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The Economics of the Global Minimum Tax

Abstract

This paper shows that the OECD inclusive framework of Pillar Two fails to implement the claimed 15% minimum corporate tax for subsidiaries of multinational corporations. The reason is that the Substance-based Income Exclusion of Pillar Two allows to tax-deduct payroll costs and user costs of intangible assets twice from the tax base of the top-up tax. Employing a standard multinational firm model, we show that Pillar Two dampens tax motivated transfer pricing, but changes the employment, investment and import incentives. For a sufficiently large cost share of labor and/or capital, the Substance-based Income Exclusion is equivalent to a production subsidy.

JEL-Codes: F230, F550, H250, H730.

Keywords: corporate taxation, BEPS, Pillar Two, minimum tax.

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1 Introduction

The 137 participating countries that have signed up to the OECD inclusive framework for a 15% global minimum tax may choose whether they wish to adopt the OECD Pillar Two Model Rules or must accept the application of Pillar Two Rules by other countries. The agreement sets out Global Anti-Base Erosion (GloBE) Rules designed to ensure that large multinational businesses with consolidated profits in the excess of 750 million Euro pay a minimum effective rate of tax of 15% on profits arising in a jurisdiction whenever the effective tax rate, determined on a jurisdictional basis, is below the minimum rate. Groups with an effective tax rate below the minimum in any particular jurisdiction would be required to pay top-up taxes either to their head office location or to the low-tax jurisdiction. The global minimum tax attempts to limit tax competition over investment capital and profit shifting by introducing a globally uniform floor for corporate taxes.

This paper studies the design of the OECD inclusive framework of Pillar Two that should implement a global minimum corporate tax of 15% (OECD, 2021). Our analysis focuses on how the top-up tax owed by subsidiaries in low-tax countries is calculated. We show that Pillar Two has at least two effects on multinational firm behavior. First, the tax base for the top-up tax implies a production subsidy in low-tax countries that may replace imports by foreign direct investment. Second, the minimum tax makes transfer pricing less attractive and thus imposes a cost on an importing subsidiary. Which of these effects dominate is crucial for how Pillar Two works. The production subsidy will favor capital-intensive industries more than labor-intensive industries, and it is the main reason why the minimum tax will not be able to achieve an effective rate of 15%.

To arrive at these conclusions we model the profit-maximizing behavior of a multinational firm based on how the top-up tax is calculated. The multinational uses labor, capital and a material input, and shifts profits to a low-tax country by a transfer price on the material input. We bring key empirical findings on capital structure and tax deductible depreciation rates into the modeling framework to understand the full effect of Pillar Two. Our analysis indicates that low-tax countries could benefit from Pillar Two.

Affiliates of multinationals in low-tax countries that are shell companies stand to lose because they do not receive a reduction in the tax base based on "real activity" (referred to as the Substance-based Income Exclusion in the OECD jargon).

There is a large literature related to coordinated tax reform and a small literature related to the effect of Pillar Two. In the tax coordination literature, and arguably with relevance to Pillar Two is Konrad and Schjelderup (1999) who study how a group of countries can gain from harmonizing their capital income taxes if the rest of the world does not follow suit. They show that cooperation among the subgroup of countries is beneficial if tax rates in the initial fully non-cooperative Nash equilibrium are strategic complements.[1]

In the context of Pillar Two, Hebous and Keen (2021) assume that firm's profits are fixed, while the location of reported profits is endogenous. They show in a two-country framework that a haven country may benefit from an exogenous increase in its own tax rate under plausible assumptions about strategic complementarity of tax policies. Johannesen (2022) also assumes that capital is fixed in countries and across firms. He finds that low-tax countries will respond to the global minimum tax by increasing their own corporate tax rate, thus reducing after-tax profits in MNCs. Since the owners of multinational firms are assumed to be located in high-tax countries, welfare may fall in high-tax countries if the benefit of less profit shifting (and higher tax revenue) is less than the loss in after-tax profits by MNCs. Janeba and Schjelderup (2022) assume an open economy where capital is mobile across countries and between firms and study the revenue effects of Pillar Two by focusing on strategic tax setting effects. They show that the revenue effect of the global minimum tax depends crucially on whether competition is over tax rates or over other incentive instruments such as subsidies. When governments compete via firm-specific or uniform subsidies, the revenue gains from less profit shifting are exactly offset by higher subsidies. When competition is by tax rates, revenues and welfare may increase, but this depends on how easy it is to shift profits initially.

[1]The tax coordination literature is surveyed in Keen and Konrad (2013).

Our study sets itself apart from the studies on Pillar Two above by modeling in detail how the top-up tax is calculated, and we embed its features in a model of a multinational firm. This enables us to study how the global minimum tax affects investments, factor demand and profit shifting to low-tax countries. In the next section we describe the design of Pillar Two and how the top-up tax is calculated. The purpose of this section is to prepare the analysis in the following two sections. Section 3 introduces a model in which a multinational firm uses capital, labor and material imports for the output of a subsidiary located in a low-tax country. Section 4 shows how Pillar Two changes employment, investment and import incentives in the subsidiary, and section 5 offers some concluding remarks.

2 The Design of Pillar Two Rules

Under Pillar Two, a top-up tax will arise only if a group pays an insufficient amount of corporate income taxes at a jurisdictional level. In order to know if top-up tax is owed, rules are needed to calculate the Effective Tax Rate (ETR) in each jurisdiction where the multinational enterprise operates. This requires first a calculation of the income that a subsidiary in a low-tax country has (called GloBE income) and, second, a calculation of the tax (referred to as "covered taxes") on that income. The ETR is then found by dividing the tax amount by the tax base (GloBE Income). Once the effective tax rate is calculated, the top-up tax rate percentage is the difference between the 15% minimum rate and the subsidiary's ETR. Income taxed at less than 15% would be targeted for additional taxation. That top-up tax percentage is then applied to the GloBE income in the jurisdiction, after deducting a Substance-based Income Exclusion (SBIE). The SBIE reduces the exposure to the minimum tax and is calculated as a percentage mark-up on tangible assets and payroll costs. Profits after the deduction of the SBIE are called excess profits, and the top-up tax owed is found by multiplying excess profits by the top-up tax rate.

In principle, the top-up tax can be collected by the country where the headquarters

of the multinational reside (the resident country) or by the low-tax country (the source country). The latter happens if the low-tax country has a domestic minimum tax consistent with the Pillar Two Model. This is called a qualified domestic minimum top-up tax (QDMTTs for short). Once a domestic minimum tax meets the QDMTT conditions, any QDMTT paid by an entity will be fully creditable against any liability under Pillar Two rules. This means that a QDMTT will effectively change the order in which jurisdictions are entitled to charge top-up taxes where the effective tax rate of an entity within Pillar Two falls below the 15% global minimum rate.

The operation of Pillar Two can be illustrated by a stylized numerical example. A parent company located in a high-tax country has a subsidiary in a low-tax country with a GloBE income of USD 1000. The subsidiary pays USD 50 in covered taxes so the ETR of the subsidiary is given by $t^{ERT} = \frac{50}{1000} = 0.05$. Since the ETR is 5%, the top-up tax rate is $t^{TOP} = 15 - 5 = 10\%$. The top-up rate is multiplied with excess profits, which is GloBE income (USD 1000) minus the Substance-based Income Exclusion (SBIE). The SBIE is calculated as 10% of the eligible payroll costs and 8% of the carrying value of eligible tangible assets. These rates will be reduced to 5% over a ten-year period. We shall assume that payroll costs are USD 500 and that the value of tangible assets is equal to USD 7500. The SBIE is then equal to $0.1 * 500$ plus $0.08 * 7500 = 650$. Excess profits are $\pi^e = 1000 - 650 = 350$ and the top-up tax owed is $\pi^e * t^{TOP} = 350 * 0,1 = 35$. The subsidiary pays 50 in domestic taxes and 35 in top-up taxes so the total tax burden is USD 85 ($= 50 + 35$), which means that the *true* effective tax rate of the subsidiary is 8.5%.

The example shows that Pillar Two will not bring the total amount of taxes paid on an MNC's excess profit in a low-tax jurisdiction up to the minimum rate of 15% as long as the Substance-based Income Exclusion is positive. How close one gets to the minimum tax depends on the size of the elements in the SBIE calculation and the percentage share used. If we had used the long-term share of 5% to calculate the SBIE in our example, the effective rate of tax would increase to 11.5% still falling short of 15%. Thus, the SBIE allows countries to continue to compete over tangible investments – in both capital

assets and labor – up to a certain point. It will benefit low-tax countries where affiliates of multinationals have "real" activity and hurt pure shell companies in traditional tax havens where there is little "real" activity (see Schjelderup, 2016). Low-tax countries that harbor real investments like Ireland and Hungary stand to be less affected by the minimum tax because their SBIEs will be substantial.

An interesting question is who will collect the top-up tax. Whilst jurisdictions are not required to implement a QDMTT there is a clear incentive for low-tax countries to do so and collect the top-up tax themselves. Businesses would pay the same level of tax on their profits whether there was a QDMTT or not. Thus, rather than allow another country to collect that tax, implementing a QDMTT would ensure the tax is paid to the domestic government in the low-tax country. Even better, the low-tax country can collect the top-up tax without altering its headline corporate tax rate.

The Substance-based Income Exclusion is crucial for the understanding of how the minimum tax works. In the next sections we explore this in detail within a model of a multinational firm that has a subsidiary in a low-tax country. The subsidiary uses labor, capital and material input, and the multinational firm can shift profits by a transfer price on the material input. We put the model to use by drawing on key empirical findings in the literature to assess the implications of Pillar Two.

3 The Model

We consider a subsidiary that is located in a low-tax country and which can generate a revenue either sold to consumers or within the multinational network. In order to be able to deal with the differential tax treatment of different inputs, we consider a subsidiary producing with a general Cobb-Douglas production function given by

$$x = AF(L, K, M) = AL^{\lambda}K^{\kappa}M^{\mu}, \tag{1}$$

where $\alpha \equiv \lambda+\kappa+\mu \leq 1$ and where $A = \left(\lambda^{\lambda}\kappa^{\kappa}\mu^{\mu}\right)^{\frac{1}{\alpha}}/\alpha$ normalizes output. We employ the Cobb-Douglas production function as it will allow us to use a minimum set of assumptions on cost shares and effective factor price changes.

The subsidiary uses three inputs L, K and M, which denote labor, capital and material input, respectively. We allow the sum of production elasticities α to be smaller or equal to one, so the firm produces under decreasing or constant returns to scale. Labor is sourced locally and labor costs are fully tax-deductible. The cost of capital in form of interest payments for debt is also fully tax-deductible, but the degree to which capital depreciation is tax-deductible depends on the specific depreciation rules in the host country. The material input is sourced from the location of the headquarters, and thus the headquarters must specify a transfer price for this form of intra-firm trade.

In what follows, we will rewrite after-tax costs such that we can use a simple profit maximization approach to investigate the effects of Pillar Two. To do so, we consider w, r and q as the respective *effective* factor prices, that is, the effective wage, the effective rental and the effective transfer price of the material input. Cost minimization implies that the cost function can be given by

$$C(w, r, q, x) = \left(w^{\lambda}r^{\kappa}q^{\mu}x\right)^{\frac{1}{\alpha}} \tag{2}$$

and the marginal costs are given by

$$\frac{\partial C(w, r, q, x)}{\partial x} \equiv C' = \frac{1}{\alpha}x^{\frac{1}{\alpha}-1}\left(w^{\lambda}r^{\kappa}q^{\mu}\right)^{\frac{1}{\alpha}}. \tag{3}$$

Given effective factor prices, we can write subsidiary profit as

$$\pi^* = (1 - t^*)\left[R(x) - C(w, r, q, x)\right],$$

where $R(x)$ denotes the revenue generated by the subsidiary for which $dR(x)/dx >$

$0, d^2R(x)/dx^2 \leq 0$ and $d^2R(x)/dx^2 < 0$ if $\alpha = 1$ holds, and where t^* denotes the host country's effective tax rate. Profit maximization implies an optimal output x^* such that $dR(x^*)/dx = dC(w, r, q, x^*)/dx$ holds. We can then investigate the effect of Pillar Two on marginal cost and on factor demands. Given (2), factor demands are given by

$$L = \frac{\lambda}{\alpha w}\left(w^\lambda r^\kappa q^\mu x\right)^{\frac{1}{\alpha}} = \frac{\lambda}{\alpha} w^{-\frac{\alpha-\lambda}{\alpha}}\left(r^\kappa q^\mu x\right)^{\frac{1}{\alpha}}, \tag{4a}$$

$$K = \frac{\kappa}{\alpha r}\left(w^\lambda r^\kappa q^\mu x\right)^{\frac{1}{\alpha}} = \frac{\kappa}{\alpha} r^{-\frac{\alpha-\kappa}{\alpha}}\left(w^\lambda q^\mu x\right)^{\frac{1}{\alpha}}, \tag{4b}$$

$$M = \frac{\mu}{\alpha q}\left(w^\lambda r^\kappa q^\mu x\right)^{\frac{1}{\alpha}} = \frac{\mu}{\alpha} q^{-\frac{\alpha-\mu}{\alpha}}\left(w^\lambda r^\kappa x\right)^{\frac{1}{\alpha}}. \tag{4c}$$

We now determine the effective factor prices. Material input is an import from the headquarters to the subsidiary. The headquarters are located in a high-tax country with tax rate t while the subsidiary is located in the low-tax country with a tax rate t^* such that $t > t^*$. The transfer price per unit of material input is the effective factor price q, and the headquarters can set a lower transfer price than the true cost γ. As is common in the tax literature, we model transfer pricing in form of concealment costs that the headquarters will have to carry.[2] In more detail, reducing the transfer price from γ to q has a concealment cost of size $\beta(\gamma - q)^2 M/2$ where $\beta > 1/\gamma$ will guarantee that the transfer price will be positive.[3] The concealment costs are tax-deductible in the headquarters' country. Thus, the firm maximizes

$$(1-t)M\left[(q-\gamma) - \beta\frac{(\gamma-q)^2}{2}\right] - (1-t^*)qM$$

[2]For papers using the concealment cost approach, see Haufler and Schjelderup (2000), and Nielsen *et al.* (2008, 2010, 2014). It has been shown that the concealment cost approach leads to qualitatively the same results as an approach in which excessive transfer pricing is penalized with a probability that increases with the difference between the true costs and the transfer price; for such an approach see Kant (1988).

[3]Our results do not change if tax authorities accepted a transfer price of size $\tilde{q} > \gamma$ without cost. In this case, the concealment cost applied to $(\tilde{q} - q)$ instead of $(\gamma - q)$.

w.r.t. q where we – reasonably – assume that transfer pricing will not bring the headquarters into a loss position since the headquarters will receive dividend payments from all locations and may also make profit with local sales. Maximization yields the optimal and effective transfer price

$$q^* = \gamma - \frac{t - t^*}{\beta(1-t)} < \gamma.$$

If $(t - t^*) = 0$, the profit shifting incentive vanishes and the transfer price is set equal to true costs (γ). To see how tax differences ($t > t^*$) affect the transfer price, consider $\gamma = 1, \beta = 2, t = 30$ % and $t^* = 5$ %, in which case $q^* = 0.82$. When the tax rate in the low-tax country is smaller than in the high-tax country (here by a magnitude of 25 basis points), the headquarters deflates the transfer price by 18 % compared to the true cost.[4]

The effective cost of capital depends on both the debt-equity structure and the depreciation allowance. As well documented in the literature (see, for example, Egger *et al.*, 2014), the multinational firm can create an internal credit market in which the headquarters and the subsidiaries are lenders and borrowers. In addition to this internal debt, it can raise external debt by issuing bonds and/or receiving loans from banks. In both cases, internal and external debt costs are tax-deductible while the opportunity cost of equity is not. At the same time, thin capitalization rules and collateral requirements imply that some equity must be held at the location of the subsidiary. Let ρ denote the opportunity cost of a unit of capital financed by (internal or external) debt within the multinational network that is tax-deductible, and let i denote the opportunity cost of equity that is not tax-deductible. Thin capitalization rules and/or collateral requirements impose that the subsidiary must secure a fraction ϕ of the tangible assets K by equity and is allowed to finance a fraction $1-\phi$ by debt. Thus, $(1-\phi)\rho$ of the per unit capital cost is tax-deductible

[4]While there is a lot of evidence that transfer pricing plays an important role (see for example Davies *et al.*, 2018), it is not easy to estimate by which factor multinational firms inflate or deflate transfer prices as the arm's length price is not observable. An exemption is Wier (2020) who finds for South-African data that the transfer price compared to related imports from low-tax countries is 31% larger on average. Thus, our example is completely within the range of the empirical literature.

at the location while ϕi are not.

As for depreciation, we know that tax-deductible and economic depreciation rates differ. The main distinction is between buildings and machinery for which economic depreciation rates are estimated at an annual 3.61% and 12.25%, respectively (see Egger *et al.*, 2009). In a sample of 3,364 observations for countries which apply the Straight Line Method, the average tax-deductible depreciation rates for buildings and machinery is respectively equal to 5.41% and 17.76%, respectively, and in a sample of 729 observations for countries that apply the Declining Balance Method we find an average rate of 7.78% and 24.97%, respectively.[5] It is thus fair to say that – on average – the applied depreciation rules act as an investment subsidy.

Summarizing, with δ denoting the economic depreciation rate and $\tilde{\delta}$ the one that is tax-deductible, the after-tax cost per unit of capital is given by

$$(1-t^*)((1-\phi)\rho+\tilde{\delta})+\delta-\tilde{\delta}+\phi i=(1-t^*)r^*$$

where

$$r^* \equiv (1-\phi)\rho+\tilde{\delta}+\frac{\delta-\tilde{\delta}}{1-t^*}+\frac{\phi i}{1-t^*}=(1-\phi)\rho+\frac{\delta-t^*\tilde{\delta}}{1-t^*}+\frac{\phi i}{1-t^*}$$

denotes the effective rental. Without Pillar Two, the wage rate is also the effective wage rate such that $w^*=\omega$, where ω denotes the wage rate in the host country. In the next section, we investigate how Pillar Two will change the effective factor prices and its implications on factor demands and marginal costs.

[5]These data are part of the RSIT International Tax Institutions Database, see Wamser *et al.* (2023).

4 The Effects of Pillar Two

As outlined in section 2, the Substance-based Income Exclusion of the Global Anti-Base Erosion Model Rules allows a multinational firm to deduct a fraction of the wage bill and of the stock of tangible assets from the tax base which determines the potential *additional* tax burden due to the minimum tax. This fraction is different for wage bills and investment at an early stage, but will be equal to 5% for both eventually. Thus, we do the analysis for a common fraction, but our main results do not change with differential treatment.

In more detail, let σ denote this fraction and let T denote the minimum tax; π^* denotes the subsidiary profit. The after tax profit is then given by $(1-t^*)\pi^*-(T-t^*)(\pi^*-\sigma(\omega L+K)) = (1-T)\pi^* + \sigma(T-t^*)(\omega L+K)$ if $\pi^* - \sigma(\omega L+K) > 0$. If $\pi^* - \sigma(\omega L+K) \leq 0$, the after tax profit will remain unchanged at $(1-t^*)\pi^*$ and the minimum tax will be inconsequential. Given that $\sigma = 5\%$, we can expect that some manufacturing subsidiaries that use tangible capital as a main input will remain unaffected by the minimum tax. This is not necessarily true for wholesale subsidiaries that use imported material as a main input. It will definitely affect shell companies that do not use any input unless they will be turned into output-generating subsidiaries. In what follows, we confine the analysis to the response of subsidiaries for which $\sigma(\omega L+K) < \pi^*$ continues to hold. It should be clear, however, that the response that we will identify may lift some subsidiaries beyond this threshold such that we may expect some bunching at $\sigma(\omega L+K) = \pi^*$.

If $\pi^* - \sigma(\omega L+K) > 0$, how does Pillar Two change the effective factor prices? First, since wage costs are completely tax-deductible, this provision is equivalent to a wage subsidy as wage costs can be deducted twice. Consequently, the wage cost per unit of labor is now given by

$$(1-T)\omega - \sigma(T-t^*)\omega = (1-T)w^{**}$$

where

$$w^{**} \equiv \omega \left(1 - \frac{\sigma(T - t^*)}{1 - T}\right) < w^*$$

is the effective wage rate that is lower than the initial wage w^*. We can determine the maximum size of this subsidy since $\sigma(T - t^*)/(1 - T) < \sigma T/(1 - T) = 0.88\%$ for $\sigma = 0.05$ and $T = 0.15$, and thus this wage subsidy is moderate.

Second, the minimum tax T makes transfer pricing less attractive since the new effective transfer price is now given by

$$q^{**} = \gamma - \frac{t - T}{\beta(1 - t)} > q^*.$$

For our example from section 3 in which we assume $\gamma = 1, \beta = 2, t = 30\%$, the transfer price will increase by 7% of the true cost from 0.82 to 0.89.

The impact on the effective rental is more complex. First, as we could see from above, $\delta < \tilde{\delta}$ is likely to hold such that the depreciation allowance already worked like an investment subsidy, and this effect will become stronger. Second, the opportunity cost of equity is now larger since it cannot be deducted from a larger minimum tax. Finally, an important detail of Pillar Two is that the firm is able to deduct a fraction of the capital stock from the tax base for the difference between the minimum tax rate and the host country's tax rate due to the Substance-based Income Exclusion. Consequently, the after-tax cost per unit of capital is now given by

$$(1 - T)((1 - \phi)\rho + \tilde{\delta}) + \delta - \tilde{\delta} - \sigma(T - t^*) + \phi i = (1 - T)r^{**}$$

where

$$r^{**} \equiv \rho + \frac{\delta - T\tilde{\delta}}{1-T} - \frac{\sigma(T-t^*)}{1-T} + \frac{\phi i}{1-T}$$

denotes the new effective rental. In general, it is not clear whether r^{**} is smaller or larger than r^*. In order to explore whether the Substance-based Income Exclusion works like an investment subsidy, we can write the difference as

$$r^{**} - r^* = -\frac{(T-t^*)[\overbrace{(1-t^*)\sigma}^{\text{I}} - \overbrace{(\delta - \tilde{\delta})}^{\text{II}}]}{(1-t^*)(1-T)} + \underbrace{\frac{\phi i (T-t^*)}{(1-t^*)(1-T)}}_{\text{III}}, \tag{5}$$

which allows us to examine the likely effects of the Substance-based Income Exclusion in some more detail. Notice that the increase in the effective rental rate due to the larger opportunity cost of equity is smaller than $\phi i T/(1-T)$, see III. A reasonable assumption is that the equity share of capital is 50% (or less) in a multinational corporation and that the opportunity cost of equity is equal to 5%.[6] Given these assumptions and since the minimum tax is equal to $T = 0.15$, we have $\phi i T/(1-T) = 0.44\%$.

Turning to the effects of the Substance-based Income Exclusion (see I), note that $t^* < 0.15$ triggers the minimum tax and $\sigma \geq 0.05$, implying that $(1-t^*)\sigma > 3.61\%$. Thus, the Substance-based Income Exclusion implies an investment subsidy as along as the difference between the economic and the tax-deductible depreciation does not exceed 3.61% (see II), which we can rule out as a relevant case. If we go with the economic and the average tax-deductible depreciation rates under the Straight Line Method from section 3, keep the

[6]Møen *et al.* (2019) report an average debt ratio of 62% for German multinationals between 1996 to 2006 which implies an equity share of 38%, and Goldbach *et al.* (2021) report that this debt share has declined to around 50% between the years 1999 to 2017 which implies an equity share of 50%. The assumption of a 5% opportunity cost of equity is very conservative. Usually, the long-term interest rate of government bonds with a maturity of 10 years is considered to reflect the opportunity cost of capital. This rate has never exceeded 5% since 2010 in Canada, France, Germany, Japan, the UK or in the US; see OECD (2023b).

other assumptions and set $t^* = 5\%$, we find that $r^{**} - r^*$ is respectively equal to -0.96% for machinery and equal to -0.5% for buildings. These changes are large in terms of rentals, and thus we may expect that the Substance-based Income Exclusion works like a strong investment subsidy.[7] Consequently, we conclude that the effective rental will decline in response to the introduction of Pillar Two.

The subsidiary profit is now given by $\pi^{**} = (1 - T)\left[R(x) - C(w^{**}, r^{**}, q^{**}, x)\right]$. If Pillar Two reduces (increases) the marginal cost for a given output level x, the subsidiary will increase (decrease) output. We find:

Proposition 1. *For a sufficiently large cost share of labor and/or capital, Pillar Two is equivalent to a production subsidy in low-tax countries.*

Proof. See Appendix A.1. □

The minimum tax leads to an increase in the transfer price and thus the effective cost of the material input. In contrast, the Substance-based Income Exclusion allows the firm to tax-deduct wages and part of the intangible assets twice from the overall tax base, and this implies an incentive to increase output. Proposition 1 shows that if the cost share of labor and/or capital are sufficiently high, the benefit of the Substance-based Income Exclusion outstrips the negative effect of a higher transfer price.

Let us illustrate the production effect for some stylized examples for which we assume constant returns to scale. We continue to use our former assumptions and additionally that $r^* = 5\%$. For example, a manufacturer can be expected to use labor, tangible capital and material input such that $\lambda = 0.7, \kappa = 0.2$ and $\mu = 0.1$. In this case, Pillar Two will subsidize output if the transfer price does not increase by more than 42.56%. Another example is a wholesaler that relies heavily on material input and less on labor and capital such that $\lambda = \kappa = 0.05$ and $\mu = 0.9$. In that case, output will decline if the transfer price goes up by more than 5.31%. Hence, we expect that Pillar Two will make manufacturing

[7] If we set $t^* = 10\%$, $r^{**} - r^*$ is equal to -0.49% and -0.25% for machinery and buildings, respectively, and these numbers are still sizable in the context of rentals.

output larger while wholesale output may decline as wholesalers are more likely to face an increase in marginal cost.

We now scrutinize how Pillar Two will change factor demands and how these changes depend on factor price and output changes. We find:

Proposition 2. *Material imports decrease if output decreases. Labor demand increases (decreases) if* $\widehat{w} < (>)(\kappa\widehat{r} + \mu\widehat{q} + \widehat{x})/(\kappa + \mu)$*, and capital demand increases (decreases) if* $\widehat{r} < (>)(\lambda\widehat{w} + \mu\widehat{q} + \widehat{x})/(\lambda + \mu)$ *where* $\widehat{w}, \widehat{r}, \widehat{q}$ *and* $\widehat{x}$ *denote the relative changes of all effective factor prices and the relative output change, respectively.*

Proof. See Appendix 2. □

Proposition 2 shows that a stylized wholesaler who faces an increase in marginal cost will import less from the headquarters. An increase in imports is possible only if the complementary increase in labor and capital and the increase in output is strong enough. An increase in output will also increase factor demands, but we have already found that the wage subsidy is moderate. Suppose that the transfer price increases by 7% as in our example. Given our manufacturing example from above in which $\lambda = 0.7, \kappa = 0.2, \mu = 0.1$ and $r^* = 5\%$, $\widehat{r} = -19.22\%$ and $\widehat{w} = -0.59\%$, and we find that the capital demand will unambiguously increase since $\widehat{x} > 0$ and $(\lambda\widehat{w} + \mu\widehat{q})/(\lambda + \mu) = 0.36\% > \widehat{r}$. Labor demand will increase also if $\widehat{x} > 2.97\%$ since $(\kappa\widehat{r} + \mu\widehat{q} + 2.97\%)/(\kappa + \mu) = \widehat{w}$. Thus, Pillar Two subsidizes labor only moderately, but is likely to be a strong investment subsidy, and Proposition 2 shows that capital demand is likely to increase. At the same time, material inputs decline and, as a consequence, Pillar Two is likely to replace imports by foreign direct investment.

Due to transfer pricing, the size of material imports is inefficiently large to begin with, and thus Pillar Two can reduce, but not eliminate this import distortion. At the same time, it is likely to exacerbate the capital demand distortion as it will increase the subsidy effects that already exists due to generous depreciation allowances. Furthermore, Pillar Two distorts labor demand that has been undistorted before for given capital and material demand.

5 Concluding remarks

This paper shows that the OECD inclusive framework of Pillar Two fails to implement the claimed 15% minimum corporate tax for subsidiaries of multinational corporations in low-tax countries that are not shell companies. The reason is that the Substance-based Income Exclusion of Pillar Two allows to tax-deduct payroll costs and user costs of intangible assets twice from the tax base of the top-up tax. Employing a standard multinational firm model, we show that Pillar Two dampens abusive transfer pricing, but changes the employment, investment and import incentives. For a sufficiently large cost share of labor and/or capital, the Substance-based Income Exclusion is equivalent to a production subsidy that favors capital-intensive industries over labor-intensive industries since the subsidy to capital is larger than the subsidy to wages.

What is the rationale of the Substance-based Income Exclusion that drives our results? According to the OECD, " [a] substance carve-out based on assets and payroll costs allows a jurisdiction to continue to offer tax incentives that reduce taxes on routine returns from investment in substantive activities, without triggering additional GloBE top-up tax. Given the carve-out covers investment in both tangible assets and payroll it will have broad application to a wide range of different industries."[8] Our paper has demonstrated that these effects can be indeed very strong and heterogeneous across industries.

At the same time, however, the welfare-relevant implications are by no means clear. First, while Pillar Two will reduce distortions implied by transfer pricing, it will exacerbate the capital demand distortion and introduce a labor market demand distortion. Since multinational firms are large and have market power, this may be justified if these effects lead to a larger multinational output. However, it is in no way clear what a 5% mark-up on payroll costs and tangible assets will imply across industries in the long run. It is also not clear that the costs of these distortions will be smaller than any benefit, in particular since the Substance-based Income Exclusion is applied uniformly.

[8]See "Global Anti-Base Erosion Model Rules (Pillar Two) – Frequently Asked Questions", https://www.oecd.org/tax/beps/pillar-two-model-GloBE-rules-faqs.pdf, page 3.

Second, while Pillar Two is likely to increase tax revenues, in particular from shell companies, this effect could be far more moderate than expected. Finally, the notion of a global minimum tax is undermined by the Substance-based Income Exclusion. It is not true that all multinational activities will be subject to an effective corporate tax rate of 15%. Whatever its underpinnings and wherever the details of this exclusion came from, it may be a rude awakening for policy-makers when the public realizes that the global minimum tax is not binding for a large number of industries.

Appendix

A.1 Proof of Proposition 1

We define $\Gamma = w^{\lambda} r^{\kappa} q^{\mu}$ and express our results in terms of relative changes such that $\widehat{y} = d\log(y)$ denotes the relative change of variable y. Taking logs and differentiating marginal costs for unchanged output yields $\widehat{C'} = \widehat{\Gamma}/\alpha$ for $\widehat{x} = 0$ where $\widehat{\Gamma} = \lambda\widehat{w} + \kappa\widehat{r} + \mu\widehat{q}$. The cost shares are respectively given by $\lambda/\alpha, \kappa/\alpha$ and μ/α. Since $\widehat{w}, \widehat{r} < 0$ and $\widehat{q} > 0$, $\widehat{\Gamma} < 0$ if $\lambda\widehat{w} + \kappa\widehat{r} < -\mu\widehat{q} = -(\alpha - \lambda - \kappa)\widehat{q}$ which is true if λ and/or κ are sufficiently large. $\widehat{\Gamma} < 0$ reduces marginal cost for $\widehat{x} = 0$ which implies an increase in output to equalize marginal revenues and marginal costs.

A.2 Proof of Proposition 2

Differentiating the logs of (4a), (4b) and (4c) yields

$$\widehat{L} = -(1/\alpha)\left[(\kappa+\mu)\widehat{w} - \kappa\widehat{r} - \mu\widehat{q} + \widehat{x}\right], \widehat{K} = -(1/\alpha)\left[(\lambda+\mu)\widehat{r} - \lambda\widehat{w} - \mu\widehat{q} + \widehat{x}\right],$$
$$\widehat{M} = -(1/\alpha)\left[(\lambda+\kappa)\widehat{q} - \lambda\widehat{w} - \kappa\widehat{r} + \widehat{x}\right].$$

Given that $\widehat{q} > 0$ and $\widehat{w}, \widehat{r} < 0$, $\widehat{M} < 0$ if $\widehat{x} \leq 0$. Furthermore,

$$\widehat{L} > (<)0 \text{ if } \widehat{w} < (>)\frac{\kappa\widehat{r} + \mu\widehat{q} + \widehat{x}}{\kappa+\mu}, \widehat{K} > (<)0 \text{ if } \widehat{r} < (>)\frac{\lambda\widehat{w} + \mu\widehat{q} + \widehat{x}}{\lambda+\mu}.$$

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