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Why Minimum Corporate Income Taxation Can Make the High-Tax Countries Worse off: the Compliance Dilemma*

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Abstract

Minimum taxation means that if a multinational enterprise (MNE) declares its operations in a jurisdiction taxing less than the minimum tax, the countries where the real economic activity takes place would have the right to tax the difference. There is a revival of the minimum tax standard for two reasons. First, there is concern about the complexity of assigning taxing rights and the effectiveness of profit-splitting rules in eliminating profit shifting. Second, the minimum tax standard has the merit of tackling multinational tax avoidance at its root. However, this argument ignores the strategic interaction between minimum taxation and tax compliance. Building upon Hindriks and Nishimura (2021), we develop a framework in which effective international tax compliance requires enforcement coordination between countries (e.g. exchange of information). We show that under sufficient market asymmetry (translating into the tax differential), minimum taxation may induce the low-tax countries to withdraw from international tax compliance agreements. We then show that such a breakdown of cooperation can make the high-tax country worse off compared to the absence of minimum taxation.

Keywords: Profit shifting; Tax competition; Tax enforcement;
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1 Introduction

New technologies and the globalization of the economy have facilitated tax avoidance through the shifting of profits by multinational enterprises (MNEs) to low-tax jurisdictions. This is the essence of base erosion and profit shifting (BEPS, hereafter referred to as "profit shifting"). In 2020, the OECD/G20 Inclusive Framework on the BEPS project released blueprints which include "global minimum tax measures". Minimum taxation means that if an MNE declares its operations in a jurisdiction taxing less than the minimum tax, the countries where the real economic activity takes place would have the right to tax the difference. As stated by the most recent OECD appraisal, much of the gains in tax collection would come from minimal taxation. There is a revival of the minimum tax standard for two reasons. First, there is concern about the complexity of assigning taxing rights and the effectiveness of profit-splitting rules in eliminating profit shifting.[1] Second, the minimum tax standard has the merit of tackling multinational tax avoidance at its root. However, this argument ignores the strategic interaction between minimum taxation and tax compliance. Building upon Hindriks and Nishimura (2021), we develop a framework in which effective international tax compliance requires enforcement coordination between countries (e.g., strict monitoring and inspection, more efficient information sharing, reinforcement of tax officials' skills and competence).

We consider a simple two-country model with different market sizes. The MNE shifts profits from the division in the high-tax country to that in the low-tax country, subject to a concealment cost. Countries choose their enforcement effort levels. The tax enforcement shares the properties of joint production with individual efforts, where the sharing of the production gains leads to a non-trivial incentive problem. We then compare the equilibria for the noncooperative and cooperative enforcement choices. In the latter scenario, countries choose enforcement levels to maximize their joint wel-

[1] The Pillar One of OECD (2021) proposes to start taxing multinationals as global firms and distribute part of the global profits where the value is created. Essentially, it involves the shift from separate accounting (SA) to formula apportionment (FA). However, a shift from SA to FA does not solve fiscal spillover problems and it may even aggravate them (Nielsen et al. (2010)). More fundamentally, each country has preferred sharing rules (for example, sales, capital, and labor) so that a group of countries would never agree on allocation rules. In our paper, we consider the scope for beneficial cooperation on tax enforcement in the context of SA. As stated by the French Council of Economic Analysis (CEA), the introduction of a worldwide minimum effective corporate tax rate (so-called pillar 2 of the OECD (2021)) should be the main priority of international negotiations, whereas the redesigning profit splitting rules has a negligible impact on tax revenues. See Fuest et al. (2019).

fare, but they still determine tax rates noncooperatively. This case reflects the current OECD framework to reinforce enforcement cooperation in which each country still can freely choose its tax system and tax rates.

A key feature of our model is that both the low-tax and high-tax jurisdictions care about international tax compliance and are willing to contribute (albeit to a different extent) to reinforce international tax compliance. More specifically, the model assumes pre-commitment on tax enforcement such that both countries can levy higher taxes. Indeed, if enforcements and taxes were simultaneously chosen, then given the market asymmetry, the low-tax jurisdiction would not agree to contribute to international compliance that limits profit shifting. Also, our argument that the minimum tax may unravel international agreement on tax compliance does not involve tax haven since such jurisdictions are not willing to participate in such agreement in the first place.

We show that under sufficient market asymmetry (translating into the tax differential), minimum taxation may induce the low-tax countries to withdraw from international tax compliance agreements. We then show that such a breakdown of cooperation can make the high tax country worse off compared to the absence of minimum taxation. The minimum tax can harm the high-tax country but not the low-tax country for which the tax floor is binding.

2 Framework

2.1 The model

There are two countries, denoted by 1 and 2. A multinational enterprise (MNE) havs branches in each country. From the production decisions in country $i = 1, 2$, the firm generates π_i in country i. Then, at some cost, it may shift profits between branches to minimize the firm's total tax liability. In other words, it decides how much profit to report, $\tilde{\pi}_i$ in country i, where total reported profit must equal total realized profit ($\tilde{\pi}_1 + \tilde{\pi}_2 = \pi_1 + \pi_2$). In order to focus on the profit shifting activities of the firms, we assume that profit taxes do not change the equilibrium demand, supply and aggregate profit (similar to a widely used model by Kanbur and Keen (1993)):

$$\pi_1 = \frac{1+\epsilon}{2},\ \pi_2 = \frac{1-\epsilon}{2},\ \epsilon \in [0, 1) \tag{1}$$

$\epsilon > 0$ is a parameter for the market asymmetry, where Country 1 has the larger domestic market. For convenience, we normalize the total actual prof-

its to be 1. For instance, if $\epsilon = 0.4$ then country 1 has a profit share of $\pi_1 = \dfrac{1+0.4}{2} = 0.7$ (before profit shifting).

Given country i's source-based tax rate t_i on the reported profit, the firm's profit becomes $(1-t_1)\tilde{\pi}_1 + (1-t_2)\tilde{\pi}_2 - C(\pi_i, \tilde{\pi}_i)$. We introduce the following convex and nonfiscally-deductible concealment cost $C(\pi_i, \tilde{\pi}_i)$, which is widely used in the literature:[2]

$$C(\pi_i, \tilde{\pi}_i) = \delta(e)(\pi_i - \tilde{\pi}_i)^2, \ i = 1, 2 \text{ and } k = a, b. \tag{2}$$

Several explanations are in order. First, $\delta(e)$ is a scaling factor for resource costs associated with profit shifting. It reflects the cost of hiring accounting experts to produce the required documents, expected penalties to be paid to the government, or the expected market sanction when caught cheating on tax liabilities. In the context of tax evasion, a standard assumption in the literature is that such costs are increasing and convex in the extent of profit shifting (tax evasion), $|\pi_i - \tilde{\pi}_i|$, regardless of the direction of profit shifting (i.e., it is cost equivalent to shift profits outward or inward).

Second, $\delta(e) = \delta(e_i, e_j)$ depends on the governments' enforcement efforts e_i, e_j, such as tougher monitoring, more efficient information sharing, and the efforts to negotiate and reach agreements with the other country's tax authority. $\delta(e)$ is an increasing function of e_i and e_j, such that stricter enforcement implies a higher $\delta(e)$. Moreover, in reality, dispersed (unilateral) enforcement efforts between involved countries are less effective in aggregate.[3] For instance, a lack of tax-relevant information provided by the host country makes the taxable income unclear to the home country, and the tax authorities cannot address tax fraud effectively. To formalize the imperfect substitutability of enforcement efforts, we adopt the following CES formula:

$$\delta(e_1, e_2) = \left(0.5\, {e_1}^{-\rho} + 0.5\, {e_2}^{-\rho}\right)^{-\frac{1}{\rho}}, \quad \rho \geq -1. \tag{3}$$

The enforcement technology (3) is exogenous. The polar cases are: (i) $\rho = -1$ (perfect substitutes: total enforcement is based on the average enforcement); (ii) $\rho \to 0$ (the Cobb–Douglas case $\delta(e_1, e_2) = e_1^{0.5} e_2^{0.5}$); and (iii) $\rho \to \infty$ (the weakest–link case $\delta(e_1, e_2) = \min[e_1, e_2]$, where total enforcement is based on that of the lowest enforcer). For example, if during the mutual agreement

[2]For example, see Haufler and Schjelderup (2000), Swenson (2001), Kind et al. (2005), Peralta et al. (2006), Devereux et al. (2008), Nielsen et al. (2008), and Keen and Konrad (2013). See also Huizinga and Laeven (2008) and Amerighi and Peralta (2010) for a slightly different specification.

[3]Klassen and Laplante (2012) showed that profit shifting in a given country depends not only on the enforcement of the regulations in the home country but also on the implementation of the regulations in the host country.

procedure, the low-tax country can exercise a veto power on the transfer price and taxable incomes of the MNEs, then the enforcement technology becomes closer to the weakest–link formula.

The tax revenue in country i is:

$$R_i = t_i \left(\tilde{\pi}_i^a + \tilde{\pi}_i^b\right)$$

We assume that governments seek to maximize their fiscal revenue net of the enforcement cost (the tax administration costs). This feature is similar to a widely used model by Kanbur and Keen (1993). We assume that $t_i \leq 1$, for $i = 1, 2$. Assuming a quadratic cost of enforcement ($c(e_i) = \eta\frac{(e_i)^2}{2}$) for simplicity, welfare in country i is:

$$W_i = R_i - \eta\frac{(e_i)^2}{2},$$

where $\eta > 0$ is a parameter for the enforcement cost. For simplicity, we set $\eta = 1$ for the rest of the paper.[4]

2.2 Profit shifting by the firm

We consider a three-stage game with the following sequence of events. In the first stage, both countries set their enforcement efforts. In the second stage, both countries choose their tax rates. In the third stage, multinational enterprises compete à la Cournot in each local market and choose a level of production in each country and the amount of profit to be shifted.

Regarding enforcement and tax timing, we assume that the enforcement efforts are chosen first and taxes are chosen later. Any alternative timing leads to $e_2 = 0$: the small country would always choose zero enforcement. In turn, when $\rho \geq 0$, it leads to zero taxes for both countries.[5] Our enforcement-then-tax timing rationalizes the BEPS project which is to promote voluntary tax enforcement to increase the tax capacity of member states.

The model is solved by backward induction. In this subsection, we analyze the decisions of the firms in each country, given the tax $t = (t_1, t_2)$ and enforcement $e = (e_1, e_2)$ choices made earlier. The firm chooses the quantities

[4] In most of the paper, we can restrict $\eta = 1$ without loss of generality. The exceptions are when either the asymmetry parameter ϵ or the minimum tax parameter τ below is sufficiently large in the cooperative regime. A sufficient condition for interior tax equilibrium is $\eta \geq 33/32$ in these specific cases.

[5] In Hindriks and Nishimura (2018), we considered the scenario that the tax rate and enforcement effort are chosen simultaneously and noncooperatively. We showed that there is no equilibrium with positive taxes in pure strategy. The case when the sequence of decisions is reversed is available upon request to the authors.

to produce in each market and the profit to report, $(\tilde{\pi}_1, \tilde{\pi}_2)$, to maximize the after-tax profit net of the profit-shifting cost, as follows:

$$(1-t_1)\tilde{\pi}_1 + (1-t_2)\tilde{\pi}_2 - \delta(e)(\pi_1 - \tilde{\pi}_1)^2,$$

subject to $\tilde{\pi}_1 + \tilde{\pi}_2 = \pi_1 + \pi_2$. The first-order condition for $\tilde{\pi}_1$ yields:

$$-t_1 + t_2 - 2\delta(e)(\tilde{\pi}_1 - \pi_1) = 0. \tag{4}$$

Profit taxes do not change supply and aggregate profit. However, profit taxes change the distribution of profit shares (reported profit) between countries via profit shifting. (1) and (4) derive the following Stage-3 outcome:

$$\tilde{\pi}_1 = \frac{1+\epsilon}{2} - \frac{t_1 - t_2}{2\delta(e)} \equiv \tilde{\pi}_1(t,e),\ \tilde{\pi}_2 = \frac{1-\epsilon}{2} + \frac{t_1 - t_2}{2\delta(e)} \equiv \tilde{\pi}_2(t,e). \tag{5}$$

The reported profit in country i consists of (a) actual profits π_i that depend on the market size ϵ and (b) the amount of profit shifting $\pi_i - \tilde{\pi}_i$. The latter is proportional to the tax difference $t_i - t_j$ and inversely proportional to the total enforcement $\delta(e)$.

From (5), given the equilibrium profit shifting, country i's tax revenue net of the enforcement cost is, with $\eta = 1$:

$$W_i = t_i\tilde{\pi}_i(t_i, t_j, e) - \frac{(e_i)^2}{2} = t_i\left(\frac{1+\epsilon_i}{2} - \frac{t_i - t_j}{2\delta(e)}\right) - \frac{(e_i)^2}{2}, \tag{6}$$

where $\epsilon_1 = \epsilon = -\epsilon_2$.

2.3 Tax choices under the minimum tax

In the second stage of the game, each country noncooperatively chooses its own tax rate t_i $(i = 1, 2)$ to maximize (6). This stage is divided into two substages. Given e in Stage 1, the governments first set the mimimum tax in Stage 2.0, prior to the tax competition in Stage 2.1.

To see how we set the minimal-tax policies, we first derive the Nash equilibrium in the absense of the minimal taxation. The first-order conditions are:

$$\frac{\partial W_i}{\partial t_i} = \frac{1+\epsilon_i}{2} - \frac{t_i - t_j}{2\delta(e)} + t_i\frac{-1}{2\delta(e)} = 0. \tag{7}$$

They yield the following equilibrium taxes, denoted by $(t_1^N(e), t_2^N(e))$:

$$t_1^N(e) = \delta(e)\left(\frac{3+\epsilon}{3}\right) \quad \text{and} \quad t_2^N(e) = \delta(e)\left(\frac{3-\epsilon}{3}\right). \tag{8}$$

From (8), the binding minimum tax has to be $\underline{t} > t_2^N$.[6] For the minimum tax standard $\underline{t} > t_2^N$, the tax choice becomes:

$$t_2^M = \underline{t},\ t_1^M = \delta(e)\left(\frac{1+\epsilon}{2}\right) + \frac{\underline{t}}{2}, \tag{9}$$

where the latter comes from the high-tax country's tax reaction function from (7). (t_1^M, t_2^M) intersects with the 45°-line at $\underline{t} = \delta(e)(1+\epsilon)$ (tax harmonization). This tax equalization policy is assumed to be the upper bound of the minimum tax rate. Therefore, we consider that the governments choose the minimum tax from the following range:

$$\underline{t} = \tau\delta(e),\ \tau \in \left(\frac{3-\epsilon}{3}, 1+\epsilon\right) \equiv (\underline{\tau}, \overline{\tau}) \tag{10}$$

Here we set $\underline{t}$ to be conditional on the choice of $\delta(e)$ in the previous stage. This is a natural tax policy given the enforcement pre-commitment. As the unconstrained equilibrium tax rates (8) are conditional on the international enforcement level, we consider that the minimum tax standard is also conditional on $\delta(e)$. From (5), for $\tilde{\pi}_i^M \equiv \tilde{\pi}_i(t_1^M(e), t_2^M(e), e)$, we have:

$$\tilde{\pi}_1^M = \frac{1+\epsilon}{2} - \frac{t_1^M(e) - t_2^M(e)}{2\delta(e)} = \frac{1+\epsilon}{4} + \frac{\tau}{4} \ \text{ and } \ \tilde{\pi}_2^M = \frac{3-\epsilon}{4} - \frac{\tau}{4}. \tag{11}$$

For the range of (10), we have $\tilde{\pi}_1^M \geq 1/2$ for all $\tau \in (\underline{\tau}, \overline{\tau})$ and $\epsilon \in (0,1)$. In equilibrium, the profit shares (reported profits) as well as the profit shifting $\pi_1 - \tilde{\pi}_1^M$ are independent of enforcement levels (e_1, e_2) and enforcement technology $\delta(e)$. The higher enforcement simply scales up the tax gap by the same proportion (tax rates are proportional to international tax compliance). In equilibrium, the higher tax compliance is offset by a higher tax gap so that the extent of profit shifting is unchanged. Moreover, minimum taxation increases in equilibrium the profit share of the high-tax country at the expense of the low-tax country (tax convergence effect). The tax revenues $R_i^M(e) = t_i^M(e)\tilde{\pi}_i^M$ $(i = 1, 2)$ are as follows for all $\epsilon \in (0,1)$ and $\tau \in (\underline{\tau}, \overline{\tau})$:

$$R_1^M(e) = \frac{\delta(e)}{8}(1+\epsilon+\tau)^2 \geq R_2^M(e) = \frac{\delta(e)}{4}\tau(3-\epsilon-\tau). \tag{12}$$

The minimum tax τ increases the revenue gap. This is because the minimum tax increases the profit share of the high-tax country. This change in profit

[6] Note that this formulation includes the current proposals of country-by-country (CbC) minimum taxation, in which the income declared in the low-tax country may in part be subject to taxation in a high-tax country. This induces the low-tax country to match the minimum tax standard $t_2 = \underline{t}$, for otherwise the high-tax country would collect the residual tax.

shares will in turn change enforcement incentives of both the high tax and low tax countries.

3 Enforcement choices

In the first stage, the governments in each country choose their enforcement effort levels, taking into account the behavior in the subsequent stages. We first examine noncooperative enforcement choices, where each country chooses e_i $(i = 1, 2)$ simultaneously and independently. Let (e_1^M, e_2^M) be the non-cooperative enforcement equilibrium under minimum tax τ.

3.1 Enforcements are substitutes

As an illustration, we first consider that enforcements are perfect substitutes $(\rho = -1)$ so that the international compliance is based on the the arithmetic mean of enforcement levels $\delta_{-1} \equiv 0.5e_1 + 0.5e_2$. Given e_j, country i maximizes $W_i^M(e_i, e_j) = R_i^M(e_i, e_j) - \dfrac{(e_i)^2}{2}$ where $R_i^M(e)$'s are given in (12). The first-order conditions with respect to country i's enforcement choice yield for all $\tau \in (\underline{\tau}, \overline{\tau})$:

$$e_1^M = \left(\frac{1+\epsilon+\tau}{4}\right)^2, \; e_2^M = \frac{\tau(3-\epsilon-\tau)}{8} \tag{13}$$

Plugging the equilibrium enforcement into the welfare function, we have $W_i(e^M) = R_i^M(e^M) - \dfrac{(e_i^M)^2}{2}$ $(i = 1, 2)$.

We now turn to the international compliance agreement. Here, both countries choose their enforcement levels to maximize their joint welfare. This reflects an agreement regarding the level of information exchange in the tax treaty. However, in keeping with the current OECD framework to reinforce enforcement cooperation in which each country still can freely choose tax rates, we assume that countries set taxes (t_i) noncooperatively. Therefore, countries choose $e = (e_1, e_2)$ anticipating the noncooperative tax game $(t_1^M(e), t_2^M(e))$ and tax revenues $(R_1^M(e), R_2^M(e))$ in (12). That is,

$$\max_{e_i, e_j} \sum_i \left(R_i^M(e_i, e_j) - \frac{e_i^2}{2} \right) = \max_{e_i, e_j} \; R_1^M(e) + R_2^M(e) - \frac{e_i^2}{2} - \frac{e_j^2}{2}. \tag{14}$$

The first-order conditions give the cooperative enforcement levels $\hat{e}^M = (\hat{e}_1^M, \hat{e}_2^M)$ given by:

$$\hat{e}_1^M = \hat{e}_2^M = \left(\frac{1+\epsilon+\tau}{4}\right)^2 + \frac{\tau(3-\epsilon-\tau)}{8}$$

Enforcement efficiency requires both countries to exert the same enforcement efforts because of the convex cost function and the symmetry of the enforcement technology. When $\rho = -1$, enforcement cooperation doubles international tax compliance level (relative to no tax compliance agreement). The positive fiscal externality of enforcement $\partial R_j^M/\partial e_i > 0$ for $i \neq j$ is now internalized by the tax compliance agreement. Such cooperation induces the welfare levels $W_i(\hat{e}^M) = R_i^M(\hat{e}^M) - \dfrac{(\hat{e}^M)^2}{2}$ $(i = 1, 2)$. The large country unambiguously gains from the tax compliance agreement ($W_1(\hat{e}^M) > W_1(e^M)$ for all τ and $\epsilon > 0$). However, for the low-tax country, there are offsetting effects. The international tax compliance agreement involves extra enforcement $\hat{e}_2^M - e_2^M$ from the low-tax country that is increasing in ϵ. As a result, even though the tax compliance agreement involves higher revenues also for the low-tax country ($R_2^M(\hat{e}^M) - R_2^M(e^M) > 0$), this country may prefer the noncooperative regime. The following proposition states the conditions on the market asymmetry and the minimum tax such that the low-tax country prefers the tax compliance agreement.

Proposition 1 *Suppose that $\rho = -1$, and $\tau \in (\underline{\tau}, \overline{\tau})$.*

(i) For the high-tax country, $W_1(\hat{e}^M) > W_1(e^M)$ for all ϵ and τ.

(ii) For the low-tax country, given τ, there exists a cutoff level of asymmetry $\epsilon^M(-1, \tau)$ such that $W_2(\hat{e}^M) > W_2(e^M)$ iff $\epsilon < \epsilon^M(-1, \tau)$.

(iii) The cutoff level of asymmetry $\epsilon^M(-1, \tau)$ is decreasing in τ.

3.2 Enforcements are complements

For $a_1 \equiv \dfrac{(1+\epsilon+\tau)^2}{8}$ and $a_2 \equiv \tau\dfrac{(3-\epsilon-\tau)}{4}$ we have (see the Appendix):

$$e_i^M = 0.5\left(0.5\, {a_1}^{-\frac{\rho}{2+\rho}} + 0.5\, {a_2}^{-\frac{\rho}{2+\rho}}\right)^{\frac{-1-\rho}{\rho}} {a_i}^{\frac{1}{2+\rho}} \quad (i = 1, 2) \tag{15}$$

When enforcement efforts are complements, the international compliance is increasing with enforcement alignment: $\delta(e^* + \Delta, e^* - \Delta) < \delta(e^*, e^*)$ for $\Delta > 0$. As shown in Hindriks and Nishimura (2021), increasing complementarity (larger ρ) induces partial enforcement alignement but it is not sufficient to offset the first-order efficiency loss from enforcement dispersion. As a result, at the non-cooperative enforcement equilibrium, international compliance is decreasing with the degree of complementarity ($\delta(e^M)$ is decreasing in ρ).

Turning to enforcement cooperation, the first-order conditions of the joint welfare maximization are

$$0.5 e_i^{-\rho-1}\left(0.5 e_1^{-\rho} + 0.5 e_2^{-\rho}\right)^{\frac{1+\rho}{-\rho}}(a_1 + a_2) - e_i = 0 \quad (i = 1, 2)$$

Hence the cooperative enforcement levels are $\hat{e}_1^M = \hat{e}_2^M = 0.5(a_1 + a_2)$. We now analyze the implication of the introduction of the minimum taxation when enforcements are complements.

Proposition 2 *Suppose that $\rho = 0$ or $\rho = \infty$, and $\tau \in (\underline{\tau}, \overline{\tau})$.*

(i) For the high-tax country, $W_1(\hat{e}^M) > W_1(e^M)$ for all ρ, ϵ and τ.

(ii) For the low-tax country, given τ and ρ, there exists a cutoff level of asymmetry $\epsilon^M(\rho, \tau)$ such that $W_2(\hat{e}^M) > W_2(e^M)$ iff $\epsilon < \epsilon^M(\rho, \tau)$.

(iii) The cutoff level of asymmetry $\epsilon^M(\rho, \tau)$ is decreasing in τ and increasing in ρ.

We now list those threshold values. For $\rho = -1$ (perfect substitutes) and without minimum taxation, we have $\tau = \underline{\tau} = \dfrac{3-\epsilon}{3}$, and $\epsilon^M(-1, \underline{\tau}) \equiv \underline{\epsilon}(-1) \approx 0.259$ is the threshold value below which the low-tax country benefits from cooperation. Increasing τ reduces the cutoff level, and eventually we have $\epsilon^M(-1, \overline{\tau}) \equiv \overline{\epsilon}(-1) \approx 0.172$. For the Cobb-Douglas case ($\rho = 0$), $\underline{\epsilon}(0) \approx 0.320$ and $\overline{\epsilon}(0) \approx .211$. For the perfect complement case ($\rho = \infty$), we have $\underline{\epsilon}(\infty) \approx 0.409$, $\overline{\epsilon}(\infty) \approx .268$. Recall that $\epsilon = 0.4$ is equivalent to a profit share of 0.7 for the large country in the absence of profit shifting. In short, enforcement cooperation does not take place when ϵ is in its intermediate values, where both the upper-bound and the lower-bound are increasing in the degree of enforcement complementarity.

The final step (and most striking feature) of our argument about minimal taxation is to show that the high-tax country can be worse off as a result of the minimum tax if it breaks down the international tax compliance arrangement. So if enforcements are perfect substitutes, minimum taxation τ would break the agreement if $\epsilon^M(-1, \tau) < \epsilon < 0.259$: the international agreement is sustainable without minimum taxation $\epsilon < 0.259$ but it is not sustainable under minimum tax.

Figure 1 illustrates the case of $\rho = -1$ and $\epsilon = 0.2$. Between $\underline{\tau} = \dfrac{3-\epsilon}{3} \approx 0.933$ (the Nash equilibrium) and $\tau \approx 1.100$, enforcement cooperation Pareto dominates the noncooperative equilibrium, and the minimum tax is Pareto improving. However, when the minimum tax is pushed beyond the point $\tau \approx 1.100 < 1 + \epsilon$, the low-tax country prefers non-cooperative enforcement to recover part of its tax base loss from minimum taxation. The breakdown of enforcement cooperation makes the high-tax country worse-off. Interestingly, the minimum tax can harm the high-tax country but it cannot harm the low-tax country. This is because the low-tax country has the option to opt-out freely from the international compliance arrangement. This is what we call the compliance dilemma of minimum taxation.

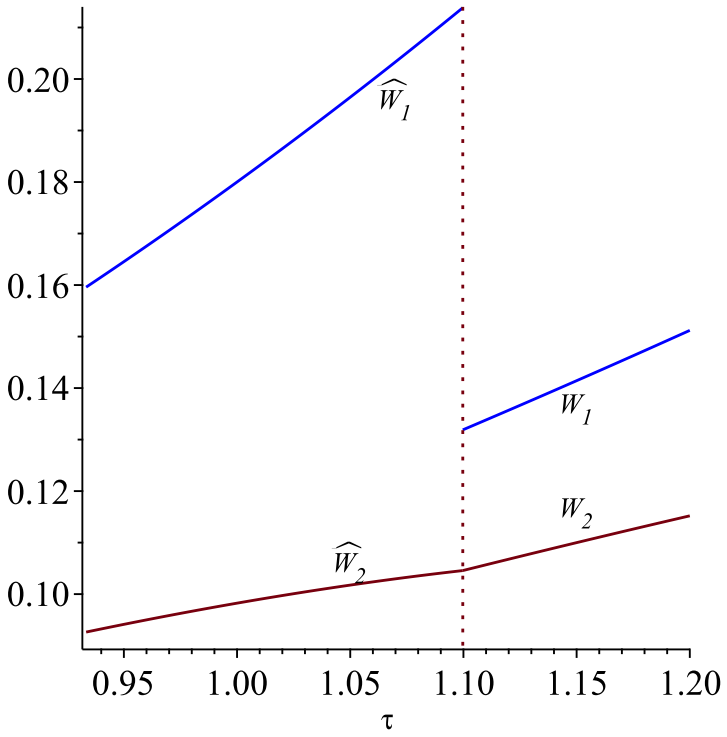

Figure 1: The minimum tax breaks the tax compliance agreement when τ is sufficiently high: $\rho = -1,\ \epsilon = 0.2$, $\hat{W}_i = W_i(\hat{e}^M)$ and $W_i = W_i(e^M)$

Note that $\epsilon > \underline{\epsilon}(\rho)$ is beyond the scope of mutually beneficial cooperation even without minimum taxation. Such cases include $\epsilon = 1$ (no production in country 2), which can be interpreted as country 2 being a tax haven. For those cases, our compliance dilemma does not apply since enforcement cooperation is not possible.

Appendix

Derivation of (15)

For $a_1 \equiv \dfrac{(1+\epsilon+\tau)^2}{8}$ and $a_2 \equiv \tau\dfrac{(3-\epsilon-\tau)}{4}$, we have:

$$\frac{\partial\delta(e)}{\partial e_i}a_i - e_i = 0 \quad \Rightarrow \quad 0.5e_i^{-\rho-1}\left(0.5e_1^{-\rho} + 0.5e_2^{-\rho}\right)^{\frac{1+\rho}{-\rho}} a_i = e_i \ (i = 1, 2).$$

The above system of equations produces (15) in the text. When $\rho = -1$, (15) is equivalent to (13).

Proof of Proposition 1 and Proposition 2

Let $\tau(a) = \min\{a(3-\epsilon), 1+\epsilon\}$. Then $\tau(a) \in (\underline{\tau}, \overline{\tau})$ for $a \in (\underline{a}, \overline{a})$ with $\underline{a} = 1/3$ and $\overline{a} = \dfrac{1+\epsilon}{3-\epsilon}$. For $a < \overline{a}$, we evaluate $W_2(\hat{e}^M)$ and $W_2(e^M)$ by setting $\tau = a(3-\epsilon)$. Numerically, we find the threshold value $\tilde{\epsilon}(-1, a)$ such that $W_2(\hat{e}^M) - W_2(e^M)$ is positive (negative) when $\epsilon < \tilde{\epsilon}(-1, a)$ ($\epsilon > \tilde{\epsilon}(-1, a)$). Also, $\tilde{\epsilon}(-1, a)$ is decreasing in a. When $a = \overline{a}$, we evaluate $W_2(\hat{e}^M)$ and $W_2(e^M)$ by setting $\tau = 1 + \epsilon$. In this case, $W_2(\hat{e}^M) - W_2(e^M)$ is positive (negative) when $\epsilon < 3 - 2\sqrt{2} \equiv \epsilon^* \approx 0.172$ ($\epsilon > \epsilon^*$). Let $a^* = (1+\epsilon^*)/(3-\epsilon^*) \approx 0.414$. By definition, at $(a, \epsilon) = (a^*, \epsilon^*)$, $\tau(a^*) = a^*(3-\epsilon^*) = 1+\epsilon^*$ and $W_2(\hat{e}^M) - W_2(e^M) = 0$, and $\tilde{\epsilon}(-1, a^*) = \epsilon^*$.

Taking these together, if $a < a^*$, we have $a < a^* < \dfrac{1+\tilde{\epsilon}(-1,a)}{3-\tilde{\epsilon}(-1,a)}$ and $\tilde{\epsilon}(-1, a) > \epsilon^*$. Define $a(-1, \epsilon)$ implicitly by $a(-1, \tilde{\epsilon}(-1, a)) = a$. Then $\tau(-1, \epsilon) \equiv a(-1, \epsilon)(3-\epsilon)$ is decreasing in ϵ. Defining $\epsilon(-1, \tau)$ by $\tau(-1, \epsilon(-1, \tau)) = \tau$, $\epsilon(-1, \tau)$ is decreasing in τ for $\tau \in (\underline{\tau}, \overline{\tau})$.

The similar calculations yield $W_1(\hat{e}^M) - W_1(e^M) > 0$ for all ϵ and τ. The proof of Proposition 2 is similar to that of Proposition 1. *Q.E.D.*

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