower tax jurisdictions (Dowd, Landefeld and Moore, 2017<sup>[17]</sup>). Annex B contains a robustness analysis on the sensitivity of the results to the tax semi-elasticity calibration.

#### 1.4.2. Calibration for Pillar One: Amount A

96. While the specific parameters are yet to be agreed upon by the Inclusive Framework, a set of parameters has been used for the empirical calibration of the model, on a without prejudice basis, to illustrate the likely effects of the proposals on ETRs. These parameters should not be seen as pre-judging any future decisions to be taken by the Inclusive Framework.

##### *Share of firms affected by Pillar One: $\vartheta^{P1}$*

97. The scope of Pillar One is among the decisions to be agreed upon by members of the Inclusive Framework. For the purpose of this analysis, Pillar One is assumed to apply to MNE groups above a global revenue threshold (EUR 750 million) and performing activities in ADS and CFB as described in the Pillar One Blueprint report (OECD, 2020<sup>[3]</sup>). These first two design features define MNEs in-scope vs. out-of-scope (below the revenue threshold; or above the threshold but not performing activities in ADS or CFB).

98. Furthermore, as outlined in Section 1.3.2. Pillar One applies to residual profits, which are isolated on the basis of a profitability threshold. In this calibration, the profitability threshold is defined as a 10% of profit before taxes (PBT) to turnover. Given this profitability threshold, MNE groups in-scope can be divided into those with profitability ratios above and below the

<sup>27</sup> It might be the case that profits are shifted to locations with higher statutory tax rates where the effective rate that applies to these profits are lower than that in the parent jurisdiction. This might be the case when preferential tax regimes are in place, e.g. patent boxes. Given that these preferential regimes are not modelled in this framework, profit shifting behaviour is assumed, as in most of the empirical literature, to respond to statutory tax rates.

threshold. Only MNE groups in-scope with profitability ratios above the threshold are deemed to earn residual profits and will, therefore, be subject to Pillar One.

99. Using consolidated firm-level data primarily from ORBIS, applying the revenue threshold, the scope of group MNE activities (ADS and CFB),<sup>28</sup> and the profitability threshold as defined above, it is possible to empirically identify those MNEs that would be affected by Pillar One, and by the same token those unaffected. For the purpose of calibrating the impact of Pillar One in a given jurisdiction, the share of affected MNEs in total turnover is used as a weight of their presence in the economy.<sup>29</sup> Specifically, the share of MNEs subject to Pillar One,  $\vartheta^{P1}$ , is calculated by dividing the turnover held by MNEs subject to Pillar One over the total turnover of MNEs operating in the respective jurisdiction. This share can then be substituted directly into equation (14), to calculate the weighted impact of Pillar One for each jurisdiction.

*Routine profit:  $\hat{r}$*

100. Given this subsample of MNEs subject to reallocation, routine profit<sup>30</sup>,  $\hat{r}$ , can be determined based on a two-step procedure (see Section 1.3.2). First, an empirical estimate of the share of routine profit in total profit, across all firms above the profitability threshold, is obtained<sup>31</sup> from firm-level data in ORBIS by dividing the profitability threshold,  $\bar{\varphi}$ , by observed firm-specific profitability ratios,  $\varphi_i$ . This share can be estimated as a fixed average across jurisdictions or it can be jurisdiction-specific; the current set of results uses the jurisdiction-specific figures allowing for cross-jurisdictional variation. Second, the share of routine profit is multiplied by asset-specific total profit as defined in the model,  $p + \delta$ , to arrive at an estimate of routine profit,  $\hat{r}$ .

*Share of profits reallocated to the market:  $\theta$*

101. The share of residual profits that are subject to reallocation to market jurisdictions is calibrated to 20%.

*Tax rate on reallocated profits:  $\tau_R$*

102. The tax rate on reallocated profits is calibrated using destination-based sales as the allocation key. Destination-based sales are approximated using the turnover of MNEs in a given jurisdiction minus MNE exports, both available from the Analytical Activities from Multinationals

<sup>28</sup> For a more extensive explanation of the methodology for the classification of MNE groups as ADS, CFB and out of scope, see Chapter 2 in OECD (2020<sub>[2]</sub>).

<sup>29</sup> While other variables such as investment may be desirable, the only variables available to us were based on tangible assets failing to account for importance of intangible assets in the asset mix. Profits were also another variable considered but the presence of losses can potentially bias the weights. Furthermore, EATRs are calculated for a firm in profit and loss-making provisions are not accounted for. Considering positive profits could also be an option but would fail to consider that Pillar One does not affect firms in a loss-making position.

<sup>30</sup> As is the case for other profit measures discussed in this note, routine profit can be interpreted equivalently as a profit measure or as a return on investment, given that the analysis considers a capital investment of one unit.

<sup>31</sup> To see this, consider the case where the firm-specific profitability ratio,  $\varphi_i$ , equals 12.5% and the profitability threshold is defined as  $\bar{\varphi} = 10\%$ . In this case, the share of routine returns in total profit is equal to 80% and the share of non-routine profits in total profits is equal to 20%.

database (Cadestin et al., 2018<sup>[17]</sup>). When data on activities of domestic MNEs is not available, extrapolation is used to circumvent data restrictions and achieve greater coverage (see Chapter 5 in OECD (2020<sup>[2]</sup>)). This variable is however not available on a bilateral basis, implying that the allocation key is fixed for all jurisdictions in the dataset. Given the location of destination-based sales, the tax rate on reallocated profits is constructed by weighting the statutory tax rate in each jurisdiction by its share in destination-based sales.<sup>32</sup> The weighted-average tax rate on reallocated profits is equal to 26% in this calibration.

### 1.4.3. Calibration for Pillar Two

103. While the specific parameters of the Pillar Two proposal are yet to be agreed upon by the Inclusive Framework, a set of parameters has been used for the empirical calibration of the model, on a without prejudice basis, to illustrate the likely effects of the proposals on ETRs. These parameters are stylised and, therefore, should not be seen as pre-judging any future decisions to be taken by the Inclusive Framework.

#### *Minimum tax threshold and blending options*

104. The minimum tax thresholds for global and jurisdictional blending, to be used in the empirical calibration on a without prejudice basis, are as shown in Table 3.

**Table 3. Pillar Two: Minimum tax rate thresholds considered for calibration**

Minimum tax threshold with global blending			Minimum tax threshold with jurisdictional blending		
12.5%	15%	17.5%	10%	12.5%	15%

Note: These values are chosen arbitrarily for calibration purposes and do not reflect political consensus.

Source: OECD Secretariat.

#### *Carve-out*

105. The Pillar Two Blueprint report envisages that the IIR and UTPR could include a formulaic substance-based carve-out based on a fixed percentage of payroll plus a fixed percentage of depreciation expenses on a broad range of tangible assets (OECD, 2020<sup>[4]</sup>). However, in this paper, a payroll carve-out is not included; the carve-out of depreciation expenses is approximated on the basis of the value and location of tangible assets. Specifically, the empirical calibration assumes a carve-out based on a 10% on tangible assets,  $x = 0.1$ . In order to assess the impact of such a carve-out, the location of assets by UPE is obtained from the tangible asset matrix described in Chapter 5 in OECD (2020<sup>[2]</sup>). The effect of the carve-out is calibrated based on the distribution of the tangible assets by UPE across jurisdictions. In addition, it is assumed that an MNE group that claims the benefit of the carve-out should be required to make a corresponding and proportional adjustment to the covered taxes for the calculation of the ETR. The alternative option (i.e. not making a corresponding and proportional adjustment to the covered taxes) would be difficult to model with the available data.

#### *Share of firms affected by Pillar Two: $\vartheta^{P2}$*

106. A EUR 750 million threshold in global turnover is assumed to apply for Pillar Two. Only MNE groups above the threshold are assumed to be in-scope for Pillar Two. Among firms in-

<sup>32</sup> Note that the effect of nexus elements of the Pillar One proposal are not accounted for in this paper.

scope, the existence of a carve-out would mean that only a share of the profits for these firms would be subject to Pillar Two.

107. Using firm-level consolidated financial accounts data from ORBIS, it is possible to approximate the share of MNE groups potentially affected by Pillar Two by applying the EUR 750 million global revenue threshold.

108. The share of MNEs that could be subject to Pillar Two,  $g^{P2}$ , is calculated by dividing the turnover held by MNE groups above the revenue threshold over the total turnover of firms operating in the respective jurisdiction. Turnover is used as a weight of their presence in the economy.<sup>33</sup> This share can then be substituted directly into equation (24), to calculate the weighted impact of Pillar Two for each jurisdiction. This calibration may tend to overestimate the impact of Pillar Two, as there may be firms above the EUR 750 million revenue threshold that will not be subject to Pillar Two, depending on the design of the proposals.

#### *Other assumptions*

109. The empirical calibration focuses on the impact of the proposals on real investment undertaken in the ultimate parent jurisdiction. As discussed in Section 1.1 the MNE structure is held constant and the case of a newly established subsidiary is not considered. Profit shifting, as introduced in Section 1.3.1 refers to situations where profits are shifted purely for tax reasons; the weighted average low-tax rate and the corresponding profit shifting share should thus be interpreted only in these terms.

110. As shown in Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>), certain jurisdictions lack the tax provisions and administrative infrastructure to operate a full-fledged CIT system. This is typically the case in jurisdictions where the statutory rate is zero. Given this lack of infrastructure in zero-tax jurisdictions, the impact of the proposals on real investment in those jurisdictions will strongly depend on the tax policy responses by the respective government following the implementation of the Pillar One and Pillar Two proposals. For this reason, and to operate on a without prejudice basis, the empirical modelling does not consider the impact of such, more wide-ranging, tax policy changes in the case of zero-tax jurisdictions. The impact of the proposals on foreign profits shifted into these jurisdictions is, nonetheless, accounted for.

111. In the case of Pillar Two with jurisdictional blending, the assumption used in this estimation is that jurisdictions with a statutory rate below the minimum tax will increase their rates to match the minimum tax in order to avoid revenue losses to other jurisdictions.

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<sup>33</sup> The same data limitations outlined for Pillar One in footnote 30 apply also for Pillar Two.

## 1.5. Empirical Results

112. The assessment of the proposals' implications on the volume and location of investment is based on the comparison of forward-looking ETRs on investment in a given jurisdiction before and after the implementation of the proposals. The baseline case accounts for profit shifting activities by MNEs (scenario *PS* in Table 1). The analysis covers both average effective tax rates (EATRs), which influence MNEs' investment location decisions, and marginal effective tax rates (EMTRs), which influence the scale of their investments. The first part of this section concentrates on the impact of Pillar One (i.e. case *PS – P1* in Table 1) and the second part on the impact of Pillar Two (i.e. case *PS – P2* in Table 1). However, the effects of each of the Pillars are modelled independently of one another.

### 1.5.1. Pillar One: Amount A

113. Table 4 presents the expected change in ETRs following the introduction of Pillar One using the assumptions on policy design outlined in Section 1.4.2. The results are broken down by the income level of the jurisdiction where the investment takes place, i.e., the UPE jurisdiction.

114. The results show that Pillar One would have relatively limited impacts on group-level ETRs. The global GDP-weighted EATR is expected to increase on average 0.01 percentage points following the introduction of Pillar One, with the EMTR increasing roughly by the same amount. The result of this slight increase is directly linked to the design of Pillar One. Two main factors play a role. First, many MNEs would not be affected by the proposals if Pillar One is restricted to MNEs that perform activities within the definition of ADS and CFB with revenues above the EUR 750 million threshold.<sup>34</sup> Even if certain firms are in-scope, their profitability might be below the residual profit threshold, limiting further the impact of Pillar One. Second, for MNEs above the profitability threshold, the actual changes in ETRs would be small, since only a modest amount, in this calibration, is allocated to market jurisdictions and thus potentially taxable at higher statutory CIT rates.<sup>35</sup>

115. In certain cases, Pillar One might lead to a small decrease in EATRs that can be explained by revenues being reallocated to market jurisdictions with lower taxation than before the application of the Pillar, e.g., if profits were taxed before at a weighted rate of 25% and a share is reallocated to market jurisdictions with a lower average rate than 25%. Taken together, Pillar One implies that profits located in lower (higher) tax jurisdictions may be reallocated to jurisdictions with a higher (lower) statutory CIT rate, leading to an increase (decrease) in their taxation. While the implementation of Pillar One could potentially have some impact on the location and volume of investment by MNEs, the limited changes in ETRs suggest that these effects would be small. Most of the average global GDP-weighted effects are driven by ETR changes related to investments located in investment hubs.

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<sup>34</sup> To illustrate the limited impact of the design scope of Pillar One being modelled, the turnover of firms in-scope of Pillar One as defined above only account for 10% of the turnover of all MNEs in the analysis.

<sup>35</sup> When looking in isolation to the subset of firms affected by Pillar One (with revenues over EUR 750 million, performing activities within the definition of CFB or ADS and with residual profits defined using a 10% threshold), the change in ETRs is estimated to be of to 0.12 percentage points for the EATR and 0.07 percentage points for the EMTR. However, these figures fail to reflect the scope restrictions of Pillar One that will only target a subset of MNEs.

**Table 4. Estimated expected impact of Pillar One on ETRs, all firms, by income group**

GDP-weighted average changes in ETRs, in percentage points

By income group	Number of jurisdictions	Average change in the EATR (percentage points)	Average change in the EMTR (percentage points)
High Income	35	0.02	0.01
Low-Middle Income	21	-0.01	0
Investment Hubs	16	0.11	0.05
<b>All jurisdictions in the analysis</b>	<b>72</b>	<b>0.01</b>	<b>0.01</b>

Note: ETRs are calculated at the MNE group level assuming an investment in the jurisdiction of the ultimate parent entity. For modelling purposes, Pillar One (Amount A only) considers a 10% profitability threshold on Profit/Turnover, 20% reallocation percentage to market and a scope that is restricted to ADS and CFB activities. Estimates include all jurisdictions in Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>) with the exception of Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. Jurisdiction groups are based on the World Bank classification of countries by income group. Investment hubs are defined as jurisdictions with a total inward FDI position above 150% of GDP.

Source: OECD Secretariat calculations.

### 1.5.2. Pillar Two: Global Anti-Base Erosion Proposal

116. Table 5 presents the expected change in ETRs following the introduction of Pillar Two using the assumptions on proposal design and applicable tax rates outlined in Section 1.4.2, including a substance-based carve-out. The results for Pillar Two do not account for the effect of Pillar One, i.e., their interaction is not considered. However, given the reduced estimated impact of Pillar One Amount A on ETRs, the interaction effect is thought to have only limited impacts on the overall magnitude of the Pillar Two effects.<sup>36</sup> As with Pillar One, it is assumed that the new provisions only apply to MNEs above the revenue threshold of EUR 750 million. Panel A and B present the results for the change in EATRs and EMTRs broken down by the level of income of the ultimate parent jurisdiction where the investment takes place.<sup>37</sup>

117. Pillar Two would lead to modest increases in EATRs and EMTRs across all income groups, independent of the type of blending (Panel A and B in Table 5). In general, this increase is driven by the proportion of outward-shifted profits in each jurisdiction and the statutory CIT rates applicable to these profits pre-implementation. The impact of Pillar Two would be greater, the higher the proportion of profits shifted to jurisdictions below the minimum tax threshold is (see Annex B for a sensitivity analysis of the impact of the proposals to different calibrations of the profit shifting intensity). Similarly, larger increase in EMTRs are observed in jurisdictions with ETRs currently below the minimum tax threshold, e.g., investment hubs, implying that investment impacts are likely to be more significant in these jurisdictions.

<sup>36</sup> Given the reduced estimated impact of Pillar One Amount A on ETRs, the interaction effect is thought to have a negligible impact on the overall magnitude of the Pillar Two effects. Estimates of the revenue effect that account for the interaction between the two pillars do arrive at the same conclusion. The estimated revenue gains from Pillar Two are modestly reduced by taking into account the interaction with Pillar One (see Chapter 3 in OECD (2020<sup>[2]</sup>)).

<sup>37</sup> Note that to account for the assumption that Pillar Two only applies to MNEs with revenues above EUR 750 million, the impact of Pillar Two is weighted by the share of turnover from MNEs above the EUR 750 million threshold. While this subset of MNEs still includes over 90% of the turnover of all firms in the economy, only those with low-taxed profits will be affected by Pillar Two.

**Table 5. Estimated expected impact of Pillar Two on ETRs, all firms, by income group**

GDP-weighted average changes in ETRs, in percentage points

	Number of jurisdictions	Minimum tax with Global Blending			Minimum tax with Jurisdiction Blending		
		12.50%	15%	17.50%	10%	12.50%	15%
<b>Panel A: Expected change in EATR of investments (percentage points)</b>							
By income group							
Zero-tax jurisdictions	6	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
High Income	35	0.05	0.1	0.24	0.27	0.34	0.46
Low-Middle Income	21	0.01	0.05	0.21	0.2	0.26	0.33
Investment Hubs	10	0.63	0.85	1.33	0.71	0.95	1.54
<b>All jurisdictions in the analysis</b>	<b>66</b>	<b>0.06</b>	<b>0.12</b>	<b>0.27</b>	<b>0.26</b>	<b>0.34</b>	<b>0.46</b>
<b>Panel B: Expected change in EMTR of investments (percentage points)</b>							
By income group							
Zero-tax jurisdictions	6	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
High Income	35	0.2	0.4	0.94	1.11	1.42	1.9
Low-Middle Income	21	0.03	0.19	0.83	0.85	1.1	1.42
Investment Hubs	10	2.21	3.02	4.86	2.59	3.33	4.65
<b>All jurisdictions in the analysis</b>	<b>66</b>	<b>0.22</b>	<b>0.43</b>	<b>1.06</b>	<b>1.08</b>	<b>1.39</b>	<b>1.85</b>

Note 1: ETRs are calculated at the MNE group level assuming an investment in the jurisdiction of the ultimate parent entity. For modelling purposes, Pillar Two is considered to apply to businesses with revenues above EUR 750 million and a 10% carve-out on depreciation expenses (approximated using the value of tangible assets) is modelled in the case of a minimum tax with jurisdictional blending. In addition, it is assumed that an MNE group that claims the benefit of the carve-out should be required to make a corresponding and proportional adjustment to the covered taxes for the calculation of the ETR. The alternative option (i.e. not making a corresponding and proportional adjustment to the covered taxes) would be difficult to model with the available data.

Note 2: Real investments in jurisdictions without a full-fledged CIT system are not considered; data for these jurisdictions are set to 'not determined' (n.d.) in the table, but profits can still be shifted to these jurisdictions. Estimates include all jurisdictions in Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>) with the exception of Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. Jurisdiction groups are based on the World Bank classification of countries by income group. Investment hubs are defined as jurisdictions with a total inward FDI position above 150% of GDP.

Source: OECD Secretariat calculations.

118. Under global blending, the expected change in EATRs and EMTRs is generally lower than under jurisdictional blending. A minimum tax of 15% with global blending would yield an increase in EATRs of 0.12 percentage points on average; while a minimum tax of 12.5% with jurisdictional blending would increase EATRs by 0.34 percentage points (cf. Panel A). The impact on EMTRs (cf. Panel B) closely matches this pattern.

119. The lower impact of Pillar Two with global blending is due to the possibility of mixing foreign low- and high-tax income, which dampens the effect of the minimum tax, as low tax rates applicable to some of a MNE's foreign profits can be compensated with higher tax rates to the remaining share of foreign profits. Jurisdictional blending, on the other hand, increases all profits taxed below the threshold in a given jurisdiction up to the minimum tax rate, therefore leading to comparatively larger impacts on the ETRs.

### 1.5.3. Pillar One and Pillar Two: The combined effect

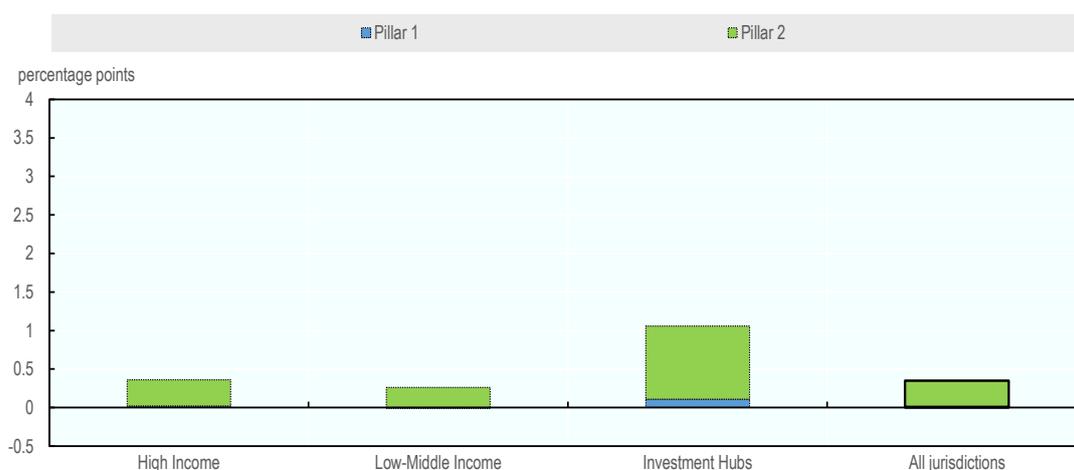
120. Figure 3 shows the combined additive effects of Pillar One and Pillar Two, excluding potential interaction effects. Taken together, the combined effect of Pillar One and Two in ETRs

is likely to be small with Pillar Two having a greater impact than Pillar One. If the interaction was accounted for, it would likely reduced the overall impact of the proposals on ETRs but only very slightly given the modest impact of Pillar One. This result is in line with the findings on the revenue estimate (see Chapter 2 in OECD (2020<sub>[19]</sub>)).

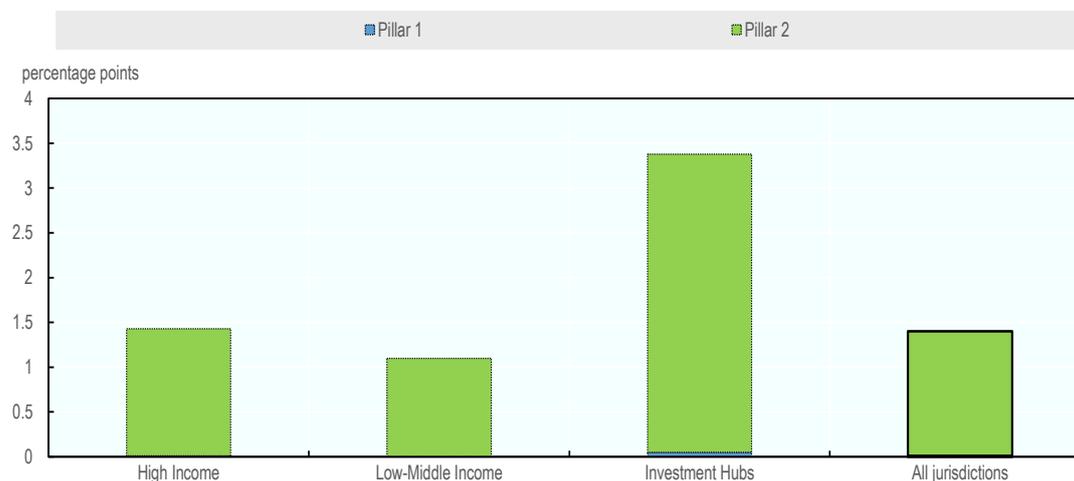
**Figure 3. Changes in Effective Tax Rates due to Pillars 1 and 2**

ETRs are calculated at the MNE group level assuming an investment in the jurisdiction of the ultimate parent entity; the vertical axis shows GDP-weighted average changes in ETRs in percentage points by income group.

*Panel A: Effective Average Tax Rates*



*Panel B: Effective Marginal Tax Rates*



Note 1: Pillar One (Amount A only) considers a 10% profitability threshold on Profit/Turnover, 20% reallocation percentage to market and a scope that is restricted to ADS and CFB activities. Pillar Two considers a 12.5% rate with jurisdiction blending and a 10% carve-out on depreciation expenses (approximated using the value of tangible assets). In addition, it is assumed that an MNE group that claims the benefit of the carve-out should be required to make a corresponding and proportional adjustment to the covered taxes for the calculation of the ETR. The alternative option (i.e. not making a corresponding and proportional adjustment to the covered taxes) would be difficult to model with the available data. A revenue threshold of EUR 750 million is assumed, on a without prejudice basis, for the modelling of both Pillars. The combined effect does not include interaction effects of both pillars.

Note 2: The number of jurisdictions is restricted to those available in the OECD's Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>), with the exception of Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. The figure excludes the impact of Pillar One on zero-tax jurisdictions for alignment with Pillar Two estimates. Real investments in jurisdictions without a full-fledged CIT system are not considered; those jurisdictions are thus excluded from the figure, but profits can still be shifted to these jurisdictions (cf. Section 1.4.3). Jurisdiction groups are based on the World Bank classification of countries by income group. Investment hubs are defined as jurisdictions with a total inward FDI position above 150% of GDP. The High Income category covers 35 jurisdictions, the Low-Middle Income category covers 21 jurisdictions and the Investment Hubs category covers 10 jurisdictions.

Source: OECD Secretariat calculations.

## 1.6. Conclusion

121. The Pillar One and Pillar Two proposals would introduce new rules into international taxation, affecting global investment through their impacts on the incentives faced by MNEs and governments. This paper has presented a methodology to estimate the direct impact of the proposals on investment costs. The analysis of MNE group-level ETRs suggests modest effects of Pillar One and Pillar Two on MNE group-level EATRs and EMTRs. The global GDP-weighted average change in the EATRs from Pillar One and Pillar Two is estimated to be of 0.4 percentage points,<sup>38</sup> representing a small impact compared to 24%, i.e., the weighted average EATR in the sample, or the 6 percentage point reduction in the EATR observed in the period 1999-2017 (see Chapter 4 in OECD (2020<sup>[2]</sup>)).

122. In line with these results, the proposals would also lead to a reduction in the tax rate differentials, with the effects of Pillar One and Pillar Two both reinforcing each other. Under Pillar Two, for example, the difference between the highest and lowest EATRs in the sample would decline by 2.8 percentage points in the case of a minimum tax with jurisdictional blending at 12.5%. This reduced dispersion in ETRs across jurisdictions would decrease profit shifting incentives and increase the relevance of non-tax factors, e.g., workforce education, skill supply, infrastructure quality, strength of legal and regulatory systems, in determining the scale and location of investments.

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<sup>38</sup> Pillar One (Amount A only) considers a 10% profitability threshold on Profit/Turnover, 20% reallocation percentage to market and a scope that is restricted to ADS and CFB activities. Pillar Two considers a 12.5% rate with jurisdiction blending and a 10% carve-out on depreciation expenses (approximated using the value of tangible assets), see Section 1.4 for additional modelling assumptions. The combined effect expressed here does not account for the interaction between the two pillars. However, this effect is deemed to be very small, given the modest impact of Pillar One. This is supported by findings from the revenue estimate that arrive at similar conclusions (see Chapter 2 in OECD (2020<sup>[2]</sup>))

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## Annex A. Additional Formulae

123. This annex spells out the formulae to estimate the EMTRs and EATRs from the expressions of the cost of capital derived in the text for each scenario of analysis outlined in Table 1 and for the different design features analysed. Alternative calculations of the EATRs can be obtained as explained in the text by direct substitution of the post-tax economic rent in equation (1).

**Table A.1. Effective marginal and average tax rates for each scenario described in Table 1**

Scenario	Design variants		
Baseline scenario		$EATR^{PS} = \frac{\tilde{p}^{PS} - r + \tau_{PS}(p - \tilde{p}^{PS})}{p}$	(A.1)
		$EMTR^{PS} = \frac{\tilde{p}^{PS} - r}{r}$	(A.2)
Reform Scenario: Pillar One		$EATR^{PS-P1} = \frac{\tilde{p}^{PS-P1} - r + \tau_{PS-P1}(p - \tilde{p}^{PS-P1})}{p}$	(A.3)
		$EMTR^{PS-P1} = \frac{\tilde{p}^{PS-P1} - r}{r}$	(A.4)
Global blending		$EATR^{PS-GB} = \frac{\tilde{p}^{PS-GB} - r + \tau_{PS}^{gb}(p - \tilde{p}^{PS-GB})}{p}$	(A.5)
		$EMTR^{PS-GB} = \frac{\tilde{p}^{PS-GB} - r}{r}$	(A.6)
Reform Scenario: Pillar Two	Jurisdictional blending	$EATR^{PS-JB} = \frac{\tilde{p}^{PS-JB} - r + \tau_{PS}^{jb}(p - \tilde{p}^{PS-JB})}{p}$	(A.7)
		$EMTR^{PS-JB} = \frac{\tilde{p}^{PS-JB} - r}{r}$	(A.8)
Substance-based carve-outs		$EATR^{PS-JB-CO} = \frac{\tilde{p}^{PS-JB} - r + \tau_{PS}^{jb}(p - \tilde{p}^{PS-JB})}{p}$	(A.9)
		$EMTR^{PS-JB-CO} = \frac{\tilde{p}^{PS-JB-CO} - r}{r}$	(A.10)

Source: OECD Secretariat.

## Annex B. Sensitivity Analysis

### Estimating the tax semi-elasticity based on micro- and macroeconomic data

124. Empirical evidence suggests that corporate tax bases are sensitive to changes in the ETR differential. Estimates on how sensitive the tax base is vary across studies and, most significantly, across data sources. Studies based on microeconomic data, mostly using financial accounts, tend to estimate tax semi-elasticities around one, i.e., a one percentage point change in the tax rate differential yields a change of one percent in reported profits (Heckemeyer and Overesch, 2017<sup>[13]</sup>; Beer, Mooij and Liu, 2020<sup>[7]</sup>). Studies based on aggregate data tend to estimate significantly larger tax semi-elasticities, ranging from over one to around four depending on the study (Clausing, 2020<sup>[20]</sup>; Clausing, 2018<sup>[21]</sup>). Meta-studies surveying both macro- and micro-based estimates situate the average effect at around one, while recognising the heterogeneity among estimates as well as a possible increase over time.

125. The discrepancies between the estimates in macro- and micro-based studies are still to be reconciled. However, several potential factors have been discussed in the literature. A key weakness of micro-based studies, based typically on financial accounts, is the limited coverage of subsidiaries located in zero tax jurisdictions and investment hubs (Clausing, 2016<sup>[22]</sup>; Tørsløv, Wier and Zucman, 2018<sup>[16]</sup>). This could be particularly relevant since evidence suggests that profits are disproportionately shifted to jurisdictions with low or zero tax rates<sup>39</sup> (Clausing, 2020<sup>[20]</sup>; Dowd, Landefeld and Moore, 2017<sup>[17]</sup>), causing a potential downward bias in tax semi-elasticities estimated based on these data sources.

126. Another explanation for the larger estimates of semi-elasticities obtained from aggregated sources could be related to the fact that they reflect long-term rather than short-term responses, capturing a larger variety of profit shifting channels compared to studies based on microeconomic data. However, a potential overestimation of the semi-elasticity could also occur due to the inability to capture firm-level heterogeneity in aggregate data (Beer, Mooij and Liu, 2020<sup>[7]</sup>).

127. Given the variation in the estimates of the tax semi-elasticity in the literature, this annex seeks to provide a sensitivity analysis of the impact of this parameter on the ETR changes due to the introduction of the Pillar One and Pillar Two proposals.

### The baseline specification used for the ETR calculations

128. The estimate of the tax semi-elasticity used in the baseline specification of the ETR calculations, discussed in the main text in Section 1.4.1 and underlying the results in Chapter 4 in OECD (2020<sup>[2]</sup>), follows the approach outlined in Box 2 in Johansson et al. (2017<sup>[15]</sup>), to be fully aligned with prior work on BEPS. The preferred estimation yields a semi-elasticity<sup>40</sup> of around 1.6. This estimate is higher than the

<sup>39</sup> Dowd et al. find that the tax elasticity is much higher for jurisdictions with a low tax rate, i.e., they estimate that a change from 5% to 4% in the statutory rate increases reported income by 4.7%, while a change in the statutory CIT rate from 30% to 29% results in a 0.7 % change in reported income.

<sup>40</sup> The estimation in this paper has profit-to-assets as the dependent variable and the tax rate differential as an independent among other covariates. Using the estimates in Box 2, a one-percentage point tax difference leads to a

consensus estimate obtained in a recent meta-study that situates the semi-elasticity at around one (Heckemeyer and Overesch, 2017<sub>[13]</sub>; Beer, Mooij and Liu, 2020<sub>[7]</sub>). However, the use of a larger estimate can be justified on the basis of the potential non-linearities in profit shifting with respect to ETRs, as well as to account for a potential downwards bias due to the lack of coverage of investment hubs in financial accounts data. In any case, using a larger semi-elasticity unambiguously increases the effect of Pillar One and Pillar Two proposals on investment costs as captured in the ETR analysis<sup>41</sup>.

$$\lambda_{ji} \cong \frac{\text{Shifted Profits}_{j,i}}{\text{Total Profits}_j} \cong \hat{\beta} \cdot \left( \frac{\sum_N \text{Assets}}{\sum_N \text{Profits}} \right) \cdot \left( \tau_j - \frac{\sum_{i=1}^{N_{LT}} \tau_i}{N_{LT}} \right) = 1.6 * \left( \tau_j - \frac{\sum_{i=1}^{N_{LT}} \tau_i}{N_{LT}} \right)$$

129. In this baseline specification, the tax rate differential is computed as the difference with respect to the unweighted average statutory tax rate of low-tax jurisdictions where profits are located. The empirical distribution of low-tax profits is used as a weight to achieve a country-level aggregate (see Section 1.4.1).

### Robustness to alternative specifications

130. In order to assess the robustness of the results to different estimates of the semi-elasticity, two alternative scenarios are considered. The first scenario uses a tax semi-elasticity of 1, in line with estimates obtained using microeconomic data, i.e., hereafter referred to as the micro-level estimate. The second uses a tax semi-elasticity of 3, broadly in line with estimates using aggregated data, i.e., hereafter referred to as the macro-level estimate; although it is slightly higher than the average of 2.3 reported in Beer et al. (2020<sub>[7]</sub>). However, given the significant variation across macro-based studies, the value of the tax semi-elasticity in the second scenario is calibrated to match the most recent studies (Clausing, 2020<sub>[20]</sub>; Clausing, 2018<sub>[21]</sub>). The baseline estimate of 1.6 based on Johansson et al. (2017<sub>[15]</sub>) used to produce the results on Section 1.5 lies in between the micro- and macro-based estimates and stands as the preferred specification.<sup>42</sup>

131. As displayed in Figure B.1, the extent of profit shifting based on the micro- (macro-) level estimate will be lower (higher) than using the baseline estimate. The unweighted average outwards profit shifting estimate  $\lambda$  takes the value of 14% in the baseline specification. Using the micro-level estimate, the corresponding figure would drop to an average of 9% while it would increase to 18% using the macro-level estimate.

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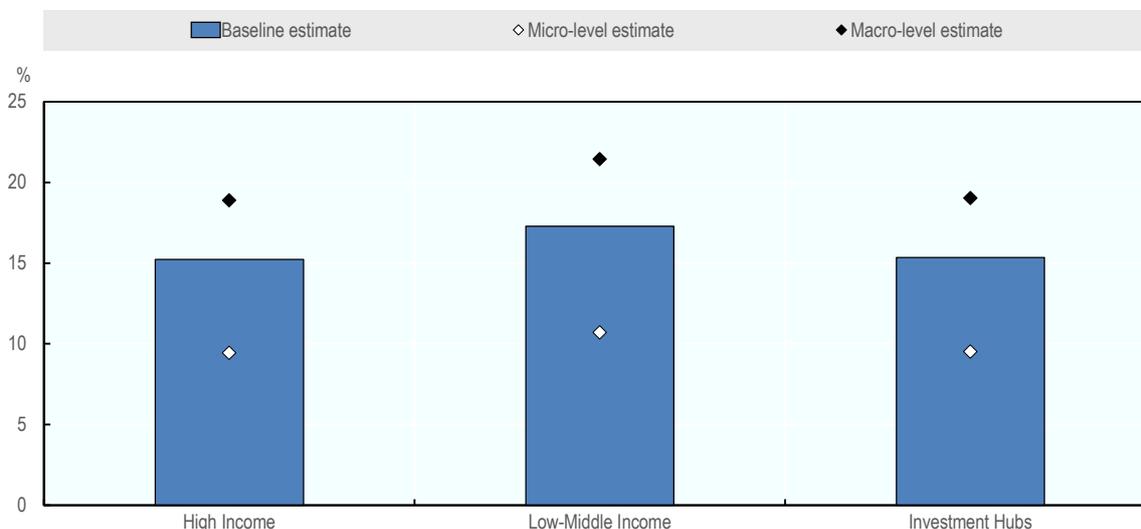
reduction of 0.1 percentage points in the profit-to-asset ratio (i.e., dependent variable in the estimation). Given that the profit-to-asset ratio in the sample is of 0.062, this will reduce profits by 1.6% (i.e., 0.1/0.062=1.6).

<sup>41</sup> The higher the amount of profits that are shifted to low-tax jurisdictions below the minimum tax rate, the higher the impact of Pillar Two. Likewise, under Pillar One, the lower the tax at which profits were taxed, the higher the impact of relocation to jurisdictions with a higher average tax rate.

<sup>42</sup> Note that the use of the micro-level estimate might be downwards biased due to the lack of universal coverage of profits in low-tax jurisdictions as well as the presence of non-linearities not accounted for in the estimation. The macro-level estimate is biased towards the higher end of the spectrum and might also be an overestimate due to the failure to control for firm-specific characteristics.

### Figure B.1. Sensitivity analysis: average outwards profit shifting, by income group of the UPE

This estimate of outward shifted profits corresponds to the model parameter  $\lambda$



Note: The number of jurisdictions is restricted to those available in the OECD's Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>), with the exception of Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. Real investments in jurisdictions without a full-fledged CIT system are not considered; those jurisdictions are thus excluded from the figure, but profits can still be shifted to these jurisdictions (Section 1.4.3). The High Income category covers 35 jurisdictions, the Low-Middle Income category covers 21 jurisdictions and the Investment Hubs category covers 10 jurisdictions. Jurisdiction groups are based on the World Bank classification of countries by income group. Investment hubs are defined as jurisdictions with a total inward FDI position above 150% of GDP.

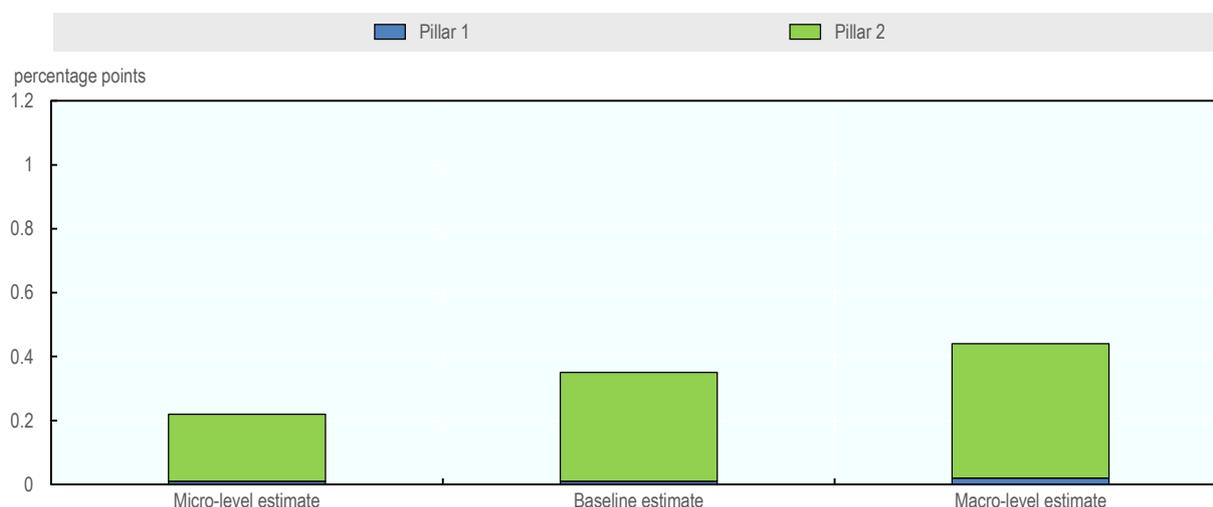
Source: OECD Secretariat calculations.

132. Figure B.2 displays ETR changes due to Pillar One and Pillar Two for the different estimates of the tax semi-elasticity, including the baseline estimate. As shown in the figures, the use of different assumptions regarding the profit shifting elasticity does not qualitatively change the results, with Pillar Two having a greater impact on ETRs than Pillar One. In general, the higher the tax sensitivity of reported profits, the higher the impact that Pillar Two will have as a minimum effective tax. The weighted average change in the EATR due to the implementation of the proposals is estimated at 0.22 and 0.44 using the micro- and macro-level estimates, respectively, with the change being at 0.35 using the baseline estimate. The same pattern arises for EMTRs: the weighted average change is estimated at 0.88 using the micro-level estimate and 1.72 using the macro-level estimate, with the estimated change using the baseline estimate at 1.4. Results by income groups are presented in Table B.1.

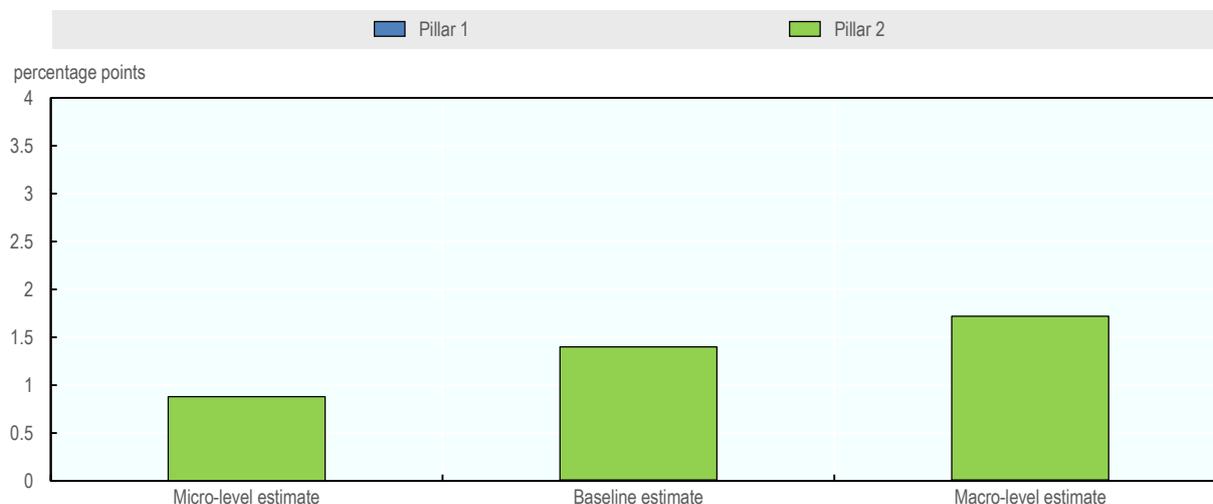
## Figure B.2. Sensitivity analysis: Changes in Effective Tax Rates due to Pillar One and Pillar Two

ETRs are calculated at the MNE group level assuming an investment in the jurisdiction of the ultimate parent entity; the vertical axis shows GDP-weighted average changes in ETRs in percentage points.

*Panel A: Effective Average Tax Rate*



*Panel B: Effective Marginal Tax Rates*



Note 1: The semi-elasticity is equal to 1, 1.6 and 3 for the micro-level, baseline and macro-level estimate. Note that the scale in Panel A that refers to EATRs and Panel B that refers to EMTRs is different for better readability of the results. Pillar One (Amount A only) considers a 10% profitability threshold on Profit/Turnover, 20% reallocation percentage to market and a scope that is restricted to ADS and CFB activities. Pillar Two considers a 12.5% rate with jurisdiction blending and a 10% carve-out on depreciation expenses (approximated using the value of tangible assets). In addition, it is assumed that an MNE group that claims the benefit of the carve-out should be required to make a corresponding and proportional adjustment to the covered taxes for the calculation of the ETR. The alternative option (i.e. not making a corresponding and proportional adjustment to the covered taxes) would be difficult to model with the available data. A revenue threshold of EUR 750 million is assumed, on a without prejudice basis, for the modelling of both Pillars. The combined effect does not include interaction effects of both pillars.

Note 2: The number of jurisdictions is restricted to those available in the OECD's Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>), with the exception of Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. The figure excludes the impact of Pillar One on zero-tax jurisdictions for alignment with Pillar Two estimates. Real investments in jurisdictions without a full-fledged CIT system are not considered; those jurisdictions are thus excluded from the figure, but profits can still be shifted to these jurisdictions (cf. Section 1.4.3). Jurisdiction groups are based on the World Bank classification of countries by income group. Investment hubs are defined as jurisdictions with a total inward FDI position above 150% of GDP. The High Income category covers 35 jurisdictions, the Low-Middle Income category covers 21 jurisdictions and the Investment Hubs category covers 10 jurisdictions.

Source: OECD Secretariat calculations.

**Table B.1. Sensitivity analysis: Changes in Effective Tax Rates due to Pillar One and Pillar Two**

GDP-weighted average changes in ETRs in percentage points, by income group

Income group	Tax semi-elasticity estimate	Changes to the EATR		Changes to the EMTR	
		Pillar One	Pillar Two	Pillar One	Pillar Two
High Income	Micro-level estimate	0.01	0.21	0.01	0.89
	Baseline estimate	0.02	0.34	0.01	1.42
	Macro-level estimate	0.02	0.43	0.01	1.75
Low-Middle Income	Micro-level estimate	-0.02	0.16	-0.02	0.72
	Baseline estimate	-0.01	0.26	0	1.1
	Macro-level estimate	0	0.32	0	1.32
Investment Hubs	Micro-level estimate	0.1	0.61	0.05	2.1
	Baseline estimate	0.11	0.95	0.05	3.33
	Macro-level estimate	0.11	1.17	0.05	4.1
All jurisdictions	Micro-level estimate	0.01	0.21	0	0.88
	Baseline estimate	0.01	0.34	0.01	1.39
	Macro-level estimate	0.02	0.42	0.01	1.71

Note 1: ETRs are calculated at the MNE group level assuming an investment in the jurisdiction of the ultimate parent entity. The semi-elasticity is equal to 1, 1.6 and 3 for the micro-level, baseline and macro-level estimate. Pillar One (Amount A only) considers a 10% profitability threshold on Profit/Turnover, 20% reallocation percentage to market and a scope that is restricted to ADS and CFB activities. Pillar Two considers a 12.5% rate with jurisdiction blending and a 10% carve-out on depreciation expenses (approximated using the value of tangible assets). In addition, it is assumed that an MNE group that claims the benefit of the carve-out should be required to make a corresponding and proportional adjustment to the covered taxes for the calculation of the ETR. The alternative option (i.e. not making a corresponding and proportional adjustment to the covered taxes) would be difficult to model with the available data. A revenue threshold of EUR 750 million is assumed, on a without prejudice basis, for the modelling of both Pillars.

Note 2: The number of jurisdictions is restricted to those available in the OECD's Corporate Tax Statistics (OECD, 2020<sup>[5]</sup>), with the exception of Estonia and Latvia who have corporate income tax systems that only apply to distributed profits. The figure excludes the impact of Pillar One on zero-tax jurisdictions for alignment with Pillar Two estimates. Real investments in jurisdictions without a full-fledged CIT system are not considered; those jurisdictions are thus excluded from the figure, but profits can still be shifted to these jurisdictions (cf. Section 1.4.3). Jurisdiction groups are based on the World Bank classification of countries by income group. Investment hubs are defined as jurisdictions with a total inward FDI position above 150% of GDP. The High Income category covers 35 jurisdictions, the Low-Middle Income category covers 21 jurisdictions and the Investment Hubs category covers 10 jurisdictions.

Source: OECD Secretariat calculations.