# Business Location Decisions with a Global Minimum Tax*

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**Abstract**

In July 2021, the OECD's Inclusive Framework reached an historic agreement on the reform of the international system for taxing profit. One radical element of the package is a global minimum tax, applied by the country of an MNE parent, which would top up taxes paid in foreign subsidiaries if those subsidiaries were not already paying enough tax to reach a minimum threshold effective tax rate. This paper investigates the impact of the global minimum tax on the dispersion of effective average tax rates (EATRs) for new investment, which have been shown to be important for business location decisions. It demonstrates that the dispersion of EATRs across OECD countries would rise at low levels of the threshold, thereby exacerbating tax distortions to location decisions. At higher levels of the threshold, however, the dispersion of EATRs would fall. The impact of the reform on locational efficiency therefore depends on the level at which the threshold is set.

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# 1 Introduction

In July 2021, over 130 countries in the OECD's Inclusive Forum agreed to two major reforms to the international tax system for taxing the profit of multinational companies (MNEs). Pillar 1 introduced an element of taxation in the market country for a small number of the very largest companies. Pillar 2 introduced a form of worldwide minimum taxation for companies with revenue exceeding 750 million Euros. There is a general consensus that these reforms are the most far-reaching since the structure of the international tax system was first created in the 1920s. They have the potential to create a significant impact on both governments and international business.

These reforms follow some years of debate about the problems of the existing system and how they should be addressed. The political debate has mostly concerned the view that MNEs have been able to game the system by shifting profit to low tax countries. But there are a number of other problems with the existing system, including the economic inefficiency arising from distortions to investment.[1] Various reforms have been advocated, including moving towards taxing profit in the country of sale, [2] or the country of the ultimate shareholders,[3] both on the grounds of the relative immobility of the tax base, based on the location of individuals. Others have advocated basing taxing rights more closely on the location of real activity, through the use of formula apportionment,[4] and the use of public goods.[5]

This paper does not address the general debate about possible reforms. Instead it analyses one important consequence of one of the agreed OECD proposals: the introduction of a minimum tax. The minimum tax proposal essentially gives an additional tax right to the country of the parent company. If the MNE has a subsidiary which pays an effective tax rate below a threshold (likely to be 15%) then the country of the parent will charge additional tax to bring the effective tax rate up to the threshold.[6]

Specifically, the paper explores how the introduction of the worldwide minimum tax will affect the impact of taxation on the decisions made by MNEs as to where to locate their real

[1] For a comprehensive discussion, see Devereux et al (2021); see also Foss et al (2019).

[2] See Bond and Devereux (2002) for an initial view on this, and most recently, Devereux et al (2021).

[3] See Foss et al (2019).

[4] This includes the European Commission's proposals for the Common Consolidated Corporate Tax Base (CCCTB). Other advocates include Picciotto (2016), ICRIT (2018), and McGaughey and Raimondos (2019).

[5] See Foss et al (2019), Devereux et al (2021).

[6] There are a host of details as to how this would work in practice. See, for example, OECD (2020) and, for some analysis, Becker and English (2020).

economic activity. To address this issue, the analysis also takes into account how the reform will affect the incentive to shift profit to low tax countries.

The effects of tax on location decisions have been widely researched and are well documented. One recent meta-study of the literature reports a median semi-elasticity of flows of foreign direct investment (FDI) with respect to an effective tax rate of around 2.5.[7] This is a large effect, indicating that the location of economic activity is very sensitive to differences in tax between countries. In principle, these effects represent distortions to the world economy generated by the international tax system, with consequences for MNEs, their shareholders, employees, suppliers and customers. An important question is therefore whether the 2021 tax reforms will have a positive impact by reducing the scale of these distortions. That is the central question investigated in this paper.

Other implications of these reforms must also be taken into account in any analysis of location and investment patterns. As analysed by Kohlhase and Pierk (2020), MNEs can engage in a number of activities which can be labelled as "tax management". These include exploiting domestically-available tax provisions, such as patent boxes,[8] tax credits and holidays.[9] The incentive to exploit such opportunities depends on the tax treatment beyond the host country. Kohlhase and Pierk (2020) investigate the effect on tax management of the country of the parent operating a worldwide system for taxing profit in the host country (usually when repatriated), as opposed to exempting that profit. Others estimate the effects of parent country taxation on investment in host countries. For example, Liu (2020) estimates that the impact of the UK moving from a worldwide system to an exemption system increased the investment rate of UK multinationals in low tax countries by 16.7 percentage points. The introduction of a minimum tax is likely to be more profound than the difference between a conventional worldwide system and an exemption system, since the minimum tax would apply to profit as it is accrued in the host country, rather than only when it is repatriated to the parent.

One important aspect of tax management is the possibility open to MNEs to shift profit from high tax rate countries to low tax rate countries. There are several methods open to MNEs to undertake profit shifting. Three of the most important are members of the MNE group borrowing from and hence paying interest to, tax haven subsidiaries, or paying royalties

[7] Feld and Heckemeyer (2011). See also De Mooij and Ederveen (2008).

[8] See, for example, Evers, Miller and Spengel (2014), Alstadsæter et al (2018), Bornemann, Laplante, and Osswald (2019).

[9] See, for example, Shevlin, Tang and Wilson (2012).

to the same subsidiaries, or by manipulating within-MNE transfer prices. All of these tend to reduce taxable profit in high tax countries and increase taxable profit in low tax countries, such as tax havens.

The extent of profit shifting has also been the subject to an extensive empirical literature, dating back to Hines and Rice (1994). OECD (2015) estimated the scale of "base erosion and profit shifting" at between 4% and 10% of worldwide corporation tax revenues. Other recent papers have found rather larger effects.[10] Recent surveys by Dharmapala (2014) and Riedel (2015) have noted the divergence in estimates in this literature.[11] A recent meta-analysis by Heckemeyer and Overesch (2017) found an average effect of a semi-elasticity of pre-tax profit of about -0.8. That is, reported profits decrease by about 8% if the international tax rate differential increases by 10 percentage points.

These issues of tax management and profit shifting have typically been ignored in the literature on the effect of taxes on real location and investment decisions.[12] However, since a major reason for introducing a worldwide minimum tax is to combat profit shifting, then this should be accounted for in any analysis of the impact of taxation on real location decisions. In this paper we develop a simulation model which draws on and extends the standard framework used for such analysis. We analyse a simplified framework in which the parent of an MNE makes three decisions:

1. In which foreign country to locate a new investment;
2. How much to invest, conditional on having chosen the location; and
3. How far to reduce taxes paid by tax management, especially through shifting profit to a low rate tax "haven".

These decisions are related. Economic theory suggests that the first decision depends on the effective average tax rate.[13] Suppose the multinational is choosing between country H ("high" tax rate) and country L ("low" tax rate). It should choose the location which will

[10] See Crivelli et al (2016), Tørsløv et al (2018) and Bilicka (2020).

[11] Sugathan and George (2015) examine how governance infrastructure, secure property rights and efficient contracting affect the extent of profit shifting.

[12] Exceptions are Overesch (2009), which examines how inbound investment in Germany is affected by the tax rate in the home country of the investor, and Buettner et al (2018) which examines how limitations of interest deductibility and transfer pricing regulations affect investment and employment of foreign subsidiaries.

[13] See Devereux and Griffith (1998).

yield the highest post-tax profit. This will depend on the economic conditions, and hence the pre-tax profit available, in each country, as well as the proportion of profit that is levied in tax in each country, typically measured by an effective average tax rate (EATR). Conditional on choosing location, the MNE than must decide how much to invest. In a standard model that will depend on the cost of capital, and an effective marginal tax rate (EMTR).

Both of these tax measures have been widely used in the literature investigating the impact of taxes on real economic behaviour such as location and investment decisions. But both are in principle also affected by tax management and profit shifting. In this paper we therefore modify the standard model (Devereux and Griffith, 2003), to account for these factors.[14] Specifically, we consider the case in which the multinational shifts profit from either H or L to a tax haven with a lower rate, possibly of zero. This reduces the overall tax liability on the investment in H or L, which may, in turn, affect the initial location decision, and also the investment decision conditional on location. We model profit shifting in a simple way, based on a common approach in the economic literature. Essentially, this implies that the multinational will shift profit to the tax haven up to the point at which the marginal benefit of shifting an additional $1 – measured by the difference in tax rates between the two countries – is equal to the marginal cost.

Given this framework, we are then able to modify our estimates of the effective tax rates to allow for profit-shifting: we can calculate "profit-shifting-adjusted" effective average and marginal tax rates. We are then able to simulate the impact of the introduction of a minimum tax – in the various in which it could be introduced. In essence, and consistent with the results of Kohlhase and Pierk (2020), the introduction of the worldwide minimum tax will reduce the incentive for tax management and profit shifting, since the benefit of such activities is reduced.

To summarise the welfare consequences of reform we require a measure which is related to the likely welfare costs of the tax system. Since Diamond and Mirrlees (1971), the public finance literature has been clear that an efficient tax system would exhibit production efficiency – that is that taxes would not distort production decisions. In the context of international investment, this has several implications. The clearest implication, and the one we focus on primarily in this paper, is that the location choices of a particular MNE should not depend on taxation.

[14] Calculations using the standard Devereux/Griffith methodology is now routinely included in the OECD Corporation Tax Statistics Database. An example of recent use by the European Commission is Spengel et al (2020).

For location decisions, this can be achieved by "capital export neutrality", which implies that the effective tax rates facing the MNE are independent of the choice of location. More specifically, the MNE must face the same EATR in all possible location decisions. Of course, this condition does not hold in practice, and would not under a minimum tax. We therefore measure the extent to which the tax system deviates from this notion of neutrality. Focusing on investment in OECD countries, our primary measure is the standard deviation of effective tax rates across countries.

In principle, the introduction of a worldwide minimum tax could increase or decrease the dispersion of EATRs. In the absence of a minimum tax, we would expect more profit to be shifted to havens from high tax countries than low taxed countries. That reduces the EATR more for higher taxed countries and so tends to reduce the dispersion across countries. The minimum tax limits such profit shifting, which could give rise to an increased dispersion, more closely aligned with statutory rates of tax. On the other hand, the minimum tax removes the lower part of the distribution of tax rates, since tax rates cannot go below the threshold minimum tax rate. This will tend to reduce the dispersion of EATRs. Our empirical results confirm that both effects are present on the introduction of a minimum tax.

# 2 Conceptual Framework

We investigate the choice of the parent company, resident in country $P$, of a multinational (MNE) as to in which of a number of potential locations to set up a subsidiary for a real investment. The choice depends on a number of factors, including the effective average tax rate ($EATR$) in each potential host country, denoted $i$. We extend the standard model of the $EATR$ to incorporate the possibility that the subsidiary shifts a proportion $\alpha$ of its taxable profit in each period to another subsidiary in a tax haven $X$, which has a tax rate of $\tau_X$, below that of the host country, $\tau_i$. Any such shifting reduces the overall $EATR$ on investment that takes place in $i$.

Within this framework we then model the impact of a minimum tax. Specifically we model the "income inclusion rule" of the OECD's Pillar 2 proposal for a global minimum tax, as set out in OECD (2020). [15] Under this proposal, an additional tax is levied by P on the profit in any country in which a subsidiary of the MNE faces an effective tax rate ($ETR$)

[15]Note that the OECD proposal contains a "substance-based carve-out", which is intended to shield a normal return on real investment from the minimum tax. We do not model that explicitly, on the grounds that we assume that there is no real activity in the tax haven.

below a threshold; the size of the additional tax would be that required to lift the $ETR$ to the threshold. We discuss the measurement of the $ETR$ below. We also consider a variant of this proposal from OECD (2019) under which the additional tax is levied by $P$ on the aggregate profit of all its foreign subsidiaries to the extent that the aggregate $ETR$ of those foreign subsidiaries is below the threshold. Again, the size of the additional tax would be that required to lift this $ETR$ to the threshold.

The standard approach of identifying the impact of taxes on investment is to consider a one-year perturbation to the capital stock.[16] This can be applied by considering an increase in investment in period 1 by one unit and reducing investment in period 2 by $1-\delta$, where $\delta$ is the rate of depreciation. The capital stock is therefore higher only in period 2 and generates a financial return, $R_i$, only in that period. The total return, $R_i$, can be split into a financial return, $p_i$, and a return to compensate for depreciation, $\delta$; hence $R_i = p_i + \delta$.

The pre-tax value of the investment is:

$$V_i^* = -1 + \frac{R_i + (1-\delta)}{1+r} = \frac{p_i - r}{1+r} \tag{1}$$

where the MNE's discount rate is $r$, which does not depend on the location of the investment. (Note that this presentation simplifies the model by assuming there is only one asset and that it is financed by an injection of new equity; and we do not include inflation or personal taxes. A more sophisticated version of the model is used in the empirical section, as described in the next section.)

The NPV of the tax base is:

$$B_i = -A_i + \frac{R_i + A_i\ (1-\delta)}{1+r} \tag{2}$$

where $A_i$ is the NPV of tax depreciation allowances per unit of investment in country $i$. A proportion $\alpha_i$ of this base is shifted to the tax haven, so that the overall rate of tax faced by the subsidiary in $i$ is

$$\tau_i^* = (1-\alpha_i\ )\ \tau_i + \alpha_i\ \tau_X \tag{3}$$

and the overall tax liability is therefore

$$T_i = \tau_i^*\ B_i. \tag{4}$$

[16] Jorgensen, 1963. Here we follow the approach of Devereux and Griffith, 1998, 2003.

Following the standard model, we define the $EATR$ on the investment in $i$ as

$$EATR_i = \frac{T_i}{p_i/(1+r)}. \tag{5}$$

In the special case in which there is no profit shifting, with $\alpha_i = 0$, the $EATR$ is:

$$EATR_i^* = \frac{\tau_i B_i}{p_i/(1+r)}. \tag{6}$$

The extent of profit shifting is most naturally modelled by assuming some cost of doing so, offsetting the tax benefits. Following much of the literature on profit shifting, we assume a quadratic cost of shifting, $c_i$

$$c_i = \frac{\alpha_i^2}{2\beta} B_i \tag{7}$$

The net benefit from profit shifting is therefore

$$(\tau_i - \tau_X)\alpha_i B_i - \frac{\alpha_i^2}{2\beta} B_i \tag{8}$$

Maximising this benefit with respect to $\alpha_i$, implies that the optimal level of shifting is proportional to the difference in tax rates:

$$\alpha_i = \beta(\tau_i - \tau_X) \tag{9}$$

As noted above, the size of the estimates in the literature of the extent of profit shifting varies. Our base case is taken from the meta-analysis of Heckemeyer and Overesch (2013), which implies $\beta = 0.8$. However, we consider a range of different possible values of $\beta$.

In considering the impact of taxes on the choice of locating in country $i$ it is necessary in principle to account for not only the tax levied in countries $i$ and $X$, but also the cost of profit shifting. We therefore also define an "extended" $EATR$, denoted $EEATR$ as

$$EEATR_i = \frac{T_i + c_i}{p_i/(1+r)} \tag{10}$$

which includes this cost. Given our formulation, exactly half of the reduction in the $EATR$ due to profit shifting is lost through the costs of implementing that shifting.

The OECD minimum tax proposal is based on a typical accounting-based "effective tax rate" ($ETR$), measured in any period as the tax liability as a proportion of accounting profit.

For the main country-by-country approach, this needs to be calculated for each country separately. In this one period investment, there would be no change in pre-tax accounting profit in any period other than period 1.

In the absence of profit shifting, accounting profit in i in period 1 is simply $p_i$. As an approximation of a one-period $ETR$, it is natural to scale the NPV of tax by the NPV of the accounting profit. In the absence of profit shifting, this is exactly the $EATR$.

In the presence of profit shifting, the tax liability in country $i$ is $(1-\alpha_i)\tau_i B_i$. However, in measuring the $ETR$ there is a choice of denominator. This could be the "true" financial return earned in country $i$, i.e. $p_i/(1+r)$. The $ETR$ in country $i$ is then

$$ETR_i = \frac{(1-\alpha_i)\tau_i B_i}{p_i/(1+r)} \tag{11}$$

This is the main definition we consider. Note that if the tax haven rate is zero, $\tau_x = 0$, this measure of the ETR is equal to the EATR: $ETR_i = EATR_i$.

However, an alternative would be to assume that accounting profit is also reduced by the taxable profit shifted, so that the "measured" financial return in the denominator is also reduced by profit shifting. In this case, the "measured" ETR, denoted $METR_i$ is

$$METR_i = \frac{(1-\alpha_i)\tau_i B_i}{p_i/(1+r) - \alpha_i B_i} \tag{12}$$

In this case, since profit shifting reduces both the numerator and the denominator of $METR_i$, then it is possible that it can result in a reduction or an increase in $METR_i$. The latter would occur, for example, when $\tau_X = 0$ and tax depreciation is less generous than accounting depreciation. In our base case below, we assume that the tax authority in country $i$ can observe $ETR_i$. However, we also consider the case in which it can only observe $METR_i$.

The tax base in country $X$ is $\alpha_i B_i$. We assume that this is also the measure of accounting profit, which implies that $ETR_X = METR_X = \tau_X$.

In applying the minimum tax on a "country-by-country" basis, denote the threshold $ETR$ in each country as $z$. We assume throughout $ETR_i > \tau_X$. In that case, there are three possible regimes.

(a) $ETR_i > \tau_X > z$

The minimum tax has no effect; there is no country for which the $ETR$ is lower than the threshold.

(b) $ETR_i > z > \tau_X$

The "effective" statutory rate in $X$ will increase to $z$. Conditional on $\tau_i > z$, the proportion of profit shifted will be $\alpha_i = \beta(\tau_i - z)$ and all of the above expressions for profit shifting will hold, with $z$ replacing $\tau_X$. If, unusually in this case, $\tau_i \leq z$, then there will be no profit shifting.

(c) $z > ETR_i > \tau_X$

The "effective" statutory rate in $X$ will again increase to $z$. Additional tax now also needs to be levied in country $i$. Conditional on $\tau_i > z$ and $EATR_i^* > z$, the proportion of profit shifted will again be $\alpha_i = \beta(\tau_i - z)$. If either of these two conditions do not hold, then there will be no profit shifting. In either case, $EATR_i$ and $ETR_i$ will rise to be equal to the threshold, $z$.

Now consider the case in which the tax authority can only observe $METR_i$, rather than $ETR_i$. Note that, for any $\alpha_i > 0$, $METR_i > ETR_i$, and for $\alpha_i = 0$, $METR_i = ETR_i$. This implies that, in situations (a) and (b), replacing $ETR_i$ with $METR_i$ has no effect on profit shifting, $EATR_i$ or $EEATR_i$. However, it is possible, for some positive $\alpha_i$, that

(d) $METR_i > z > ETR_i > \tau_X$

In this case, the observed ETR in country i is above the threshold. While profit shifting would be affected by applying the minimum tax to profit shifted to the tax haven, as long as $METR_i$ remains above $z$ there would be no further effect from applying the minimum tax to country $i$. The manipulation of the effective tax rate calculation would therefore permit greater profit shifting from country $i$.

In applying the alternative "entity" approach for the minimum tax, the threshold $ETR$ for the minimum tax is the total $ETR$ for the whole MNE outside the parent country. If we assume that the MNE consists only of the subsidiaries in countries $i$ and $X$, then following the reasoning above, the MNE's aggregate $ETR$ is

$$ETR_{MNE} = EATR_i \tag{13}$$

In this case there are two possible regimes:

(a) $ETR_{MNE} > z$

No additional tax is levied. The minimum tax has no impact and profit shifting is unaffected.

(b) $z > ETR_{MNE}$

In this case, $ETR_{MNE}$ must be raised to be equal to $z$. This may be achieved by a

reduction in profit shifting if, in the absence of profit shifting, $EATR_i^* > z$. In this case, $\alpha_i$ must be reduced to the point at which $EATR_i = z$. Otherwise if, in the absence of profit shifting, $EATR_i^* < z$, there will be no profit shifting, and additional tax will be levied on the profit in $i$.

# 3 Moving from Theory to Implementation

In this section, we first describe additional features of the simulation model which are not included in the simplified conceptual framework set out above. We then describe the data that the model uses.

## 3.1 Simulation model

The simulation model develops the simplified framework set out above in several ways. We do not describe these in detail, since they are standard in models of forward-looking effective tax rates, and they are set out in Devereux and Griffith (2003), and elaborated in detail in, for example, Spengel et al (2020).

First, we consider a combination of investment in four types of asset and three sources of finance. The four assets are plant and machinery, buildings, intangible assets and inventories. These are generally treated differently in taxation, with different tax depreciation rates permitted; we also assume different economic depreciation rates. We calculate the net present value, $A_i$ for an investment in each type of asset, and take a weighted average based on the shares of each asset listed in Table 1. In effect, we assume that each investment consists of investment in each asset given by these shares.

Second, we also consider investment financed by borrowing as well as by equity; borrowing has an advantage that interest costs are generally tax deductible.[17]

We assume a proportion of debt finance as shown in Table 1. the adjustment for debt finance set out in Devereux and Griffith (2003) is multiplied by this weight for debt.

Third, the simulation model allows for general inflation, which is assumed to affect nominal required rates of return, including the interest rate. Fourth, we assume the same pre-tax rate of return across countries, in order to make straightforward comparisons of the EATRs.

[17]Note that we do not allow for taxes on dividends paid by the parent company or ultimate shareholders. In this case, effective tax rates are the same for investment financed by new equity and retained earnings.

The parameters used in in the calculations for our base case scenario are largely taken from Spengel et al (2020), and set out in Table 1.

Table 1: Parameter assumptions

| Description | Value (%) |
|---|---|
| Pre-tax rate of return ($p$) | 20 |
| Inflation rate ($\pi$) | 2.5 |
| Real interest rate ($r$) | 5 |
| profit shifting parameter ($\beta$) (*not* %) | 0.8 |
| Economic depreciation of machinery | 17.5 |
| Economic depreciation of building | 3.1 |
| Economic depreciation of inventory | 0 |
| Economic depreciation of intangible asset | 15.35 |
| Share of investment financed by equity | 65 |
| Share of investment financed by debt | 35 |
| Share of building in total investment | 24 |
| Share of machinery in total investment | 25.6 |
| Share of inventory in total investment | 41.7 |
| Share of intangible asset in total investment | 8.7 |

## 3.2 Tax Data

We apply the simulation model to the corporation taxes used by each OECD member country. We use data for the 2019 tax regimes, before any special measures were introduced due to the covid pandemic. These data are collected from a variety of sources, including International Bureau for Fiscal Documentation (IBFD) sources and and publications of professional firms. They form part of the Centre for Business Taxation database.[18]

The two key tax components used in the analysis are

- The statutory tax rate on profit, $\tau_i$, allowing for taxes levied by both national and sub-national governments, for any offsets between the two and including any surcharges.

- The schedule of tax depreciation permitted for each asset; we summarise each schedule as the net present value of allowances, $A_i$, using the company's discount rate.

[18]These data are freely available online at the Centre's website.

Where appropriate, we also account for any special features of the tax system in each country such as patent boxes, notional interest deductions and accelerated depreciation allowances. We include these only to the extent that they apply generally to a wide range of investment; we do not include, for example, measures available only to small businesses.

The data for $\tau_i$ and $A_i$ are presented in Table 2 for each OECD country. The mean tax rate is 24.3%. However, this reflects some substantial variation, from 11% in Hungary to 32% in France. The standard deviation across the countries is 5.4. The average NPV of allowances is *to add*, and the standard deviation is *to add*.

## 3.3 EATR measurements

In Table 3 we present three measures of the EATR, based on these data for 2019, and reflecting the discussion above. The first column is the standard measure of the EATR, $EATR_i^*$, which does not make any adjustment for profit shifting. The second column shows the EATR in the presence of the optimal profit shifting from that country, $EATR_i$, according to the model set out above. It is assumed here that the profit is shifted to a country with a zero tax rate. And the third column adds the implied cost of profit shifting (using the functional form assumed above), $EEATR_i$, and so reflects not only the tax liability to the government, but additional costs of shifting profit.

Note that the standard EATR without profit shifting is generally below the statutory rate; the mean is 21.3% as opposed to 24.3% for the statutory rate. This difference reflects the relative generosity of the tax base, through both tax depreciation allowances and deductions for the cost of finance. This difference between the statutory rate and the EATR varies across countries. For example, the difference is 7.5 percentage points in the case of the USA, which allows immediate expensing for plant and machinery, as well as giving a deduction for interest payments. Note that the EATR has a smaller standard deviation (5.0) than the statutory rate (5.4); this reflects the fact that there is a tendency for countries with higher rates to have more generous allowances, so that part of the variation in rates is reduced when the tax base is taken into account.

Not surprisingly, the EATR is lower when account is taken of profit shifting. On average the EATR is reduced by 4.3 percentage points after allowing for profit shifting. The gain in terms of a lower EATR is also - not surprisingly - higher for companies located in countries

Table 2: Main components of Corporation Tax, OECD Countries, 2019

| Country | Statutory rate, $\tau_i$ (%) | Capital allowances, $A_i$ |
|---|---|---|
| Australia | 30 | 0.43 |
| Austria | 25 | 0.40 |
| Belgium | 29.58 | 0.47 |
| Canada | 26.1 | 0.24 |
| Chile | 27 | 0.37 |
| Colombia | 33 | 0.48 |
| Denmark | 22 | 0.44 |
| Finland | 20 | 0.44 |
| France | 32.02 | 0.47 |
| Germany | 30.95 | 0.41 |
| Greece | 28 | 0.42 |
| Hungary | 11 | 0.40 |
| Iceland | 20 | 0.44 |
| Ireland | 12.5 | 0.42 |
| Israel | 23 | 0.39 |
| Italy | 26.58 | 0.35 |
| Japan | 30.69 | 0.38 |
| Korea | 27.5 | 0.47 |
| Lithuania | 15 | 0.53 |
| Luxembourg | 26.01 | 0.58 |
| Mexico | 30 | 0.44 |
| Netherlands | 25 | 0.38 |
| New Zealand | 28 | 0.37 |
| Norway | 22 | 0.40 |
| Poland | 19 | 0.40 |
| Portugal | 24.39 | 0.46 |
| Slovakia | 21 | 0.28 |
| Slovenia | 19 | 0.43 |
| Spain | 30.63 | 0.31 |
| Sweden | 21 | 0.45 |
| Switzerland | 25.3 | 0.47 |
| Turkey | 22 | 0.39 |
| United Kingdom | 19 | 0.41 |
| United States | 28.74 | 0.56 |
| Mean | 24.4 | 0.419 |
| St Dev | 5.5 | 0.069 |

Table 3: Alternative EATR measures

| Country | $EATR_i^*$ (%) | $EATR_i$ (%) | $EEATR_i$ (%) |
|---|---|---|---|
| Australia | 26.1 | 19.8 | 23.0 |
| Austria | 21.9 | 17.5 | 19.7 |
| Belgium | 25.1 | 19.2 | 22.2 |
| Canada | 27.6 | 21.8 | 24.7 |
| Chile | 24.7 | 19.4 | 22.1 |
| Colombia | 27.4 | 20.2 | 23.8 |
| Denmark | 18.8 | 15.5 | 17.2 |
| Finland | 17.2 | 14.4 | 15.8 |
| France | 26.9 | 20.0 | 23.4 |
| Germany | 27.2 | 20.5 | 23.8 |
| Greece | 24.6 | 19.1 | 21.8 |
| Hungary | 9.6 | 8.7 | 9.1 |
| Iceland | 17.0 | 14.3 | 15.7 |
| Ireland | 11.0 | 9.9 | 10.5 |
| Israel | 20.6 | 16.8 | 18.7 |
| Italy | 22.8 | 18.0 | 20.4 |
| Japan | 27.3 | 20.6 | 24.0 |
| Korea | 23.0 | 17.9 | 20.5 |
| Lithuania | 12.0 | 10.6 | 11.3 |
| Luxembourg | 18.3 | 14.5 | 16.4 |
| Mexico | 26.2 | 19.9 | 23.0 |
| Netherlands | 19.8 | 15.9 | 17.8 |
| Norway | 19.4 | 16.0 | 17.7 |
| New Zealand | 25.2 | 19.6 | 22.4 |
| Poland | 16.8 | 14.2 | 15.5 |
| Portugal | 20.5 | 16.5 | 18.5 |
| Slovakia | 19.6 | 16.3 | 18.0 |
| Slovenia | 16.3 | 13.8 | 15.1 |
| Spain | 29.1 | 22.0 | 25.6 |
| Sweden | 17.8 | 14.8 | 16.3 |
| Switzerland | 21.2 | 16.9 | 19.1 |
| Turkey | 19.3 | 15.9 | 17.6 |
| United Kingdom | 17.2 | 14.6 | 15.9 |
| United States | 21.2 | 16.3 | 18.8 |
| Mean | 21.1 | 16.8 | 19.0 |
| St Dev | 5.0 | 3.2 | 4.1 |

with higher tax rates. Recall that we are assuming here that the country to which profit is shifted has a zero tax rate. In this case, the proportion shifted is proportional to the statutory rate in the host country. There is therefore a much higher gain to profit shifting from, say, France compared to, say Hungary.

There is a significant reduction in the standard deviation of the EATR once allowance is made for profit shifting, to 3.3. As noted above, this is important in identifying the likely distortion to location decisions as a result of differences in the EATR across countries. MNEs in countries with higher statutory rates shift a higher proportion of their profit to the tax haven. The result is a reduction in the dispersion of EATRs, and hence a gain in economic efficiency. In terms of tax design, this of course represents a trade-off of efficiency against revenue: if all profit were shifted to the tax haven, then there would be no revenue and no inefficiency.

As noted above, adding the costs of profit shifting halves the reduction in the EATR due to profit shifting. The pattern in the last two columns is therefore very similar, but the gains from shifting are smaller: the mean rises back up to 19.1% and the standard deviation rises to 4.1. In principle, it is the last column that should be relevant for a MNE deciding in which country to undertake real investment, since that takes into account all tax-related costs of investing in that country. The issue for a MNE is therefore whether any real economic gain from investing one country - for example, from lower labour costs - may be offset by higher taxes. Taking shifting costs into account makes it less likely that differences in taxation would overturn differences in other real costs, and hence less likely - other things being equal - that taxes would distort location decisions. In this analysis we focus primarily on the distribution of the EATR, taking profit shifting into account. Our main conclusions hold whether we consider the measures in columns 2 or 3.

# 4 Main Results

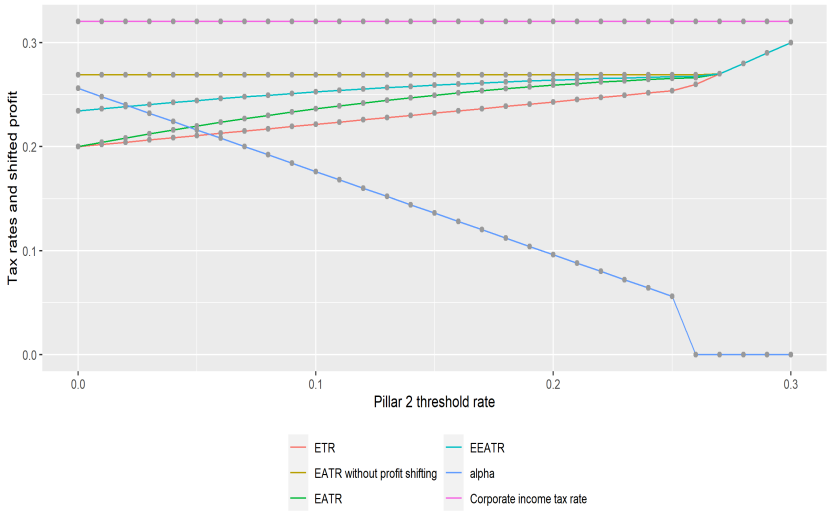
We now turn to using the simulation model to address the consequences of the introduction of the worldwide minimum tax. We begin by illustrating the effects for a single country, and then consider the distribution of effects across all the OECD countries.

## 4.1 An example country: France

To illustrate how the minimum tax proposal affects the incentive to invest in a given country, we being by demonstrating the impact of the minimum tax in a single country, depending on the threshold for the minimum tax. We use France, since it has a relatively high statutory rate, and so the benefits of shifting profit to a haven are relatively large.

In Figure 1 we plot various measures against the threshold for the minimum tax. Consider first the far left of the Figure, where the threshold is zero, and so the minimum tax does not apply. The Figure shows the French statutory rate at 32%, and the EATR in the absence of profit shifting at 26.9%. In the absence of the minimum tax, the MNE shifts a proportion of the tax base to a zero-rated haven. That proportion shifted is equal to 80% of the statutory rate: that is 25.6% - just over a quarter of the tax base - is shifted.[19] This results in the values of the EATR accounting for profit shifting as shown in the Figure and as given in columns 2 and 3 of Table 3.

Figure 1: Effect of the threshold on the incentive to locate in France




As the minimum tax threshold rises, the gain from profit shifting is reduced to 80% of the difference between the French statutory rate and the threshold rate (which is effectively the new rate in the haven). Hence the proportion of the tax base shifted falls linearly as the threshold rises, as shown in the Figure. As a consequence the measures of the EATR

[19] This is based on choosing a value of $\beta$ of 0.8, as noted above.

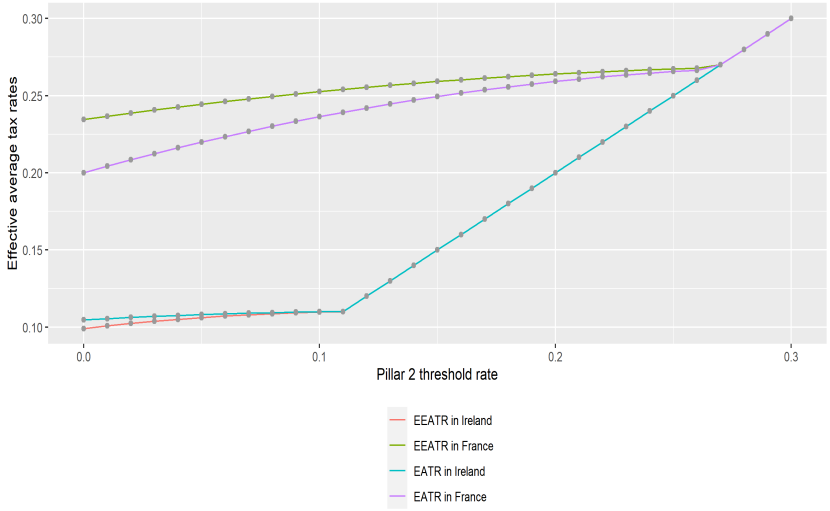
that allow for profit shifting also rise. As profit shifting declines, then the ETR in country $i$ also rises. However, it rises less quickly than the tax threshold itself. Eventually, the tax threshold becomes equal to $ETR_i$. At this point there is no profit shifting, and so all three measures of the EATR are the same, and they are also equal to $ETR_i$. This occurs when all of these measures are equal to the EATR in the absence of profit shifting, $ETR_i^*$, which in the French case is at 26.9%.

As the threshold rises above 26.9%, then not only is there no profit shifting from France, but there is additional tax levied by the country of the MNE parent that has a subsidiary in France. Above a threshold of 26.9%, all the measures of the EATR are equal to the minimum tax threshold.

## 4.2 Comparing France and Ireland

The pattern described in Figure 1 applies to each country, although clearly at different levels of profit shifting and EATRs. Ultimately, we are concerned about the difference in EATRs between countries. To illustrate that, Figure 2 presents the two measures of the EATRS that allow for profit shifting - $EATR_i$ and $EEATR_i$ - for both France and Ireland, again as the minimum tax threshold rises.

Figure 2: Comparison between Ireland and France




Ireland is a relatively low tax jurisdiction with a statutory rate of 12.5%, very nearly

20 percentage points lower than that in France. The difference between the two countries reduces to around 15 percentage points when we compare the EATRs in the absence of profit shifting. It is reduced further to only 10 percentage points when we allow for profit shifting (although the difference is a little higher if we also allow for the costs of profit shifting). These comparisons all relate to the far left of the Figure, where the minimum tax threshold is zero.

As the threshold rises, the proportion of the tax base shifted from both countries falls by the same percentage point (for example, both proportions fall by 8 percentage points if the threshold is raised by 10 percentage points). However, that raises the EATRs in France more steeply than in Ireland, since there is a larger rise for each percentage point reduction. As a result, the difference in EATRs between the two countries initially increases - reflecting a movement towards the EATR in the absence of profit shifting.

However, as illustrated in Figure 1, when the threshold reaches the EATR in the absence of shifting, $EATR_i^*$, then there is no further profit shifting and all three measures of the EATR (and the ETR) are equal to the threshold. That occurs in Ireland when the threshold reaches 11%. Beyond that, the Irish EATRs rise in line with the threshold. At this point, that is a much steeper rise than occurs in France, which has yet to reach that point. And so, between a threshold of 11% and 26.9%, the EATRs of the two countries converge. At a threshold of 26.9% and above they are equal.

Figure 2 therefore illustrates the claim made in the conceptual section above. As the minimum tax is introduced at a relatively low threshold and then raised, the dispersion of profit-shifting-adjusted EATRs initially increases. When relatively low tax countries reach the point where profit is no longer shifted from them, then their EATRs rise in line with the threshold, which has an offsetting effect of reducing the dispersion in EATRs.

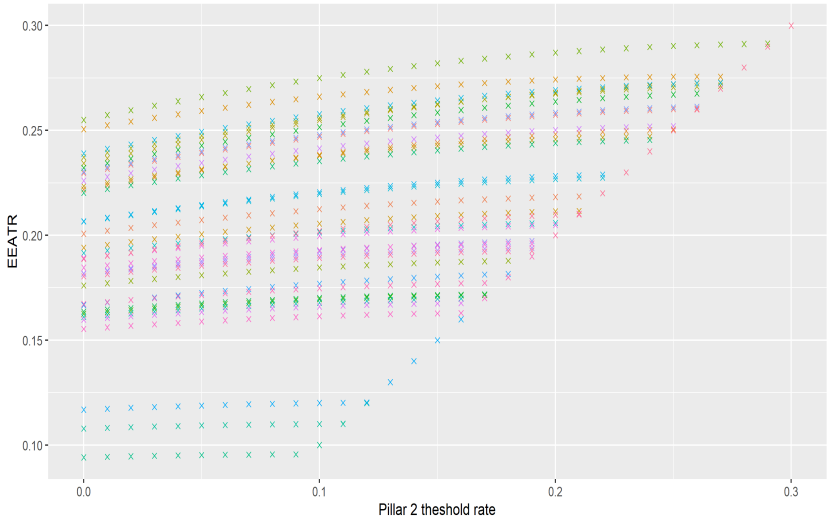
The overall impact of the minimum tax is therefore ambiguous; it depends on the distribution of statutory rates and EATRs in the absence of profit shifting; and also on the threshold at which the minimum tax is introduced. We now turn to examine the distribution across all OECD countries.

## 4.3 The Dispersion of EATRs across OECD countries

We now simulate the model using data from all OECD countries. As shown in Figure 3, the same mechanism that we explored with the two country example is at play here. Each line

tracks the EATR with profit shifting and including the costs of profit shifting for one OECD country, ie. $EEATR_i$. There is a small non-linear increase in $EEATR_i$ of each country $i$ as the minimum tax is introduced at the threshold raised from low levels. Then $EEATR_i$ increases more rapidly when the threshold reaches and exceeds the "non-shifting" EATR for each country. At that point, there is no longer shifting from that country, and all measures of the EATR and the ETR are equal to the threshold.

Figure 3: Effect of the threshold on the incentive to locate in OECD countries

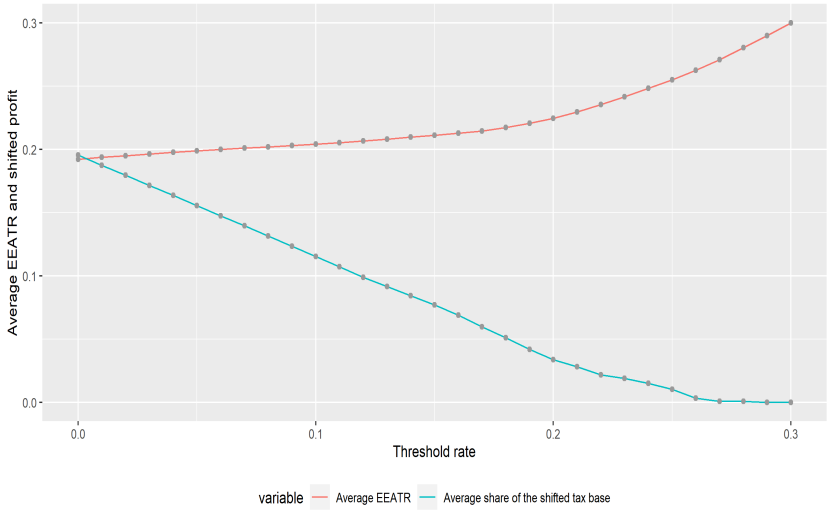



As Figure 4 shows, the average rate of profit shifting across the OECD at first declines quite rapidly as the threshold increases. It then begins to decline more and more slowly as profit shifting reaches zero in more and more countries. By contrast, the mean $EEATR$ rises relatively slowly at first since profit shifting continues, declining only gently. But as profit shifting ends in more and more countries, the mean $EEATR$ begins to rise more rapidly - eventually in line with the threshold itself.

However, our main focus is on tax distortions to location decisions. The most obvious measure to consider here is a measure of the dispersion of EATRs across countries. In Figure 5, we present the standard deviation of the $EEATR_i$ for a range of possible values of the profit shifting parameter, $\beta$. Recall this is 0.8 in our base case analysis. However, we now explore the impact on this standard deviation for values ranging from 0.6 to 1.5.

In the absence of a minimum tax, at the far left of the figure, the standard deviation falls as the elasticity of profit shifting rises. This reflects the analysis above: given statutory rates,

Figure 4: Mean EEATR and profit shifting




a higher elasticity implies more profit shifting, and hence a greater reduction in the $EEATR_i$ - and consequently a smaller standard deviation. Again this reflects the trade-off between profit shifting and economic efficiency - a higher elasticity generates more profit shifting, and hence lower inefficiencies.

Also in line with our analysis so far, raising the threshold from a very low rate tends to exacerbate differences in EATRs across countries, as reflected in a higher standard deviation. Profit shifting is reduced in all countries, but that has a greater effect on EATRs in high tax countries. Raising the threshold from a relatively low rate is therefore likely to lead to greater distortions to location choices by MNEs.

This effect is more marked the higher the elasticity of profit shifting with respect to the difference in tax rates between each country and the tax haven. For example, at $\beta = 1.5$, the standard deviation rises considerably from 0.02 without the minimum tax to a maximum of around 0.033 with a threshold of around 11%. At the other extreme in the Figure, for $\beta = 0.6$, the standard deviation rises from around 0.037 to 0.043, at a maximum when the threshold is around 10%. These results reflect the difference sensitivity of shifting with respect to the difference in tax rates.

However, there comes a point at which the second effect becomes dominant - that is when profit shifting from lower-taxed countries is eliminated. At this point, the EATRs become closer to each other: the standard deviation of the $EEATR_i$ then begins to fall. Over this range, further increases in the threshold reduce distortions to location choice (although since

tax rates are higher, overall investment is also likely to be lower).

Figure 5: Dispersion of $EEATR_i$ for a range of shifting elasticities