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Global minimum tax and tax incentives

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Abstract

This study examines the impact of global minimum tax (GMT) on the tax savings that firms derive from national tax incentives, which many governments use to stimulate economic activity. The GMT framework includes two approaches to treat such national tax rules: tax reduction treatment (TRT) and income treatment (IT). By incorporating these rules into the King and Fullerton (1984) framework, we calculate effective tax rates (EMTR and EATR) to assess the effects of these treatments. We show that while tax reduction treatment significantly reduces the tax benefits, income treatment has a more modest impact. However, in both cases, the effective tax rate on investment can remain low, primarily due to the substance-based income exclusion (SBIE) included in the rules of GMT. We also find that the effective tax rate is sensitive to inflation, staying very low or even negative at low inflation rates but increasing sharply with higher inflation.

Keywords: Corporate taxation, Global minimum tax, Pillar 2, Investment incentive, Tax credit, Tax allowance

JEL Classification: F23, H25, H32, H73

Tiivistelmä

Tutkimuksessa tarkastellaan globaalin minimiveron (GMT) vaikutusta veroetuun, jonka yritykset saavat kansallisista veronhuojennuksista, joita monet valtiot tarjoavat taloudellisen toiminnan piristämiseksi. GMT:n piirissä on kaksi erilaista tapaa kohdella erilaisia huojennuksia, tax reduction treatment (TRT) ja income treatment (IT). Mallinnamme niitä koskevat säännöt King - Fullerton (1984) -kehikossa ja tarkastelemme efektiivisen veroasteen (ETR) laskelmilla minimiveron vaikutuksia huojennusten synnyttämään investointikannusteeseen. Tulosten mukaan TRT-verokohtelu leikkaa yrityksen saamasta veroedusta suurimman osan, kun taas IT-verokohtelu pienentää veroetua selvästi vähemmän. Investoinnin efektiivinen veroaste on kuitenkin kummassakin vaihtoehdossa useimmiten matala. Tämä johtuu pääosin SBIE-vähennyksestä, joka tehdään minimiveroa laskettaessa. Havaitsemme myös, että investoinnin efektiivinen veroaste riippuu voimakkaasti inflaatiotasosta: matalalla inflaatiolla ETR on alhainen, jopa negatiivinen, ja nousee nopeasti inflaation noustessa.

Asiasanat: Yritysverotus, GloBE vähimmäisvero, Pilari 2, kansainvälinen yritys, investoinnit, veronhuojennus, veronhyvitys

JEL luokat: F23, H25, H32, H73

Sisällys

Global minimum tax and tax incentives[1]

1 Introduction

In October 2021, the member states of the OECD Inclusive Framework agreed on a two-pillar solution to reform the international business tax system. One key element of the tax package is the global minimum tax (GMT) based on the Global Anti-Base Erosion (GloBE) Model rules. The GMT aims to ensure that large multinational corporate groups (MNEs) pay a minimum effective level of tax of 15% in each jurisdiction where they operate.[2] The goal of the proposal was to reduce profit-shifting as well as the protracted downward trend in corporate tax rates caused by competition over investments and paper profits. In December 2022, the Council of the EU reached an agreement to implement its Minimum Tax Directive, which closely follows the OECD initiative.[3]

The GMT works broadly as follows. The system imposes a top-up tax when a company's effective tax rate (GMT ETR) in a country is less than the 15% minimum. The country where the low-tax entity is located has the primary right to collect the tax by making use of the qualified domestic minimum top-up tax (QDMTT). If the low-tax country does not implement the QDMTT, the MNE's headquarter country is the next in line to collect the top-up tax under a rule known as the income inclusion rule (IIR). Finally, if the headquarter country also does not collect the top-up tax, all the jurisdictions in which the MNE operates may collect the top-up tax based on an undertaxed payment rule (UTPR).

Basically, the right given to other countries to collect the top-up tax under IIR or UTPR is intended to encourage the low-tax country to raise its effective tax rate to the minimum level, either by adjusting its national corporate income tax (CIT) or by levying the new top-up tax, QDMTT.

This paper focuses on two interesting elements of GMT, both of which are non-standard in a corporate income tax system. The first is the substance-based income exclusion, SBIE, which is calculated as a percentage of the sum of the entity's tangible assets and payroll expenses and is deducted from the tax base of the top-up tax. Such an additional deduction determined on key economic variables is likely to affect decisions by MNEs and possibly also the choices by the jurisdictions where they operate. In recent research, Devereux et al. (2022, 2023), Schjelderup and Stähler (2023) and Kari and Viertola (2023) have discussed the implications of SBIE for corporate behavior and tax revenue.

[1] We thank Olli Ropponen, Jukka Pirttilä and the participants of the Advisory Board meeting of the African-Finnish Partnerships on Taxation Capacity in Africa, held on 10 May 2024, for helpful comments and discussions.

[2] The GloBE rules apply to MNEs with annual revenues of at least €750 million.

[3] One difference between the OECD's GloBE rules and the tax rules of the EU Directive is that the former only apply to MNEs, while the EU rules also apply to large groups operating in one Member State only (OECD 2021, EC 2022).

The second special element of GMT this paper focuses on is the treatment of the various forms of tax incentives which many countries apply to stimulate investment or to attract foreign economic activity. The rules include two different ways of treating tax incentives.[4] Under the so-called *tax reduction treatment*, TRT, tax incentives are considered to lower the GMT's measure of the company's effective tax rate in the jurisdiction (GMT ETR). Under this treatment, generous tax incentives may easily trigger the liability to pay top-up tax and, therefore, make tax incentives a less effective tool in a country's attempts to stimulate economic activity.

Under *income treatment*, IT, tax credits are not seen as reducing taxes but rather constituting taxable income similar to direct subsidies. GMT ETR is calculated, in this case, by dividing the gross amount of taxes before tax credits by the sum of profit and tax credits. Under this approach, tax credits reduce the effective tax rate but, in most cases, less than under TRT. Therefore, IT tends to lead to a smaller top-up tax than TRT.

The IT case is only applied to qualified refundable tax credits (QRTC) that satisfy certain strict conditions related to the refundability of the credit within a short time span. The TRT case, on the other hand, is applied to most other forms of tax incentives such as special allowances, reduced tax rates and tax credits that do not satisfy the requirements of QRTC.[5]

This paper illustrates the effects of SBIE and the treatment of tax incentives on the taxes of low-tax entities and on the incentive to invest faced by such entities. The effects on investment are studied using the effective marginal tax rate (EMTR) and effective average tax rate (EATR) as indicators. To be able to provide these calculations, we model GMT in the King-Fullerton framework (King and Fullerton, 1984). To our knowledge, this is the first study that reports the key formulae for the cost of capital and EMTR for the GMT's tax incentive rules.[6]

We show that TRT abolishes most of the incentive impact of tax allowances and tax credits, while IT is more generous as it removes only a small part of the impact. Despite this, the GMT-induced reduction in the impact on the incentive to invest remains small in most cases thanks to the SBIE allowance. We also find that a low-tax entity's incentive to invest is fairly sensitive to inflation. In general, our calculations show that the cost of capital and the EMTR are low under both treatment types (TRT and IT), which may have implications for the continuation of tax competition between countries.

In the next section we introduce the SBIE deduction and the rules around the treatment of tax incentives in more detail and show the impact of GMT on a low-tax company's taxes using illustrative calculations. In Section 3 we analyze the effects on investment incentives. The final

[4] See OECD (2022, 2023).

[5] Interestingly, the rules do not classify accelerated depreciation allowances in either category. Instead, accelerated depreciation allowances are accepted as being a normal element of income calculation, and therefore have no effect on GMT's ETR measure. In a recent paper, Hebous and Mengistu (2024) analyze the implications of this practice for designing a neutral corporate tax system.

[6] Hebous and Mengistu (2024) consider investment incentives under GMT using the framework of Devereux and Griffith (2003). Their focus is on the impacts of GMT on some neutral business tax designs. OECD (2022) reports calculations of the impacts of GMT on the incentive to invest using the method of Devereux and Griffith (2023). The report uses EATR as the indicator, not EMTR or the cost of capital.

section summarizes and discusses. The two appendices provide a more formal analysis of the impacts of GMT on tax revenue (Appendix 1) and the incentive to invest (Appendix 2).

2 Introducing the GMT calculation

The global minimum tax gives jurisdictions the right to levy top-up taxes if the effective tax rate (GMT ETR) of an in-scope MNE in a jurisdiction falls below the agreed minimum level of 15%. The MNE's effective tax rate in a jurisdiction is calculated by dividing the "adjusted covered taxes" by the "adjusted income". The adjusted income is based on the financial accounting income used to prepare consolidated financial statements but includes some adjustments. The covered taxes, on the other hand, include the taxes associated with the adjusted income. Corporate income taxes are a central part of this, but since national tax systems differ, and in cross-border situations income may be subject to foreign taxes, covered taxes are defined more broadly and may also be subject to some adjustments.

Hence, the GMT top-up tax, T^{GMT}, is calculated as follows:

$$T^{GMT} = (t^{GMT} - t^{ETR})(\ P^{Adj} - S), \tag{1}$$

where t^{GMT} denotes GMT's statutory minimum tax rate (currently 15%), $t^{ETR} = \frac{T^{Adj}}{P^{Adj}}$ denotes the effective tax rate (GMT ETR), P^{Adj} is adjusted income, T^{Adj} denotes adjusted covered taxes in the current tax system and S denotes the SBIE deduction. Here P^{Adj}, T^{Adj}, t^{ETR} and S are the jurisdiction level variables of the MNE in a country.[7]

GMT is only levied if GMT ETR is lower than the minimum tax rate. Therefore, in equation 1, it is required that $t^{GMT} - t^{ETR} \geq 0$. Similarly, the tax base of GMT, $P^{Adj} - S$, is required to be non-negative. This applies also in a multiperiod context since GMT does not include any loss-offset rules (e.g. carrying forward an unutilized amount of SBIE).

Observe that the tax base of the top-up tax, $P^{Adj} - S$, is not income or profit like the tax base in a standard CIT system, but rather "excess" profit. This likely has implications for revenue contributions of GMT. The SBIE allowance is calculated as the share s of tangible assets (K) and labor costs (W), hence $S = s(K + W)$. The allowance rate, s, will be 5% after a transition period.

Next, we consider the GMT's rules that define the treatment of tax incentives which countries grant to firms in their national tax systems. To illustrate the rules, let us assume that a country provides tax incentives in the form of investment tax credit, which effectively lowers the net amount of current taxes. Under GMT, the tax credit is either subject to tax reduction treatment, TRT, or income treatment, IT, depending on the details of the national tax credit rules. Denote the amount of profit by P, tax credit by C, and corporate taxes before credit by T^{CIT}.[8] Using these notations, we illustrate the difference between TRT and IT under GMT in Table 1.

[7] Hence all activities (subsidiaries and other forms of affiliates) of an MNE in a country are taken together.
[8] To simplify, we assume that covered taxes consist of CIT only.

Table 1. Definitions of tax variables in GMT under the two different treatments of tax credits.

	Tax reduction treatment, TRT	Income treatment, IT
Adjusted taxes, T^{Adj}	$T^{CIT} - C$	T^{CIT}
Adjusted income, P^{Adj}	P	$P + C$
GMT ETR, t^{ETR}	$\frac{T^{CIT} - C}{P}$	$\frac{T^{CIT}}{P + C}$
GMT tax base	$P - S$	$P + C - S$

Hence the treatments differ in how tax credits are considered to affect the concepts of adjusted taxes and adjusted income. Under TRT they are considered to reduce taxes, while under IT they are added to income. This difference affects how the GMT ETR is calculated and also the definition of the GMT tax base. Through these variables the difference ultimately affects the top-up tax liability (T^{GMT}).

The company's total taxes consist of CIT and GMT as follows:[9]

$$T^{Tot} = (T^{CIT} - C) + T^{GMT} = (T^{CIT} - C) + [(t^{GMT} - t^{ETR})(P^{Adj} - S)],$$

where the first term on the right-hand side is the current tax system's tax liability after tax credit and the second term (in brackets) is the top-up tax liability. t^{ETR} and P^{Adj} denote the GMT ETR and the adjusted income of the respective treatment case. In Appendix 1 we provide simplified expressions of T^{Tot} for the TRT and IT cases and provide insights into the interaction between SBIE and the tax treatment rules regarding different forms of tax incentives.

In Table 2 we illustrate how GMT is calculated. We start from a case where the country applies no tax incentives. We assume profit is 100. The SBIE base of the firm is 800 and the rate 5%, thus it is allowed to deduct 40 as the SBIE allowance. We calculate total taxes for three statutory corporate tax rates, 20%, 12% and 0%, to illustrate the impacts of the level of CIT on total taxes.

Column 1 of Table 2 provides tax calculations for the case where the CIT rate is 20%. The GMT ETR of 20% exceeds the minimum tax rate of 15%, and therefore no top-up tax is due. In Column 2 the CIT rate is 12%. Now the GMT ETR is lower than the minimum tax rate (12% vs. 15%), and therefore top-up tax is levied. A top-up tax rate of 3% is levied on the tax base of 60, resulting in a top-up tax liability of 1.8. Total taxes sum up to 13.8. The total effective tax rate (13.8%) lies between the national CIT rate (12%) and the GMT's statutory tax rate (15%).

Finally, Column 3 of Table 2 considers a hypothetical case where the CIT rate is 0%. Now the top-up tax rate is 15% and the company pays top-up tax at this rate on the tax base of 60. Total taxes consist of top-up tax only and are 9.

Columns 2 and 3 in Table 2 reveal two interesting aspects of GMT: first, the rate of total taxes on profit tends to be lower than the GMT minimum tax rate of 15% and, second, the amount of total taxes declines with the CIT rate.[10] The first observation is due to the SBIE allowance, i.e. the tax base being excess income rather than income. The second observation has its roots in divergences

[9] This formula assumes that both the rate and the base of the top-up tax are non-negative.
[10] Devereux et al. (2022) discussed these properties in an early analysis of the GloBE rules.

in the definitions of the GMT tax base and adjusted income (in the denominator of GMT ETR). Kari and Viertola (2023) show that with no divergences, after, for example, aligning the ETR denominator with the GMT tax base, the dependency on the CIT rate disappears. We discuss this issue further in Appendix 1.

Table 2. Impact of GMT on total taxes: the effect of SBIE at different levels of CIT rate. No tax incentives.

	(1) CIT rate 20%	(2) CIT rate 12%	(3) CIT rate 0%
Profit (P)	100	100	100
Corporate tax liability (T^{CIT})	20	12	0
GMT ETR $(t^{ETR} = T^{CIT}/P)$	20%	12%	0%
Top-up tax rate $(t^{GMT} - t^{ETR})$	-	3%	15%
SBIE allowance (S)	-	40	40
GMT tax base $(P - S)$	-	60	60
GMT liability (T^{GMT})	-	1.8	9
Total taxes (T^{Tot})	20	13.8	9
Total effective tax rate on profit	20%	13.8%	9%

Table 3 illustrates how GMT affects taxes when the country where the company is located grants investment tax credits. We compare the outcomes under the two treatment forms, TRT and IT. We also consider the impacts of the size of the tax incentive. The company's profit is again 100, the CIT rate is now 15% [11], and the amount of credit is either 5 or 15.

At the bottom of Table 3 we calculate the "Tax increase due to GMT", which compares total taxes with and without GMT. The baseline is CIT liability net of tax credit, and therefore the figures include the impacts of both SBIE and the treatment rules.

We observe in Table 3 that introducing GMT with TRT increases taxes by 3% of profit when the tax credit is 5 units (Column 1) and by 9% of profit when the tax credit is 15 units (Column 2). This implies that 60% of the original impact of tax credit on taxes is eliminated due to GMT. The share is not higher because the SBIE deduction decreases the impact of GMT on taxes, as illustrated already in Table 2.

[11] By this assumption we exclude the effects of the CIT rate, and hence are able to focus on the impact of tax credits on the amounts of GMT and total taxes.

Table 3. Comparing tax reduction treatment and income treatment. CIT rate 15%.

	Tax reduction treatment of non-qualified credits and allowances		Income treatment of qualified credits (QRTC)	
	(1) Credit 5	(2) Credit 15	(3) Credit 5	(4) Credit 15
Profit (P)	100	100	100	100
Corporate tax liability (T^{CIT})	15	15	15	15
Tax credit (C)	5	15	5	15
CIT net of credit $(T^{CIT} - C)$	10	0	10	0
GMT ETR (t^{ETR})	10%	0%	14.3%	13%
Top-up tax rate $(t^{GMT} - t^{ETR})$	5%	15%	0.7%	2%
SBIE allowance (S)	40	40	40	40
GMT base	60	60	65	75
GMT liability (T^{GMT})	3	9	0.5	1.5
Total taxes net of credit	13	9	10.5	1.5
Tax increase due to GMT - of profit - of tax credit	 3% 60%	 9% 60%	 0.5% 10%	 1.5% 10 %

Under IT, the increase in taxes is much lower, just 0.5% or 1.5% of profit for the two credit sizes (Columns 3 and 4 in Table 3, respectively). The share of credit abolished by GMT is also much smaller than under TRT, now 10%. The calculations in Column 4 reveal that a generous QRTC (here 15 units) can reduce the company's total taxes to a very low level under GMT.

Also observe that, in both cases, a larger credit leads to lower total taxes, an analogical observation to that made in Table 2, where it was connected to the level of the CIT rate.

The sensitivity of total taxes to the effective level of CIT raises the question of whether the studied tax system satisfies the properties of a good tax system. It suggests that the non-neutral treatment of activities across different environments (a low-CIT vs. high-CIT country) could create incentives for countries to engage in strategic tax-rate setting.

3 GMT and the incentive to invest

3.1 Introduction

This section considers the effects of the minimum tax on the incentive to invest in a low-tax jurisdiction by calculating the effective tax rate on new investment projects by an in-scope MNE. The particular goal is to illustrate the impacts of the two tax treatments (TRT and IT) of national tax incentives and the SBIE allowance on the incentive to invest.

In this analysis, we use the King-Fullerton method to calculate the cost of capital as well as the marginal and average effective tax rate (EMTR and EATR respectively) for a hypothetical investment. As is familiar from the public finance literature, both the cost of capital and the EMTR illustrate how tax rules affect the minimum required rate of return on new investments. Therefore, they aim to answer the question of how tax rules affect the scale of investment.

The effective average tax rate (EATR), on the other hand, calculates the taxes paid on the profits of an intramarginal project, i.e. an investment project that yields a return clearly higher than the minimum rate of return. The EATR calculations can be a useful tool when seeking to determine how taxes affect the location of an MNE's new production units.

In this section we focus on the results of the calculation. The model framework is described in Appendix 2. The calculations reported in this section have not been calibrated to correspond to the situation of a particular country or company.

3.2 Effective tax rate on investment under GMT

We start by considering the impacts of GMT on the incentive to invest without special tax incentives. Table 4 reports calculations for EMTR and EATR for two CIT rates and three inflation rates to show the sensitivity of the indicators to these factors.

The calculations in Table 4 are made using the following parameter values: the real interest rate is 5%, the rate of economic depreciation is 15%, the rate of fiscal depreciation 15% (fixed, not adjusted to inflation), the GMT tax rate is 15%, the SBIE rate is 5%, and the rate of investment tax credit is 5% of the purchase price of the asset.[12]

Table 4. EMTR and EATR under GMT at two CIT rates and three rates of inflation. No special tax incentives.

	Inflation		
	0%	5%	10%
EMTR (%)			
CIT rate = 5%	5.6	15.8	21.5
CIT rate = 15%	15.0	22.0	26.1
EATR (%)			
CIT rate = 5%	12.5	15.3	17.1
CIT rate = 15%	15.0	17.3	18.8

We observe that EMTR is sensitive to both inflation and the rate of CIT. The former is (primarily) a result of unindexed tax allowances (fiscal depreciation and SBIE), and the latter is a result of the impact of the SBIE allowance. The tax-saving from the allowance depends on the CIT rate, as discussed above in section 2 (see also Kari and Viertola (2023) and Appendix 1). We also discover that with low inflation and a low CIT rate, EMTR is low, much lower than the nominal minimum tax rate (15%). We also observe that the EATR for a profitable investment is less sensitive to these variables.

Tables 5 and 6 compare the impacts of GMT's treatment of tax incentives on the incentive to invest. Both EMTR and EATR are calculated, and CIT is held as the baseline. In Table 5 the tax credit rate is 5% and in Table 6 it is 10%.

[12] Additionally, there are two GMT-specific firm-level parameters that consider the relationship between the tax credit and adjusted income under the two tax treatment types: $v = \frac{C}{P} = 0{,}075, w = \frac{C}{P+C} = 0{,}072$, where C is the amount of tax credit and P is accounting income. For more details, see Appendix 2.

Table 5. Effective tax rate for CIT, TRT and IT cases. CIT rate 15%, rate of tax credit 5%.

	Inflation		
	0%	5%	10%
EMTR			
CIT	-6.3	4.5	10.5
GMT, TRT	-6.9	11.4	20.5
GMT, IT	-6.0	5.7	12.2
EATR			
CIT	10.0	12.3	13.8
GMT, TRT	15.6	19.4	21.9
GMT, IT	10.9	13.3	15.0

In Table 5 we observe that EMTR is negative in all cases for 0% inflation and positive for higher inflation. At 0% inflation, EMTR is similar for all the cases, CIT, TRT and IT, but increases much faster for TRT than for CIT and IT when inflation increases. Again, EATR varies much less than EMTR. The patterns of CIT and IT are fairly similar.

Table 6. Effective tax rate measures for CIT, TRT and IT cases. CIT rate 15%, rate of tax credit 10%.

	Inflation		
	0%	5%	10%
EMTR			
Standard CIT	-41.7	-23.2	-13.3
GMT, TRT	-55.6	-6.1	12.5
GMT, IT	-41.1	-19.3	-8.2
EATR			
Standard CIT	5.0	7.3	8.8
GMT, TRT	16.3	21.5	25.0
GMT, IT	6.8	9.5	11.3

In Table 6 with 10% tax credit, we observe that EMTR is negative in all cases but one. It increases with inflation at a slower pace in CIT and IT compared to the TRT case. EATR varies much less across the different cases than EMTR. With low inflation, EATR is low under CIT and IT. The patterns of CIT and IT are similar.

The intuition for the low effective tax rates under GMT observed in both tables is that both SBIE and tax credit affect the figures. GMT reduces the impacts of tax credit on the company's taxes but does not eliminate the impact entirely. SBIE compensates for the reduced impact of tax credit, in some cases entirely.

In Appendices 1 and 2, we provide additional analysis of the impact channels of GMT using formulae for total taxes and the cost of capital of a marginal investment project.

4 Conclusions

In this memo we consider the impacts of global minimum tax (GMT) on taxes and investment incentives in a low-tax jurisdiction. Particular attention is paid to how GMT impacts special tax incentives provided via the national corporate income tax (CIT) system. To analyze the impacts of GMT on the incentive to invest, we model GMT in the King-Fullerton framework. This model is used in calculating the two measures of effective tax rates, EMTR and EATR, under various assumptions of the tax system and the economy.

Our paper focuses on the treatment of special tax incentives under the GMT. The model rules include two approaches. The first is tax reduction treatment, TRT, which considers tax credits and allowances as reducing the company's taxes, and therefore also the GMT effective tax rate, a critical measure in calculating the GMT liability. Under this treatment, tax incentives may easily lead to a low ETR, resulting in a liability to pay GMT top-up tax. The second approach is income treatment, IT, which assumes tax credits to be included in adjusted income rather than reducing taxes paid. This approach tends to lead less frequently to a GMT liability and to a lesser extent.[13]

In Section 2 we illustrate the impacts of GMT on taxes in a low-tax jurisdiction by providing calculations under different assumptions. We find that the impact of SBIE on the company's taxes depends on the effective level of CIT. A low CIT leads to a relatively low level of total tax payments (GMT and CIT combined). We also find that the IT case of tax incentives allows much higher benefits from national tax incentives than TRT. However, TRT also passes through some of the benefits.

In Section 3 we investigate the incentive effects of GMT using effective tax rate calculations. We find that ETRs are quite sensitive to inflation under GMT, even more sensitive than under CIT. This is despite the SBIE allowance, which, if designed in an ideal way, could abolish such sensitivity.

We find that ETRs are generally low, even negative, in a low-inflation environment. Unsurprisingly, IT of tax incentives produces lower ETRs than TRT. The low ETRs that we find are a result of the coexistence of two special tax rules, the SBIE allowance and the rules related to tax incentives. Their joint effect is to take the effective tax rates clearly below the reference level of 15% and even below zero. However, we also find high ETRs, particularly when inflation is high.

The observed sensitivity of total taxes to inflation and to the effective level of CIT raises the question of whether GMT satisfies the properties of a good tax system.[14] Both sensitivities speak of non-neutral treatment of activities performed in different environments (low-inflation vs. high-inflation environment; low-CIT vs. high-CIT country). The latter sensitivity might also imply an incentive for strategic tax rate setting by countries (tax competition). We discuss some remedies. One is adjusting the SBIE allowance to inflation in the economy and the second is redefining GMT

[13] There is a third category of tax incentives, accelerated fiscal depreciation rates, commonly applied by governments in developed economies. The incentive effect of this tax incentive type is unaffected by GMT. We leave closer analysis of these for further research.

[14] See e.g. the Mirrlees Review (2011), which provides a thorough discussion of the criteria for a good tax system.

ETR so that GMT's concept 'adjusted income' is aligned with the GMT tax base. This would remove the dependencies on the CIT rate.

Finally, the model framework could be calibrated to the conditions of specific countries. It could be utilized e.g. in redesigning the national tax incentive system to better conform to an environment that includes a global minimum tax.

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Appendix 1. How global minimum tax (GMT) affects total taxes: Some algebra.

We study how taxes of a company are determined under global minimum tax (GMT), with special attention to how GMT treats different forms of tax incentives (tax allowances, tax credits etc.). We consider a simplified setting where the tax system before GMT includes only one form of taxation: corporate income tax, CIT. We assume that the country grants investment tax credits, which are deducted from the company's CIT bill.

Under GMT, total taxes can be written $T^{Tot} = T^{CIT} + T^{GMT}$. The first addend is CIT payments after investment tax credit, $T^{CIT} = t^{CIT}P - C$, where t^{CIT} is the statutory CIT rate, P is taxable profit and C is the tax credit. The second addend denotes the GMT liability, $T^{GMT} = (t^{GMT} - t^{ETR})\left[P^{adj} - S\right]$, where t^{GMT} is the minimum tax rate (currently 15%), t^{ETR} is the effective tax rate in the national tax system as defined in the GloBE rules (GMT ETR), P^{adj} is adjusted income as defined under the rules of GMT, and S is substance allowance (SBIE allowance). Thus, we can rewrite the total taxes as

(A1.1) $$T^{Tot} = t^{CIT}P - C + (t^{GMT} - t^{ETR})\left[P^{adj} - S\right].$$[15]

GMT treats national tax incentives in two different ways. These differences are reflected in how the GMT ETR, t^{ETR}, is calculated and in the definition of adjusted income, P^{adj}:

- Under tax reduction treatment (TRT): $t^{ETR,TRT} = \frac{t^{CIT}P - C}{P^{adj}}$ and $P^{adj} = P$.
- Under income treatment (IT): $t^{ETR,IT} = \frac{t^{CIT}P}{P^{adj}}$ and $P^{adj} = P + C$.

Using these definitions, we can write the company's total taxes in a simplified form. For the TRT case, total taxes are:

(A1.2) $$T^{Tot,TRT} = t^{GMT}P - (t^{GMT} - t^{CIT})S - C\frac{S}{P}.$$

Here, total taxes are formed of three components. The first is tax on the company's profit at the statutory minimum tax rate, the second is the SBIE allowance factored by the difference between the statutory tax rates of GMT and CIT, and the third is tax credit in the national tax system shrunk by the GMT rules, $C\frac{S}{P}$.

We observe that after introducing GMT:

- The SBIE deduction reduces total taxes below the level of 15% of profit. This reduction is higher the lower the CIT rate is and is maximized when $t^{CIT} = 0$.
- The tax credit term still reduces the amount of total taxes. Assuming that S is a small share of P, the tax credit term reduces the amount of total taxes much less than in a CIT before introducing GMT.

[15] Where both $t^{GMT} - t^{ETR}$ and $P^{adj} - S$ are non-negative.

- Assuming $t^{GMT} = t^{CIT}$, total taxes become $T^{Tot,TRT} = t^{GMT}P - C\frac{S}{P}$, i.e. tax on profit at rate t^{GMT} less the shrunk amount of tax credit.

For the IT case, total taxes are

(A1.3) $$T^{Tot,IT} = t^{GMT}P - (t^{GMT} - t^{CIT})S - \left[1 - (t^{GMT} - \frac{S}{P+C}t^{CIT})\right]C.$$

Again, the expression for total taxes comprises three terms. The first two terms are the same as in equation A1.2. The third gives the impact of tax credits on the net amount of taxes. It depends in a complex way on the statutory tax rates of GMT and CIT, as well as the amounts of profit, tax credit and the SBIE allowance. For further considerations, it may be useful to simplify the formula by assuming $t^{GMT} = t^{CIT}$. Now total taxes can be written as

$$T^{Tot,IT} = t^{GMT}P - \left[1 - \frac{P+C-S}{P+C}t^{GMT}\right]C.$$

The bracketed term may take values between 0.85 and 1, depending on the size of S.[16] This implies that, under IT, the impact of tax credits on the amount of taxes is not much different from their impacts under pure CIT (i.e. before introducing GMT).

We have observed that GMT leads to complex formulae for total taxes which lack transparency. For example, it is not easy to see why total taxes should depend on the CIT rate. Also, the bracketed multiplier of C in equation A1.3 is confusingly complex.

Some new light can be shed on the formulae by considering the implications of a hypothetical definition of GMT ETR where the denominator is $P^{adj} - S$ instead of P^{adj}. Under the TRT total taxes would now be:

$$T^{Tot,TRT} = t^{GMT}(P - S). \qquad \text{(hypothetical case)}$$

We observe that the dependency of total taxes on the CIT rate disappears and that the impact of tax credit is eliminated entirely.

Under IT case, total taxes would become:

$$T^{Tot,IT} = t^{GMT}(P - S) - (1 - t^{GMT})C. \qquad \text{(hypothetical case)}$$

Again, the dependency on the CIT rate disappears. The IT case would retain a substantial impact of tax credits on total taxes. The multiplier term of C would be much simpler than in equation A1.3.

This consideration suggests that the complexities in calculating total taxes under GMT derive from differences in the definitions of the GMT tax base and adjusted income in the denominator of GMT ETR. Aligning these could be the remedy to the apparent problems in the current rules.

[16] Recall that the base of GMT is $P + C - S \geq 0$.

Appendix 2. Cost of capital and effective tax rate under global minimum tax

1. Introduction

In this Appendix we derive the formulae for the cost of capital, the effective marginal tax rate, EMTR, and the effective average tax rate, EATR, for investments by a firm that is liable to pay GMT on its profits. Special attention is paid to the tax treatment of tax allowances and tax credits under GMT. As is standard in literature, we first derive the cost of capital for a marginal investment project and then consider the effective tax rates.

2. Cost of capital under TRT and IT cases of tax incentives

To derive the cost of capital, we consider a one-unit investment that depreciates exponentially at rate δ and yields a pre-tax rate of return R. Pre-tax profit at time t is written as $Re^{-(\delta-\pi)t}$, where π denotes the rate of inflation.

The firm pays national corporate tax at rate t^{CIT} on a tax base of gross profit (R) reduced by (exponential) fiscal depreciation at rate α. The amount of tax-deductible depreciation at time t is $\alpha e^{-\alpha t}$. At time $t = 0$, the project's taxes are reduced by an investment tax credit, which is calculated as the share c of the acquisition cost of the investment.

The GMT (top-up tax) is paid on a tax base that is adjusted income minus the SBIE allowance. In our model, the amount of SBIE is obtained by factoring the book value of the investment project by the SBIE rate, s. For our one-unit investment, the SBIE allowance at time t is $se^{-\alpha t}$, i.e. allowance rate times the book value of the one-unit investment at time t.

Now we can write taxes on profit of the one-unit investment under the *tax reduction treatment*. The project's taxes at time t are:

(A2.1) $$T^{Tot,TRT}(t) = (t^{GMT} + v)P(t) - [(t^{GMT} + v) - t^{CIT}]S(t) - C,$$

where profit $P(t) = Re^{-(\delta-\pi)t} - \alpha e^{-\alpha t}$, the SBIE deduction $S(t) = se^{-\alpha t}$, and the investment tax credit is

(A2.2) $$C = \begin{cases} c, & t = 0 \\ 0, & t > 0 \end{cases}$$

as we assume that tax credits only have tax implications at the start of the investment project.

In equation A2.1, parameter v denotes the ratio of tax credits to the (adjusted) profit of the MNE in the jurisdiction, $v = \frac{C^{Firm}}{P^{Firm}}$, and should be taken as given in the case of marginal investment.

Observe that in equation A2.1 the marginal tax rate on profit is unconventional, $MTR^{TRT} = t^{GMT} + v$.

To derive the cost of capital we write the marginal condition for the project. It equates the present value of the project's net cashflow, $V(0)$, to the investment cost after credit. In the TRT case, the cost is $1 - c$. The condition can be written:

(A2.3) $\int_0^{\infty}\left[\,[1-MTR^{TRT}]Re^{-(\delta-\pi)t}+[(MTR^{TRT}-t^{CIT})s+MTR^{TRT})\alpha]e^{-\alpha t}\right]e^{-\rho t}dt=1-c,$ where the left-hand side is $V(0)$ and the right-hand side is the net cost of investment. ρ denotes the firm's discount rate, which in this model is the market rate of interest.

Solving the integral, the left-hand side becomes

$$\frac{(1-(t^{GMT}+v))}{\rho+\delta-\pi}R+\frac{(t^{GMT}+v-t^{CIT})s+(t^{GMT}+v)\alpha}{\rho+\alpha}.$$

Inserting $R=p+\delta$ and solving the equation for p gives the cost of capital after economic depreciation:

(A2.4) $$p^{TRT}=\frac{1-[c+\frac{(MTR^{TRT}-t^{CIT})s}{\rho+\alpha}+\frac{MTR^{TRT}\alpha}{\rho+\alpha}]}{1-MTR^{TRT}}(\rho+\delta-\pi)-\delta.$$

Observe that the bracketed term in the numerator of equation A2.4 comprises three parts. The last element gives the tax saving from fiscal depreciation allowances. Now the marginal tax rate is $MTR^{TRT}=t^{GMT}+v$, not the CIT rate as in the standard formula, or the minimum tax rate t^{GMT} as one could possibly expect. The second element is the present value of the SBIE allowances, which depends on both MTR^{TRT} and the CIT rate. The first term in the brackets, *c*, is tax benefits from tax credits for the one-unit investment.

In the case of *income treatment*, the taxes of the one-unit project at time *t* are:

(A2.5) $T^{Tot,IT}(t)=MTR^{IT}P(t)-(MTR^{IT}-t^{CIT})S(t)-(1-(MTR^{IT}-t^{CIT}))C,$

where $P(t)$, $S(t)$ and C are as above, and $MTR^{IT}=t^{GMT}+wt^{CIT}$, with $w=\frac{C^{Firm}}{P^{Firm}+C^{Firm}}$. This ratio again is given for the marginal investment case. Observe that MTR^{IT} depends on both statutory tax rates in play, t^{GMT} and t^{CIT}, and on the firm-level ratio w.

Following the same steps as above, we end up with the following expression for the cost of capital:

(A2.6) $$p^{IT}=\frac{1-[(1-(MTR^{IT}-t^{CIT}))c+\frac{(MTR^{IT}-t^{CIT})s}{\rho+\alpha}+\frac{MTR^{IT}\alpha}{\rho+\alpha}]}{1-MTR^{IT}}(\rho+\delta-\pi)-\delta.$$

The interpretation of the equation A2.6 is like that for equation A2.4, except for the marginal tax rate. Now $MTR^{IT}=t^{GMT}+wt^{CIT}$ instead of $MTR^{TRT}=t^{GMT}+v$ in equation A2.4. The discrepancy stems from the differences in the treatment of tax credits.

3. Effective tax rate measures

The effective marginal tax rate is calculated as follows:

(A2.7) $$EMTR=\frac{p-r}{p},$$

where r is the real rate of interest.

The effective average tax rate, EATR, is obtained by dividing the present value of taxes (PVT) on intra-marginal investment [17] by the present value of the investment's pre-tax profit (PVP):

(A2.8) $$EATR = \frac{PVT}{PVP}.$$

The present value of pre-tax profit is the same for both treatment cases,

$$PVP = \frac{\tilde{p}}{\rho+\delta-\pi},$$

where $\tilde{p}$ is the above-normal pre-tax rate of return on the investment.

The present value of taxes (PVT) differs between the two cases:

$$PVT^{TRT} = \frac{MTR^{TRT}(\tilde{p}+\delta)}{\rho+\delta-\pi} - \frac{(MTR^{TRT}-t^{CIT})s}{\rho+\alpha} - \frac{MTR^{TRT}\alpha}{\rho+\alpha} - c \qquad \text{and}$$

$$PVT^{TRT} = \frac{MTR^{IT}(\tilde{p}+\delta)}{\rho+\delta-\pi} - \frac{(MTR^{IT}-t^{CIT})s}{\rho+\alpha} - \frac{MTR^{IT}\alpha}{\rho+\alpha} - (1-(MTR^{IT}-t^{CIT}))c.$$

An alternative way of calculating EATR is the following, which determines EATR as a linear combination of EMTR and the marginal tax rate:

(A2.9) $$EATR = \frac{p}{\tilde{p}}EMTR + \left(1-\frac{p}{\tilde{p}}\right)MTR,$$

where $\tilde{p}$ is the assumed above-normal rate of return on investment and MTR is the marginal tax rate on the project's profit. It may be worthwhile to note that the statutory tax rate t^{CIT} in the standard formula is replaced in our case by MTR^{TRT} and MTR^{IT}, which can be interpreted as the effective marginal tax rate on the investment project's profit. For the standard case, see Sørensen (2004) and Devereux and Griffith (2003).

4. Parameter values used in the effective tax rate calculations

The calculations reported in the main text use the following parameter values:

Real interest rate	r	0.05
Inflation rate	π	0, 0.05, 0.10
Economic depreciation	δ	0.15
GMT tax rate	t^{GMT}	0.15
SBIE allowance rate	s	0.05
Tax credit rate	c	0.05, 0.10
CIT rate	t^{CIT}	0, 0.05, 0.12, 0.15, 0.2
Fiscal depreciation rate	a	0.15

[17] By intra-marginal investment we refer to an investment project that yields higher returns than "just profitable" marginal investment.

Ratio $\frac{C^{Firm}}{P^{Firm}}$	v	0,075
Ratio $\frac{C^{Firm}}{P^{Firm}+C^{Firm}}$	w	0,072

The values for v and w are here derived from a simple calculation example where investment is 150, economic depreciation is 0.15 and profit is determined as 10% of the real value of the stock of capital. These values imply that the steady-state capital stock is $K = 1000$ and profit is $P = 100$. The tax credit at rate 5% on new investment is $C = 7.5$. These assumptions produce the values for v and w used in the calculations. In an ideal application for some country's tax system, v and w would be estimated from the data.

In our application we let tax incentives be represented by a tax credit calculated as a percentage of the acquisition cost of investment. Nevertheless, the framework allows one to model a wide variety of tax incentive systems. Observe that accelerated depreciation allowances are not treated in accordance with either of the two treatment forms. Therefore, accelerated depreciation seems not to have any effect on GloBE ETR or on GMT liability (top-up tax) as is noticed in OECD (2022) and Hebous and Mengistu (2024).