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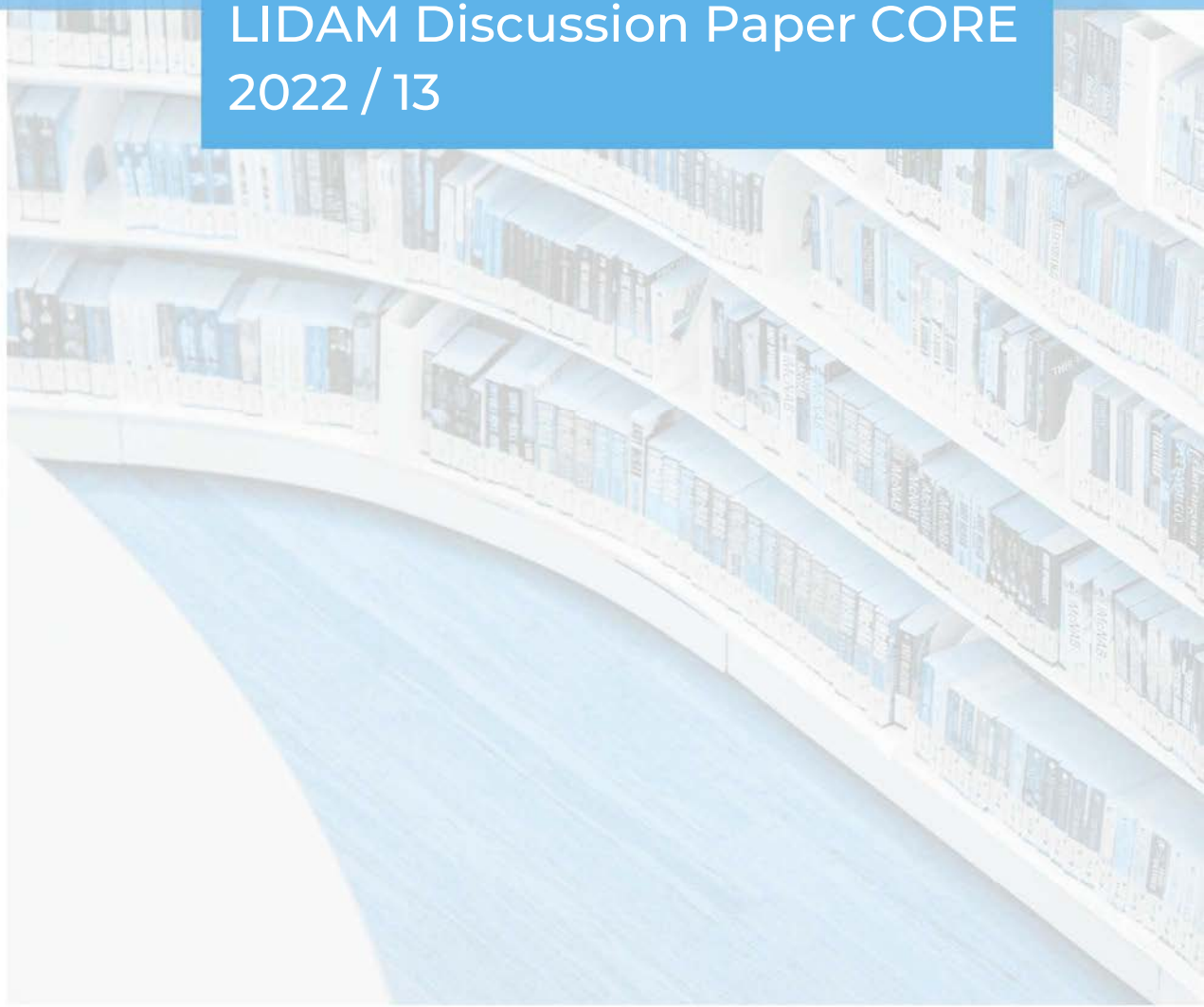
LIDAM Discussion Paper CORE
2022 / 13



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The Compliance Dilemma of the Global Minimum Tax *

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March 3, 2022

Abstract

To tackle profit shifting, the OECD/G20 Inclusive Framework proposes a Global Minimum Tax that requires that if a multinational enterprise (MNE) declares its operations in a jurisdiction taxing less than the global minimum tax, the countries where the real economic activity takes place would have the right to tax the difference. The general presumption is that (unconstrained) high-tax countries will gain and low-tax countries will lose because the constrained taxes will reduce their inward profit shifting. The purpose of this paper is to show, by means of a formal model of international tax competition with heterogeneous countries, that the consequences of the global minimum tax can be just the opposite. The key feature of our analysis is that the minimum tax will change the dynamics of tax competition together with the enforcement incentives. We show that in this broader framework, the low-tax country always gain and that there exists a critical threshold for the minimum tax beyond which enforcement cooperation will break down making the high-tax country worse off with minimum tax. The minimum tax threshold is decreasing in the extent of the tax asymmetry. We call this new effect the *compliance dilemma.*
Keywords: Profit shifting; Tax competition; Tax enforcement;
JEL Classification: C72, F23, F68, H25, H87.

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*__Declarations of interest: none.__

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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. The problem of base erosion and profit shifting (BEPS) is well documented. Bilicka (2019) used administrative firm-level data to "match" multinational companies with domestic stand alone companies in the United Kingdom, based on the size of their assets and industry in which they operate. She finds that foreign multinational subsidiaries underreport their taxable profits by 50 percent relative to domestic standalone. Dowd et al. (2017) and Bustos et al. (2019) provide evidence of extensive profit shifting respectively for the United States and Chile.

In 2020, the OECD/G20 Inclusive Framework on the BEPS project released blueprints which include "global minimum tax measures". 131 countries and jurisdictions recently joined this new plan to tackle the BEPS problem, which suggests a global minimum corporate income tax rate of 15% (see OECD (2021b)). Minimum taxation means that if a 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 (Fuest et al, 2019). However, this argument ignores the strategic interaction between minimum taxation and tax compliance. Tørsløv et al. (2020) and Bustos et al. (2019) have shown the empirical importance of addressing seriously the tax compliance issue to understand why it has been difficult to combat profit shifting so far.

The emphasis of the OECD/G20 BEPS project is on the enhancement of tax enforcement, including designing effective Controlled Foreign Company (CFC) rules, tightening transfer pricing regulations, and increasing auditing probabilities. 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,

[1]The Pillar One of OECD (2021a) 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 efficient information sharing, and reinforcement of tax officials' skills and competence).

We consider a simple two-country model with different market sizes yielding different tax incentives. 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 and tax rates so as to maximize their tax revenue net of the enforcement costs. The overall tax enforcement is the joint product of each country's enforcement level, leading to a non-trivial incentive problem. The model is voluntarily twisted to favour minimum taxation in the sense that minimum taxation benefits both the low and high-tax country when enforcement is exogenous. We then study the enforcement incentives under minimum taxation by comparing the equilibria for the non-cooperative and cooperative enforcement choices. In the latter scenario, countries choose enforcement levels to maximize their joint welfare, but they still set tax rates non-cooperatively. 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.[2]

A key feature of our model is that both the low-tax and high-tax countries care about international tax compliance but they face different incentives to invest their enforcement resources to combat profit shifting. Another feature of our model is that enforcement levels will change tax incentives. As a result, our model can fit the recent empirical evidence suggesting that profit shifting semi-elasticity with respect to tax rate differential is not constant and is higher at low-tax rates (Dowd et al, 2017). Our contribution to empirical models of profit shifting that take taxes and enforcement exogenous, is to set up a formal model to predict the impact of minimum tax on national tax and enforcement policies.

We show that when the tax differential is of intermediate values, minimum taxation will induce the low-tax countries to withdraw from international tax compliance agreements, making the high-tax country (but not the low-tax country) worse off. When tax differential is sufficiently high (as with tax haven), then cooperation breakdown cannot happen since the low-tax country is not willing to participate in tax compliance agreement in the first place. Only when tax differential is sufficiently small, both countries' enforcement incentives are sufficiently aligned to maintain tax compliance agreement under minimum taxation. For these two polar cases, minimum

[2]As an illustration of enforcement cooperation, consider transfer pricing monitoring. if there is a dispute between countries on transfer pricing corrections, it is likely to be settled quickly through the dispute resolution agreements or the general anti-avoidance provision in force among OECD countries and within the European Union. If there is no agreement, these corrections are harder to make or take more time.

taxation makes both the low and high-tax countries better off. Our paper is closely related to Hebous and Keen (2021) showing that Minimum tax can be Pareto improving by curbing profit shifing and raising equilibrium taxes. We add to that argument the dynamic of enforcement and tax policies in response to the minimum tax. Our paper is also related Johannesen (2022) showing that the minimum tax can harm high tax countries if set too low. The argument is based on a trade off between the private income of the firms' owners and tax revenue and there is no enforcement issue. In our paper we assume revenue maximizing policies (i.e. we put zero welfare weight on the private income of the firm's owners).

The rest of the paper is organized as follows. Section 2 describes the model, profit shifting incentives and tax choices under minimum taxation. Section 3 compares the coordinated and uncoordinated enforcement policies in response to the minimum tax when enforcement levels are either substitutes or complements. Section 4 studies the potential break up of cooperation. Section 5 concludes.

2 Framework

2.1 The model

There are two countries, denoted by 1 and 2. A multinational enterprise (MNE) has 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 profits to be 1. For instance, if $\epsilon = 0.4$ then country 1 has a profit share of $\pi_1 = \frac{1+0.4}{2} = 0.7$ (before profit shifting).

Given country i's source-based tax rate t_i on the reported profit, the firm's profit becomes $(1 - t_1)\tilde{\pi}_1 + (1 - t_2)\tilde{\pi}_2 - C(\pi_1, \tilde{\pi}_1)$. We introduce

the following convex and nonfiscally-deductible concealment cost $C(\pi_1, \tilde{\pi}_1)$, which is widely used in the literature:[3]

$$C(\pi_1, \tilde{\pi}_1) = \delta(e)(\pi_1 - \tilde{\pi}_1)^2.$$

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.[4] 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:

$$\delta(e_1, e_2) = \left(0.5\, {e_1}^{-\rho} + 0.5\, {e_2}^{-\rho}\right)^{-\frac{1}{\rho}}, \quad \rho \geq -1. \tag{2}$$

The enforcement technology (2) 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 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:

$$R_i = t_i \tilde{\pi}_i$$

[3]For example, see Peralta et al. (2006), Devereux et al. (2008), and Keen and Konrad (2013). See also Huizinga and Laeven (2008) for a slightly different specification.

[4]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. Using a spatial econometric approach, Durán-Cabré et al. (2015) provided evidence of strategic complementarities between regional administrations with respect to audit policies among Spanish regional governments.

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.[5]

2.2 Profit shifting incentives

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, the multinational enterprise chooses the amount of profit to be shifted.

Regarding national enforcement and tax policies, we assume that enforcements are chosen before taxes. Alternative sequence would lead to $e_2 = 0$: the low-tax country would always choose zero enforcement if enforcement did not change equilibrium taxes. As a result, when enforcements are complements $\rho \geq 0$, profits can costlessly be shifted and we are facing a race to the bottom leading to zero taxes in both countries [6] Our enforcement-before-taxing sequence fits well with the overall OECD (2021a) framework which is to promote international tax compliance leaving national discretion on tax choices.

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 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 the profit-shifting equation:

$$\pi_1 - \tilde{\pi}_1 = \frac{t_1 - t_2}{2\delta(e)} \tag{3}$$

[5] We will restrict $\eta = 1$ without much loss of generality. The main effect of the parameter $\eta = 1$ is to scale up or down equilibrium enforcements and therefore equilibrium taxes.

[6] See Hindriks and Nishimura (2018) for more details on alternative sequences of events.

Profit shifting is proportional to the tax differential and inversely proportional to enforcement levels. Thus, when enforcement is exogenous, the profit shifting (semi-)elasticity with respect to tax rate differential is constant. This is the specification used by the empirical literature on the incentives to shift profit (Dharmapala and Riedel, 2013; Huizinga and Laeven, 2008; Johansson et al., 2017; Lohse and Riedel, 2013). However, as we will show shortly, enforcement incentives are shaped by tax rates. In particular, we would expect weaker enforcement incentives when taxes and revenues are low (low-stake enforcement). Thus if enforcement levels are positively correlated to tax rates, the profit shifting semi-elasticity is no longer constant with taxes but it is higher when taxes are low (because enforcements are also low). Interestingly, this model prediction fits with recent empirical study on profit shifting (Dowd et al. (2017)). Combining (1) and (3) gives the declared profits:

$$\tilde{\pi}_1 = \frac{1+\epsilon}{2} - \frac{t_1 - t_2}{2\delta(e)} \equiv \tilde{\pi}_1(t,e),\ \tilde{\pi}_2 = \frac{1-\epsilon}{2} + \frac{t_1 - t_2}{2\delta(e)} \equiv \tilde{\pi}_2(t,e). \tag{4}$$

The reported profit in country 1 consists of the pre-tax profits π_1 that depend on the market size ϵ minus the amount of outward profit shifting $\pi_1 - \tilde{\pi}_1$ in (3).

From (4), given the equilibrium profit shifting, country i's tax revenue net of the enforcement cost is (with $\eta = 1$):

$$W_i = t_i \tilde{\pi}_i(t_i, t_j, e) - \frac{e_i^2}{2} = t_i \left(\frac{1+\epsilon_i}{2} - \frac{t_i - t_j}{2\delta(e)} \right) - \frac{e_i^2}{2}, \tag{5}$$

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

2.3 Tax choices with minimum tax

In the second stage of the game, each country non-cooperatively chooses its own tax rate t_i $(i = 1, 2)$ to maximize (5). We first derive the Nash equilibrium without the minimum tax. The first-order conditions are:

$$\frac{\partial W_i}{\partial t_i} = \frac{1+\epsilon_i}{2} - \frac{t_i - t_j}{2\delta(e)} + t_i \frac{-1}{2\delta(e)} = 0. \tag{6}$$

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

$$t_1^N(e) = \delta(e) \left(\frac{3+\epsilon}{3} \right) \quad \text{and} \quad t_2^N(e) = \delta(e) \left(\frac{3-\epsilon}{3} \right). \tag{7}$$

From (7), the binding minimum tax has to be $\underline{t} > t_2^N$.[7] We consider that the minimum tax reform takes the following form.

$$\underline{t} = \lambda t_1^N(e) + (1-\lambda)t_2^N(e),\ \lambda \in (0,1). \tag{8}$$

The constrained equilibrium taxes with minimum taxation are:

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

and the tax gap is

$$t_1^M - t_2^M = \frac{\delta(e)}{2}\left(\frac{4\epsilon}{3} - \frac{2\epsilon\lambda}{3}\right) > 0. \tag{10}$$

.

For all $\lambda \in (0,1)$, $t_1^M > t_2^M$ and the tax gap decreases with the minimum tax λ (partial tax harmonization).

Plugging the tax gap (10) into the profit shifting equation (3) gives:

$$\pi_1 - \tilde{\pi}_1 = \frac{\epsilon}{3} - \frac{\epsilon\lambda}{6}, \tag{11}$$

which is decreasing in λ. Therefore, the minimum tax by curbing profit shifting and increasing equilibrium taxes, has a positive effect on tax revenue in the high tax country. In the low-tax country the minimum tax has two opposite effects on its tax revenue: a higher tax rate and a lower tax base. To see the net effect, we compute its tax revenue with minimum tax. Tax revenues in both countries $R_i^M(e) = t_i^M(e)\tilde{\pi}_i^M$ $(i = 1, 2)$ are given by:

$$R_1^M(e) = a_1(\lambda,\epsilon)\delta(e) \geq R_2^M(e) = a_2(\lambda,\epsilon)\delta(e), \tag{12}$$

where $a_1(\lambda,\epsilon) = \dfrac{(3+\epsilon+\epsilon\lambda)^2}{18}$ and $a_2(\lambda,\epsilon) = \dfrac{(3-\epsilon-\epsilon\lambda)(3-\epsilon+2\epsilon\lambda)}{18}$. It is easily seen that tax revenue in the low-tax country is higher with minimum taxation since $a_2(\lambda,\epsilon) - a_2(0,\epsilon) = \dfrac{\epsilon\lambda(3-\epsilon-2\epsilon\lambda)}{18} > 0$ for all $\epsilon \in (0,1)$ and $\lambda \in (0,1)$. Hence, the low-tax country benefits from the introduction of a minimum tax. That does not mean that its revenue is monotonically

[7] As noted by Hebous and keen (2021) it does not matter whether we use the 'Income Inclusion Rule' (topping up to the minimum in the residence) or the 'Undertaxed Payments Rule' (topping up at source) because this minimum tax gives strong incentive for low tax country to preempt another country to tax the difference by imposing that minimum itself.

increasing with the minimum tax. Indeed, when $\epsilon > 3/5$, its revenue is an inverted U-shaped function of the minimum tax with a peak at $\lambda = (3-\epsilon)/(4\epsilon)$.[8] The revenue in the high-tax country is increasing with the minimum tax. From (12), we can also see that the minimum tax λ increases the revenue gap since $a_1(\lambda,\epsilon) - a_2(\lambda,\epsilon)$ is increasing in λ. This is because the minimum tax reduces the profit shifting. This welfare analysis is assuming exogenous enforcement. We now study how the minimum tax will also change the dynamic of enforcement policies.

3 Enforcement cooperation incentives

In the first stage, the governments in each country choose their enforcement effort levels, taking into account the behavior in the subsequent stages and the existence of a minimum tax. We first examine non-cooperative 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 λ. We will distinguish when enforcements are substitutes and when enforcements are complements.

3.1 Enforcements are substitutes

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 $W_i^M(e_i, e_j) = a_i(\lambda,\epsilon)\delta(e_i, e_j) - \dfrac{(e_i)^2}{2}$ where $a_i(\lambda,\epsilon)$ is as given in (12). The first-order conditions with respect to country i's enforcement choice yield for all $\lambda \in (0, 1)$:

$$e_1^M = \frac{a_1(\lambda,\epsilon)}{2} \geq e_2^M = \frac{a_2(\lambda,\epsilon)}{2} \tag{13}$$

When enforcements are perfect substitutes, each country choice of enforcement is independent of the other country. So the enforcement best responses are orthogonal. What is then the impact of the minimum tax on equilibrium enforcements? Since $a_1(\lambda,\epsilon)$ is increasing in λ, enforcement in the high-tax country is increasing with the minimum tax. For the low-tax country, when $\epsilon > 3/5$, $a_2(\lambda,\epsilon)$ reaches its peak at $\lambda = (3-\epsilon)/(4\epsilon)$ and then decreasing beyond. Therefore, the enforcement in the low-tax country may decrease when

[8] For instance, when $\epsilon = 1$ (tax haven), $R_2^M(e)$ is maximized at $\lambda = 1/2$. And when $\epsilon \leq 3/5$, $R_2^M(e)$ is monotonically increasing in $\lambda \in (0, 1)$.

the minimum tax is pushed too far. 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 enforcement cooperation. Here, both countries choose their enforcement levels to maximize their joint welfare. However, in keeping with the current OECD framework for enforcement cooperation, each country still can freely choose its tax rates (subject to possible the minimum tax constraint). Therefore, countries choose $e = (e_1, e_2)$ anticipating the non-cooperative 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,

$$\max_{e_i, e_j} \sum_i \left(R_i^M(e_i, e_j) - \frac{e_i^2}{2} \right) = \max_{e_i, e_j} \sum_i \left(a_i(\lambda, \delta)\delta(e_i, e_j) - \frac{e_i^2}{2} \right). \tag{14}$$

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

$$\hat{e}_1^M = \hat{e}_2^M = \frac{a_1(\lambda, \epsilon) + a_2(\lambda, \epsilon)}{2} \tag{15}$$

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 enforcement levels (relative to non cooperative enforcement). The positive enforcement externality $\partial R_j^M / \partial e_i > 0$ for $i \neq j$ is now internalized by enforcement cooperation. The positive enforcement externality may seem surprising for the low-tax country given that enforcement increases the cost of profit shifting. The reason is that taxes are updated optimally in response to the enforcement change so as to maintain profit shares unchanged as in (3). Hence the low-tax country also benefits from enforcement since its tax base is unchanged but its tax rate is increased.

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 always benefits from the tax compliance agreement because it raises equilibrium taxes without reducing its tax base ($W_1(\hat{e}^M) > W_1(e^M)$ for all $\lambda \in (0, 1)$and $\epsilon \in (0, 1)$). However, for the low-tax country, there are opposite effects. The international tax compliance agreement involves extra enforcement $\hat{e}_2^M - e_2^M$ from the low-tax country. As a result, even though the tax compliance agreement boosts revenues (higher taxes for the same tax base) also in the low-tax country ($R_2^M(\hat{e}^M) - R_2^M(e^M) > 0$), this country may reject enforcement cooperation because of the required enforcement efforts. The following proposition states the conditions under which the low-tax country benefits or not from enforcement cooperation (see Appendix

for the proof).

Proposition 1 *Enforcements are substitutes. Suppose that $\rho = -1$, then there exist minimum tax threshold $\lambda^0(\epsilon) \in (0,1)$ and country asymmetry thresholds $0 < \underline{\epsilon}(-1) < \overline{\epsilon}(-1) < 1$ such that*

(i) High-tax country benefits from enforcement cooperation for all $\lambda \in (0,1)$ and $\epsilon \in (0,1)$.

(ii) Low-tax country benefits from enforcement cooperation when $\epsilon < \underline{\epsilon}(-1)$ and does not benefit when $\epsilon > \overline{\epsilon}(-1)$, for all $\lambda \in (0,1)$,

(iii) Low-tax country benefits from enforcement cooperation if and only if $\lambda \leq \lambda^0(\epsilon)$, when $\underline{\epsilon}(-1) \leq \epsilon \leq \overline{\epsilon}(-1)$

(iv) the minimum tax threshold $\lambda^0(\epsilon)$ is decreasing with the country asymmetry ϵ.

A key feature of this proposition is that the minimum tax standard can potentially erode the benefit of enforcement cooperation for the low-tax country. This is a novel effect when we treat not just firm behavior (as in the empirical literature on profit shifting), but also national tax and enforcement policies as endogenous to changes in the minimum tax standard. Intuitively, the minimum tax puts a floor under the international tax competition acting as a commitment of the low-tax country to set its tax rate exactly at the minimum tax. This tax commitment boosts tax revenues because of the positive tax externality and strategic tax complementarity (Hebous and Keen, 2021, Johannesen, 2022). By curbing profit shifting, the minimum tax benefits more the high-tax country than the (constrained) low tax country. So the minimum tax can be Pareto improving when treating national enforcement policy as exogenous. However the global minimum tax is a fundamental change that affects both tax policies and enforcement incentives. Our finding is that the minimum tax increases enforcement in the high-tax country but it can potentially reduce enforcement in the low-tax country.[9] As a result, coordinated enforcement is less attractive for the low-tax country when the minimum tax is set too high. Another finding is that the low-tax country benefits less from coordinated enforcement if the tax asymmetry is too high. This fits well with the widespread difficulty of getting low-tax countries (notably tax havens) to join international tax enforcement agreement.

[9]This is reminiscent of Cremer and Gahvari (2000) suggesting the potential substitution between taxes and enforcements. The key difference in our model is that enforcements are set before taxes

3.2 Enforcements are complements

When enforcement are complements, there is a new effect of minimum taxation related to the strategic complementarity in the enforcement choices. Indeed, when the enforcement technology involves $\dfrac{\partial^2 \delta(e_1, e_2)}{\partial e_1 \partial e_2} > 0$, we have strategic enforcement complementarity. So higher enforcement by one country increases the enforcement productivity of the other country. The enforcement decisions are no longer independent from each others. To see this clearly, consider $\rho = 0$ so that $\delta(e) = e_1^{0.5} e_2^{0.5}$. Given e_j, country i maximizes $W_i^M(e_i, e_j) = a_i(\lambda, \epsilon)\delta(e_i, e_j) - \dfrac{e_i^2}{2}$. The first-order conditions gives the best-response functions:

$$e_i(e_j) = \left(\frac{a_i(\lambda, \epsilon)}{2}\right)^{2/3} e_j^{1/3} \quad (i = 1, 2,\ j \neq i) \tag{16}$$

Hence, the enforcement reaction functions are upward-sloping. The equilibrium enforcement levels are:

$$e_i^M = \frac{a_i(\lambda, \epsilon)^{3/4} a_j(\lambda, \epsilon)^{1/4}}{2}, \tag{17}$$

where $a_1(\lambda, \epsilon) > a_2(\lambda, \epsilon)$. Comparing with (13), we obtain that e_1^M is lower with $\rho = 0$ (since $a_1(\lambda, \epsilon) > a_1(\lambda, \epsilon)^{3/4} a_2(\lambda, \epsilon)^{1/4}$) whereas e_2^M is higher (since $a_2(\lambda, \epsilon) < a_2(\lambda, \epsilon)^{3/4} a_1(\lambda, \epsilon)^{1/4}$). This result suggests that enforcement complementarity induces a convergence of enforcement levels. The reason is that when enforcements are complements, enforcements are more effective when there are aligned: $\delta(e + \Delta,\ e - \Delta) < \delta(e, e)$ for $\Delta > 0$. However if increasing complementarity (larger ρ) induces partial enforcement alignment, it is not sufficient to offset the first-order efficiency loss from enforcement dispersion $e_1^M > e_2^M$. Indeed, the overall enforcement level $\delta(e^M)$ is lower with complementarity $\rho = 0$ than with substitutability $\rho = -1$.

Moving to the general enforcement technology in (2), the first-order conditions are

$$0.5 e_i^{-\rho-1} \left(0.5 e_1^{-\rho} + 0.5 e_2^{-\rho}\right)^{\frac{1+\rho}{-\rho}} a_i(\lambda, \epsilon) = e_i \ (i = 1, 2).$$

And the equilibrium uncoordinated enforcements are

$$e_i^M = 0.5 \left(0.5\, a_1(\lambda, \epsilon)^{-\frac{\rho}{2+\rho}} + 0.5\, a_2(\lambda, \epsilon)^{-\frac{\rho}{2+\rho}}\right)^{\frac{-1-\rho}{\rho}} a_i(\lambda, \epsilon)^{\frac{1}{2+\rho}} \ (i = 1, 2) \tag{18}$$

When $\rho = -1$, (18) is equivalent to (13), and when $\rho = 0$, (18) is equivalent to (17).

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

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

which gives the coordinated enforcements $\hat{e}_1^M = \hat{e}_2^M = 0.5(a_1(\lambda,\epsilon) + a_2(\lambda,\epsilon))$. Note that coordinated enforcements are the same as in (15). Enforcement coordination implies the same enforcement levels whether enforcements are complements or substitutes. However uncoordinated enforcements change : enforcement is less effective overall when enforcements are complements. The following proposition states the conditions under which countries benefit or not from coordinating their enforcement policies when enforcements are complements.

Proposition 2 *Enforcements are complements. Suppose that $\rho = 0$ or $\rho = \infty$, then there exist minimum tax threshold $\lambda^0(\epsilon,\rho) \in (0,1)$ and country asymmetry thresholds $0 < \underline{\epsilon}(\rho) < \overline{\epsilon}(\rho) < 1$ such that*

(i) High-tax country benefits from enforcement cooperation for all $\lambda \in (0,1)$and $\epsilon \in (0,1)$.

(ii) Low-tax country benefits from enforcement cooperation when $\epsilon < \underline{\epsilon}(\rho)$ and does not benefit when $\epsilon > \overline{\epsilon}(\rho)$, for all $\lambda \in (0,1)$,

(iii) Low-tax country benefits from enforcement cooperation if and only if $\lambda \leq \lambda^0(\epsilon,\rho)$, when $\underline{\epsilon}(\rho) \leq \epsilon \leq \overline{\epsilon}(\rho)$

(iv) the minimum tax threshold $\lambda^0(\epsilon,\rho)$ is decreasing with the country asymmetry ϵ and increasing with the enforcement complementarity ρ.

Proposition 2 extends Proposition 1 to enforcement complementarity. The proof follows same lines of argument as those in Proposition 1. The key change is that the participation threshold for the low-tax country has increased with the extent of enforcement complementarity. This is because enforcement complementarity increases the potential benefit of enforcement cooperation. Indeed, the effect of cooperation is to align enforcement choices increasing their efficiency. More effective enforcement boosts taxes and tax revenues in both countries above what is attainable under non cooperative enforcements. Except for this change in the benefits of enforcement cooperation, the implications of the minimum tax on cooperation incentives are similar. There exist a critical level of the minimum tax beyond which the low-tax country will drop out from the enforcement agreement. This threshold is decreasing with the tax asymmetry and increasing with the enforcement complementarity.

4 The break up of Cooperation

The final step of our argument about the welfare effect of the global minimal taxation is to show that given the dynamic changes in the tax and enforcement policies, the high-tax country can lose and the low-tax country always gains with the minimum tax. We illustrate this graphically when enforcements are perfect substitutes.

Figure 1 illustrates the case of $\rho = -1$ and $\epsilon = 0.22$. Between $\lambda = 0$ corresponding to $\underline{t} = t_2^N$ (the unconstrained equilibrium) and $\lambda \approx 0.59$ with $\underline{t} = \lambda t_1^N(e) + (1-\lambda)t_2^N(e)$, enforcement cooperation Pareto dominates the non-cooperative equilibrium, and the minimum tax is Pareto improving. However, when λ is pushed beyond $\lambda \approx 0.59$, the low-tax country prefers to opt out from cooperative enforcement. Interestingly, the minimum tax can harm the high-tax country because of the break down of enforcement cooperation, but it cannot harm the low-tax country which can freely opt out from the enforcement agreement if the minimum tax is set too high. We call this the compliance dilemma of minimum taxation.

Figure 2 illustrates the effect of increasing country asymmetry. We assume $\rho = -1$ and $\epsilon = 0.25$. Figure 2 reveals that increasing ϵ from 0.22 to 0.25 decreases the critical value of the minimum tax from 0.59 to 0.19. This suggests that there exists some upper bound of asymmetry $\overline{\epsilon}(\rho) \in (0,1)$ such that enforcement cooperation is no longer robust to the minimum tax when $\epsilon > \overline{\epsilon}(\rho)$. We can compute those upper bound values for $\rho = -1, 0, \infty$. We obtain $\overline{\epsilon}(-1) = 0.26$, $\overline{\epsilon}(0) = 0.32$ and $\overline{\epsilon}(\infty) = 0.41$. Hence there is no scope of mutually beneficial cooperation, even without minimum taxation, when the asymmetry is sufficiently high (as in the presence of tax haven $\epsilon = 1$). Those upper bounds on asymmetry are increasing with ρ with a maximal value of 0.41 when $\rho = \infty$. Recall such value is equivalent to a profit share of 0.7 in the large country before profit shifting.
Similarly, there exists some lower bound of asymmetry $\underline{\epsilon}(\rho) \in (0,1)$ such that enforcement cooperation is always robust to the minimum tax when $\epsilon < \underline{\epsilon}(\rho))$. We can compute those lower bounds for $\rho = -1, 0, \infty$ to obtain $\underline{\epsilon}(-1) = 0.21$, $\underline{\epsilon}(0) = 0.26$ and $\underline{\epsilon}(\infty) = 0.33$. Below those lower bounds, the asymmetry between countries is small enough to make enforcement cooperation robust to all minimum tax $\lambda \in (0,1)$. Those lower bounds of asymmetry are increasing in ρ. Under these polar cases, our compliance dilemma does not apply, and the minimum taxation is always desirable for both countries. We summarize these results in Proposition 3.

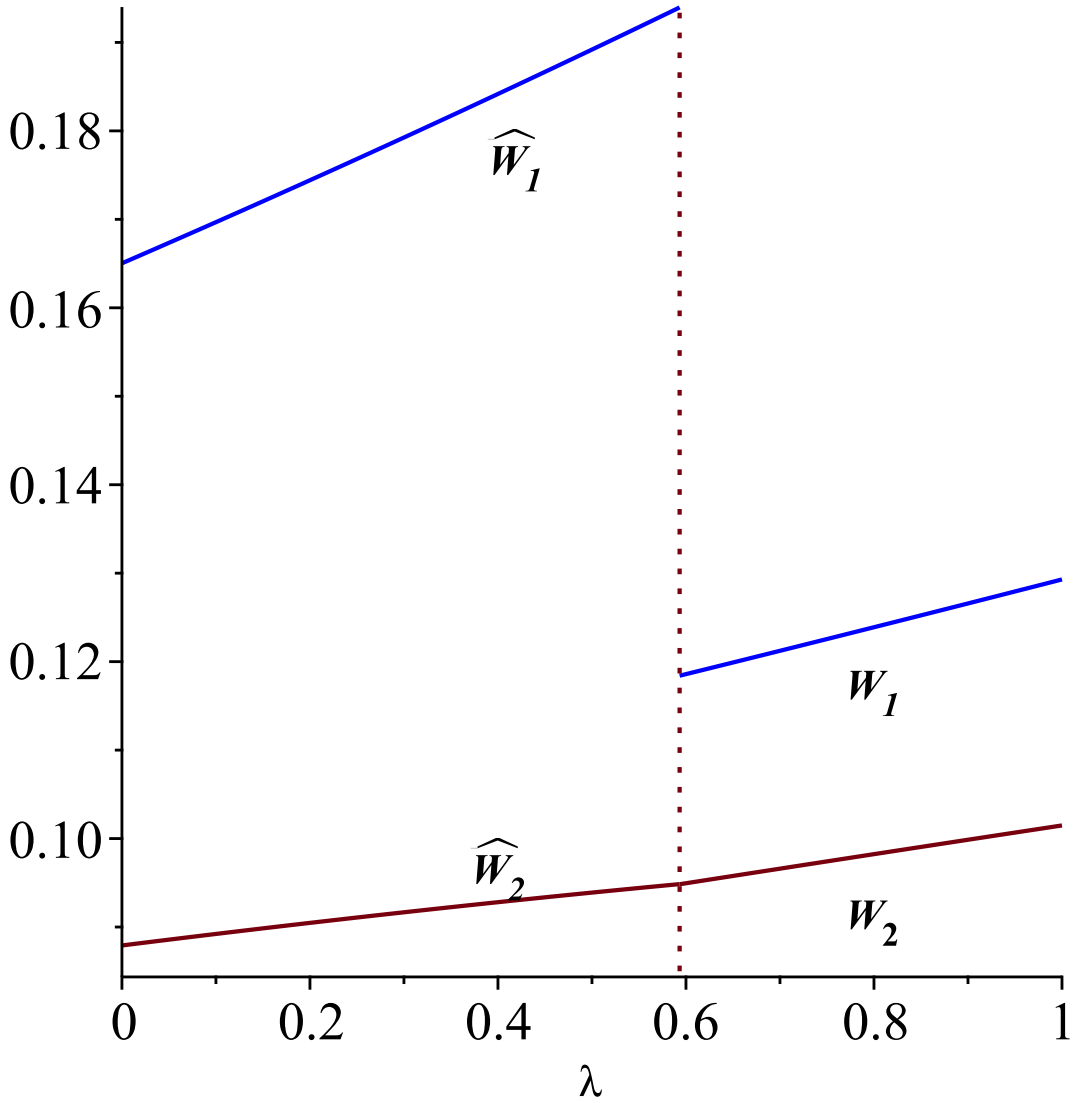

Figure 1: The minimum tax breaks the tax compliance agreement when the minimum tax is sufficiently high: $\rho = -1$, $\epsilon = 0.22$, $\hat{W}_i = W_i(\hat{e}^M)$ and $W_i = W_i(e^M)$.

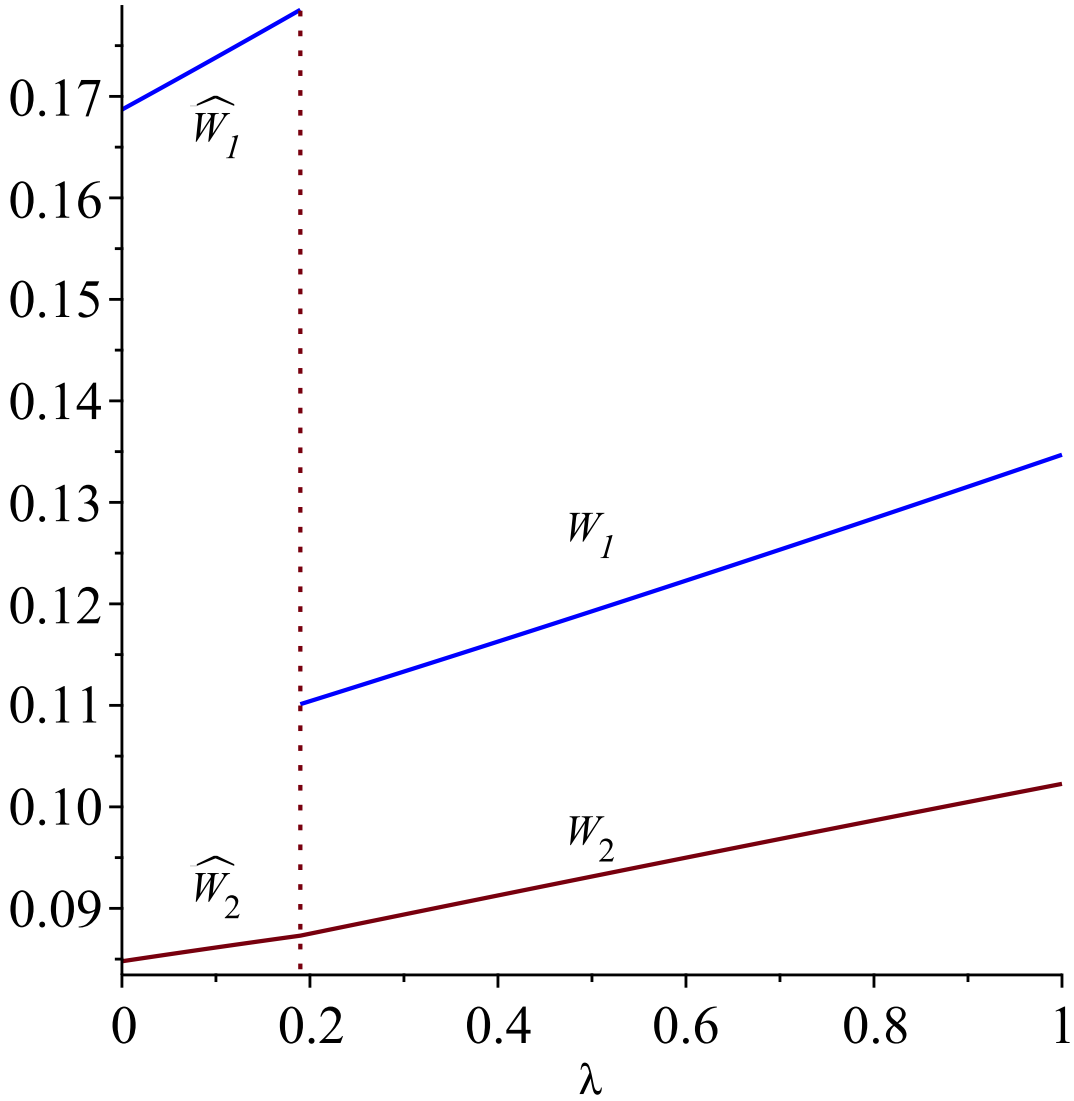

Figure 2: The minimum tax breaks the tax compliance agreement when the minimum tax is sufficiently high: $\rho = -1$, $\epsilon = 0.25$, $\hat{W}_i = W_i(\hat{e}^M)$ and $W_i = W_i(e^M)$.

Proposition 3 *Suppose that* $\rho = -1, 0, \infty$. *Then there exist minimum tax threshold* $\lambda^0(\epsilon, \rho) \in (0, 1)$ *and country asymmetry thresholds* $0 < \underline{\epsilon}(\rho) < \overline{\epsilon}(\rho) < 1$ *such that*
(i) enforcement cooperation is always robust to the minimum taxation when $\epsilon < \underline{\epsilon}(\rho)$ *and enforcement cooperation is never robust (even without the minimum taxation) when* $\epsilon > \overline{\epsilon}(\rho)$.
(ii) For any $\epsilon < \underline{\epsilon}(\rho)$ *and for any* $\epsilon > \overline{\epsilon}(\rho)$, *the introduction of minimum taxation is Pareto improving.*
(iii) For any $\underline{\epsilon}(\rho) \leq \epsilon \leq \overline{\epsilon}(\rho)$, *there is a compliance dilemma with a breakdown of enforcement cooperation when the minimum tax is* $\lambda \geq \lambda^0(\epsilon, \rho)$.

5 Conclusion

This paper provides a novel argument on the effect of minimum taxation in the presence of profit shifting by studying the incentives faced by tax authorities to invest their enforcement resources to combat profit shifting. We show theoretically that the fiscal authorities of low-tax countries, even though they may benefit from minimum tax to limit harmful tax competition, may lack the incentives to combat profit shifting. This disincentive problem is aggravated when the tax differential is large, due to a lack of enforcement cooperation with high-tax countries: a dispute between countries on transfer pricing corrections are harder to be settled.

In this paper, we show that low-tax countries may have a greater incentive to abandon enforcement cooperation in response to minimum tax. We formalize this argument and make precise the conditions under with the low-tax countries will withdraw from enforcement cooperation. Our main finding is that for intermediate tax differentials, the minimum tax can break down the enforcement cooperation making the high-tax countries (but not the low-tax countries) worse off. When the tax differential is sufficiently small, enforcement cooperation is always robust to the minimum tax. And when the tax differential is sufficiently high (as for tax haven), the enforcement cooperation is never sustainable (even without minimum tax). For these extreme cases the minimum tax is Pareto improving (assuming tax havens are seeking to maximise tax revenues). This finding points out the importance of considering carefully tax compliance incentives in the current policy reform on minimum tax. Tørsløv et al. (2020) also point out the crucial role of the (lack of adequate) tax enforcement incentives (albeit in a different context) to explain why profit shifting may persist. Tax enforcement incentives can also address the recent findings of Dowd et al. (2017) suggesting that profit shifting semi-elasticity with respect to tax rate differential is not constant

but is higher at low-tax rates. In our model, profit shifting depends both on tax differential and enforcement levels. Given that enforcement incentives are weaker under low taxes, our model can rationalize the non-linear profit shifting elasticity. Alternatively, the minimum tax increases enforcement incentives and thus reduces ceteris paribus the profit shifting elasticity.

ACKNOWLEDGMENTS This paper is a significant updating of earlier version circulated under the title : "Why minimum corporate income taxation can make the high tax countries worse off: the compliance dilemma" (Osaka DP 21-10 and Lidam DP CORE 2021-10). This paper was presented at the 2021 annual IIPF 2022. The authors wish to thank Andreas Haufler and Mohammed Mardan for their useful comments. Yukihiro Nishimura is grateful for financial support from MEXT/JSPS KAKENHI JP18H00866.

Appendix

Proof of Proposition 1

$W_1(\hat{e}^M) - W_1(e^M) > 0$ for all ϵ and λ. For country 2, define $\epsilon^0(\lambda)$ implicitly by $W_2(\hat{e}^M) - W_2(e^M) = 0$. Numerically, we find that $W_2(\hat{e}^M) - W_2(e^M)$ is positive (negative) when $\epsilon < \epsilon^0(\lambda) \in (0,1)$ ($\epsilon > \epsilon^0(\lambda)$). Also, $\epsilon^0(\lambda)$ is decreasing in λ. We have $\epsilon^0(0) \approx 0.26$ and $\epsilon^0(1) \approx 0.21$. Setting $\underline{\epsilon}(-1) \equiv \epsilon^0(1)$ and $\overline{\epsilon}(-1) \equiv \epsilon^0(0)$, we have $W_2(\hat{e}^M) - W_2(e^M) < 0$ for all $\lambda \in (0,1)$ when $\epsilon > \overline{\epsilon}(-1)$, and $W_2(\hat{e}^M) - W_2(e^M) > 0$ for all $\lambda \in (0,1)$ when $\epsilon < \underline{\epsilon}(-1)$. For $\epsilon \in (\underline{\epsilon}(-1), \overline{\epsilon}(-1))$, we invert $\epsilon^0(\lambda)$ to define $\lambda = \lambda^0(\epsilon)$ such that $W_2(\hat{e}^M) - W_2(e^M) \geq 0$ if and only if $\lambda \leq \lambda^0(\epsilon)$. *Q.E.D.*

References

[1] Bilicka, K.A., 2019, Comparing UK Tax Returns of Foreign Multinationals to Matched Domestic Firms, *American Economic Review 2019*, 109(8), 2921?2953

[2] Bustos, S., Pomeranz, D., Vila-Belda,J., Zucman, G, 2019. Challenges of Monitoring Tax Compliance by Multinational Firms: Evidence from Chile. *American Economic Review Papers and Proceedings*, 109, 500-505.

[3] Cremer, H., Gahvari, F., 2000. Tax evasion, fiscal competition and economic integration, *European Economic Review* 44, 1633–1657.

[4] Devereux, M., Lockwood, B., Redoano, M., 2008. Do countries compete over corporate tax rates? *Journal of Public Economics* 92, 1210–1235.

[5] Dharmapala D., Riedel, N., 2013. Earnings Shocks and Tax-Motivated Income-Shifting:evidence from European Multinationals, *Journal of Public Economics* 97: 95-107

[6] Dowd, T, Landefeld, P., Moore, A, 2017. Profit Shifting of U.S. Multinationals. *Journal of Public Economics*, 148: 1-13

[7] Durán-Cabré, J., Esteller-Moré, A., Salvadori, L., 2015. Empirical evidence on horizontal competition in tax enforcement, *International Tax and Public Finance* 22, 834–860.

[8] Fuest, C., Parenti, M., Toubal, F. 2019. International corporate taxation: What reforms? What impact?, Les notes du conseil d'analyse Économique, 54, 1-12.

[9] Hebous, S., Keen, M., 2021. Pareto-Improving Minimum Corporate Taxation. Oxford University Center for Business Taxation Working paper 2021-14.

[10] Hindriks, J., Nishimura, Y., 2018. Taxing multinationals: The scope for enforcement cooperation, CORE Discussion Paper, 2018/29, CORE/Université catholique de Louvain.

[11] Hindriks, J., Nishimura, Y., 2021. Taxing multinationals: The scope for enforcement cooperation, *Journal of Public Economic Theory* 23, 487-509.

[12] Huizinga, H., Laeven, L., 2008. International profit shifting within multinationals: A multi-country perspective, *Journal of Public Economics* 92, 1164–1182.

[13] Johansson, A., Skeie, O., Sorbe, S., Menon, C., 2017. Tax planning by multinational firms: Firm-level evidence from a cross-country database, OECD Economics Department Working Papers 1355, OECD Publishing.

[14] Johannesen, N., 2022. Global minimum tax, CEBI Working Paper Series 01/22, University of Copenhagen.

[15] Kanbur, R., Keen, M., 1993. Jeux sans frontieres: Tax competition and tax coordination when countries differ in size, *American Economic Review* 83, 877–892.

[16] Keen, M., Konrad, K., 2013. The theory of international tax competition and coordination, in Auerbach, A., Chetty, R., Feldstein, M., Saez, E., (Eds.), *Handbook of Public Economics*, volume 5, North Holland, Amsterdam, pp. 257–328.

[17] Klassen, K., Laplante, S., 2012. Are U.S. multinational corporations becoming more aggressive income shifters?, *Journal of Accounting Research* 50, 1245–1285.

[18] Lohse, T., and Riedel, N., 2013 Do Transfer Pricing Laws Limit International Income Shifting? Evidence from European Multinationals. CESifo Working Paper Series No. 4404.

[19] Nielsen, S. B., Raimondos-Møller, P., Schjelderup, G., 2010. Company taxation and tax spillovers: Separate accounting versus formula apportionment, *European Economic Review* 54, 121–132.

[20] OECD, 2021a. *International collaboration to end tax avoidance,* Organisation for Economic Co-operation and Development, Paris, https://www.oecd.org/ctp/beps/htm (accessed 16 July 2021).

[21] OECD, 2021b. *Statement on a Two-Pillar Solution to Address the Tax Challenges Arising From the Digitalisation of the Economy ? 1 July 2021,* Organisation for Economic Co-operation and Development, Paris, https://www.oecd.org/tax/beps/statement-on-a-two-pillar-solution-to-address-the-tax-challenges-arising-from-the-digitalisation-of-the-economy-july-2021.htm (accessed 13 August 2021).

[22] Peralta, S., Wauthy, X., van Ypersele, T., 2006. Should countries control international profit shifting?, *Journal of International Economics* 68, 24–37.

[23] Tørsløv, T., Wier, L., Zucman, G., 2020. Externalities in International Tax Enforcement: Theory and Evidence, NBER Working Paper No. 26899