Government Reputation, FDI, and Profit-Shifting *

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Abstract

Credible corporate tax announcement allows the government to exploit its reputation and impose a high tax rate by attracting investment, but amplifies tax distortion on investment as firms become more responsive to the announced tax rate. While the latter effect is outweighed by the first effect in a general model of corporate taxation with government reputation, introducing firms' profit-shifting makes the latter effect dominant. Reputation is modeled as the probability of government committing to the announced tax rate, and the optimal tax rate decreases in reputation when firms can shift profits across countries. This induces higher investment and less profit-shifting under higher levels of reputation. The model predictions are consistent with empirical facts on how government reputation is related to statutory corporate tax rate, foreign direct investment inflows, and multinational firms' profit-shifting.

Keywords: Commitment, Corporate income tax, Foreign direct investment, Government reputation, Profit-shifting

JEL Classification: E61, F21, F23, F55, H21, H26

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1 Introduction

An extensive literature since Chari, Kehoe, and Prescott (1988) has studied optimal taxation of private agents' investment returns in the presence of government's time inconsistency. While many papers focused on the setting where the government either commits or not with certainty, situations where private agents are uncertain about the government's commitment technology have gained attention only recently and even less in an open economy context. In this light, we study optimal taxation on multinational firms' investments in an open economy where the firms do not know whether the government would commit or not to an *ex ante* announced tax rate. It is evident that credibility of the tax announcement, or reputation, plays a crucial role in determining the optimal choices of the government and the firms.

How does government reputation shape the optimal level of corporate income tax? We consider government reputation as the likelihood that the government commits to an announced corporate tax rate without making retroactive tax amendments or imposing non-tax impediments to business activities. Intuitively, government reputation has two countervailing effects on the optimal level of corporate tax rate. First, better reputation may allow the government to impose a high tax rate by attracting firms' investment and expanding the tax base. Second, better reputation may lower the optimal tax rate because it amplifies distortionary effect of taxation on investment. Better reputation makes the government's tax rate announcement more credible, so firms rely more on that tax rate when they make investment decisions. If the government announces a tax hike and firms all believe in that announcement, investment will decrease whereas the distortion will be muted if no firm regards the announcement credible.

While a general model of corporate taxation with government reputation predicts that the first effect dominates the latter effect, we show that introducing firms' profit-shifting across countries into the model generates that the latter effect dominates the first effect. We extend the finite-period capital taxation model of Chari et al. (1988) by adding government reputation following the framework of Dovis and Kirpalani (2021) and firms' profit-shifting. Government reputation is modelled as the probability that the government commits to the corporate tax rate within a period.

We set up a small open economy with a government and multinational firms who maximize sum of profits across the host country and the rest of the world. There are two types of government as in Chari et al. (1988), the commitment type and the opportunistic type, and the government type is initially unknown to firms. Government chooses an optimal tax rate that maximizes its tax revenue at the beginning of the period. If it is a commitment type, then it always commits to that tax rate. If it is an opportunistic type, it reoptimizes the tax rate after firms make investment assuming irreversibility of investment. Hidden type of the government makes tax rate stochastic to the firms, so they choose investment to maximize expected profit given prior reputation of the government. After the tax rate is realized, firms shift profits across the host country and the foreign.

We first analyze the equilibrium of a static model. We show that the opportunistic type always deviates from the announced tax rate and its optimal tax rate increases in reputation as it takes advantage of high investments under high reputation. However, the optimal tax rate of the commitment type decreases in reputation as it internalizes the tax distortion on investment and the opportunistic type's potential deviation. This generates firms' expected tax rate to decrease in government reputation, so there is more investments made under higher levels of reputation. Profit-shifting is determined by the tax differential between the host country and the exogenous international tax rate. Hence, as reputation gets better, there is more profit-shifting of firms to the foreign under the opportunistic type whereas firms shift less profits under the commitment type.

Multinational firms' profit-shifting serves as an additional layer of complexity in our model. We show that the effect of better reputation on the commitment type's optimal tax rate would be exactly opposite in the static model without profit-shifting. Without profit-shifting, the opportunistic government optimally taxes away all the profits. Hence, higher reputation significantly lowers the firms' expected tax rate so better reputation increases investment tremendously. The commitment type exploits this by raising tax rate under higher levels of reputation. This is no longer true when we introduce firms' profit-shifting in the baseline model because investment and tax base does not increase as much under higher reputation. When firms can shift profits across countries, it is optimal for the commitment type to reduce tax as its reputation gets higher because better reputation makes firms be more responsive to the tax rate as mentioned earlier.

While the static model offers intuition on how profit-shifting changes the effects of reputation on optimal tax rate, it does not provide testable hypotheses on the effects of reputation because the two types of government always choose different tax rates. Therefore, we extend the model to two periods to derive empirically testable hypotheses. In the two-period model, the commitment type chooses an optimal tax rate in period 1 while internalizing the opportunistic type's deviation choice in both periods. The commitment type essentially chooses between signalling its type to raise higher revenue in period 2 by letting the firms know of its type, or hiding its type to get a high tax revenue in period 1 at the expense of reputation in period 2. We show that in this two-period model, the commitment type chooses to hide its type and induce the opportunistic type to commit in period 1 when its reputation and time discount factor are not too low. The optimal tax rate also decreases in reputation, so higher reputation generates more investment and less profit-shifting under both types of the government in period 1. When we exclude profit-shifting, however, reputation becomes irrelevant to the optimal tax rate under not too low values of reputation and time discount factor. In sum, our two-period model predicts that governments with good reputation generally impose lower tax rates, which correspondingly implies more FDI net inflows and less profit-shifting.

In the last part of the paper, we provide stylized facts on the effects of government reputation on corporate income tax rate, FDI, and profit-shifting. We proxy government reputation by investment profile risk scores provided by the International Country Risk Guide (ICRG). We find that statutory corporate tax rates are lower in countries with good government reputation. This induces more FDI net inflows into these countries while generating less profits shifted outwards from the countries. The empirical facts are qualitatively consistent with what we obtain in the two-period model under not too low values of time discount factor.

This paper is related to two strands of literature. First, this paper is related to literature on how government's lack of commitment affects the level of investment it receives from multinational firms like Thomas and Worrall (1994), Schnitzer (1999), and Aguiar and Amador (2011). Thomas and Worrall (1994) and Aguiar and Amador (2011) introduce capital expropriation as a friction in the model in a form of enforcement constraint and show that this friction results in a slower accumulation of capital over time. Azzimonti (2018) takes a slightly different approach by focusing on political instability as a source of capital expropriation risk in this framework. Our analysis shares a similar spirit with these studies in that the more likely that the government lacks commitment on tax, it receives less FDI inflows. However, we depart from the dynamic contract framework between a government and multinational firms to emphasize the role of profit-shifting as a force that keeps the opportunistic government's optimal deviation tax rate to be strictly lower than 1. This serves as an important mechanism underlying the negative relationship between the tax rate and government reputation.

Second, this paper contributes to the literature on international corporate income taxation and multinational firms' profit-shifting by presenting a view where profit-shifting serves as a disciplining force in a game between multinational firms and a time-inconsistent government. Studies on international corporate taxation including Peralta, Wauthy, and van Ypersele (2006), Devereux, Lockwood, and Redoano (2008), and Johannesen (2010) analyze tax competition between governments where they compete to attract multinational firms' investment and profit-shifting. While having a similar implication on tax competition with Devereux et al. (2008), we analyze that bad government reputation increases the magnitude of multinational firms' profit-shifting. This provides a rationale to empirical observations by recent studies such as Johannesen, Tørsløv, and Wier (2019) that profit-shifting is more aggressive in low-income countries.

The paper is organized as follows. We construct a static model of government's optimal taxation and firms' optimal choice of FDI and profit-shifting in Section 2 and discuss the results of the model in Section 3. Section 4 proceeds to a two-period extension of the static model and we present the equilibrium of the two-period model in Section 5. We then show that our model qualitatively matches the stylized facts about effects of government reputation in Section 6. Section 7 concludes.

2 Static Model

We analyze how government reputation is related to FDI and profit-shifting through a lens of a simple model of optimal corporate taxation. We model government reputation as the risk of the government not committing to corporate tax rate that is announced at the beginning of a period and trying to impose a higher tax via retroactive tax amendments.[1] The corporate tax rate chosen at the beginning of the period could be regarded as the statutory tax rate which is explicitly stated in laws in reality.

We set up a static Bayesian game with a government that either commits or not to corporate income tax rate and a continuum of homogeneous multinational firms who choose to invest and also determine how much profit to shift out of the host country. We assume that there are the host country and the foreign economy where the host country is a small open economy that takes foreign tax rate as given. In the host country, the government is either of the two types — the commitment type and the opportunistic type — and firms do not know the government type.[2] The commitment type chooses tax rate in the beginning of the period to maximize its revenue and commits to that rate, while the opportunistic type lacks commitment and reoptimizes its tax rate after firms make

[1]There have been court disputes between multinational firms and governments on legality of retroactive tax amendments in many developing countries such as Kenya and Nigeria, but this is also relevant for some developed countries including the U.S. where the retroactive tax amendment is allowed for the federal government in principle as Ortigueira and Pereira (2021) point out.

[2]Azzimonti (2018) and Schnitzer (1999) analyze models with dynamic contracts where there is an enforcement constraint for the government when multinational firms decide how much to invest in the country. Such framework can help analyze when the constraint will be more binding depending on economic fundamentals, but rules out the actual deviation of the government to happen in the equilibrium path. We intend to capture the incidence of government deviation in the model, so we build a model with government reputation on its commitment to corporate tax.

investments. Both types choose the same optimal tax rate in the beginning of the period as the opportunistic type does not want to reveal its type.

Firms have a common prior about the probability of government being the commitment type and we call this reputation throughout the model analysis. Firms' prior belief of government being the commitment type is exogenously given as $p \in [0,1]$. Since they do not know the government type, the tax rate that is going to be imposed at the end of the period is uncertain to firms and firms invest to maximize their expected profits. Profit-shifting, however, is determined after the government type is revealed and tax rate is finalized.[3]

Timeline Timing of the model within the period can be illustrated as Figure 1.

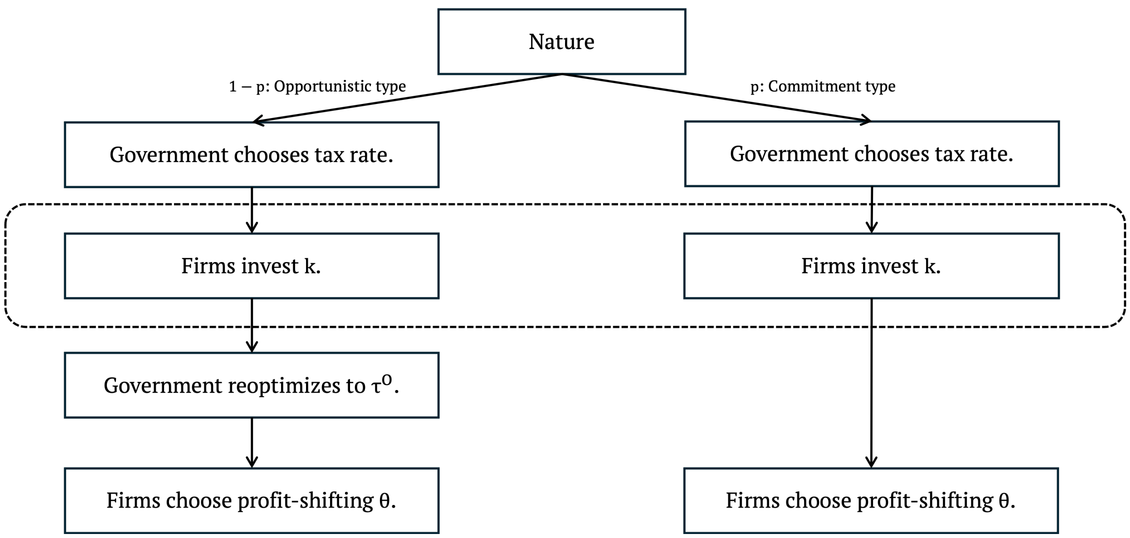


Figure 1: Timeline within a Period

At the beginning of the period, the government chooses corporate tax rate that it would commit had it been the commitment type. Since firms do not know the government type, they choose investment k to maximize expected profit. If the government is opportunistic, then it reoptimizes tax rate to τ^O taking aggregate investment K as given. Otherwise, the government maintains the tax rate it announced at the beginning of the period. After tax is finalized, firms choose profit-shifting $\theta(k,\tau)$ which will be jointly determined by investment k and the finalized tax rate.

We solve for the pooling equilibrium where both types of government choose the same tax rate τ^R at the beginning of the period. We abstract from establishing the separating

[3]This is to take account that profit-shifting techniques like transfer pricing or reallocation of debt can be quickly implemented as soon as the government's tax rate decision is finalized and imposed.

equilibrium where the two types announce different tax rates in the beginning of the period because the opportunistic type would not want to reveal its type as its prior will fall to zero in that case. We solve this model by using backward induction. Hence, we describe each stage in detail starting from the last stage.

2.1 Stage 4: Firms' Profit-shifting Choice

An atomistic firm chooses how much profit to shift to its foreign affiliate after observing the tax rate that the government imposes at the end of the period. If the government commits to the originally announced tax rate, then the firm's profit-shifting plan will not change from the original profit-shifting plan that it would have established at the beginning of the period. Hence, profit-shifting at the end of period is meaningful in that it acts like a punishment to the government's deviation.

Profit-shifting incurs a real quadratic cost as in Hines and Rice (1994) that depends on parameter γ, which we assume to be same across the two countries as in Hines and Rice (1994) and Kallen (2023).[4] Hines and Rice (1994) interpret γ to reflect potential legal costs that could be associated with the firms' income and profit shifting actions and Kallen (2023) remarks that γ can be heterogeneous across firms because firms have different levels of intellectual property and intangible assets so the ability to shift income and profit can vary across firms. While there are different interpretations of γ within the existing studies, we set γ to govern the firms' cost of shifting income and profits between countries. We further assume that γ is symmetric across countries for simplicity. We relax this assumption in Appendix B but the results of the model do not change qualitatively.

It is worth emphasizing that the risk of government's deviation should be distinguished from the cost of profit-shifting γ. Government reputation is associated with retrieving the profit net of all the costs including profit-shifting cost, so it is the risk of whether or not the government taxes away firms' profits net of profit-shifting. Hence, the notion of bad reputation is different from high profit-shifting cost and we solely focus on analyzing the implications of government's reputation p in this static game.

A representative firm maximizes the sum of after-tax profits at the host country and the foreign country given the tax rates τ and τ^*, and before-shifting profits $\rho(k)$ in the host country and $\rho(\bar{k} - k)$ in the foreign. We assume that $\rho(k)$ is a concave function of k

[4]See the Appendix of Kallen (2023) for a version of the microfoundation of real quadratic cost of profit-shifting. Cost of profit-shifting arises from a monitoring game between a firm and an auditor in Kallen (2023) and he shows that the cost of profit-shifting is convex to the absolute value of profit-shifting. Similarly, I impose that profit-shifting incurs quadratic costs at both the host country and the foreign at the same time.

and have the functional form of $\rho(k) = zk^\alpha - r^*k$ with $\alpha < 1$. The firm chooses amount of profit-shifting θ at this stage of the game, and a negative value of θ means that the firm is shifting profits from the host country to the foreign. The firm's profit maximization problem is

$$\max_\theta \, (1-\tau)\left[\rho(k) + \theta - \frac{\gamma}{2}\frac{\theta^2}{\rho(k)}\right] + (1-\tau^*)\left[\rho(\bar{k}-k) - \theta - \frac{\gamma}{2}\frac{\theta^2}{\rho(\bar{k}-k)}\right] \tag{1}$$

$$\text{s.t. } \rho(k) + \theta - \frac{\gamma}{2}\frac{\theta^2}{\rho(k)} \geq 0$$

$$\rho(\bar{k}-k) - \theta - \frac{\gamma}{2}\frac{\theta^2}{\rho(\bar{k}-k)} \geq 0.$$

The first-order condition with respect to θ yields

$$\tau^* - \tau = \frac{\gamma(1-\tau)\theta\rho(\bar{k}-k) + \gamma(1-\tau^*)\theta\rho(k)}{\rho(k)\rho(\bar{k}-k)} + \lambda_1\left[1 - \frac{\gamma\theta}{\rho(k)}\right] + \lambda_2\left[-1 - \frac{\gamma\theta}{\rho(\bar{k}-k)}\right], \tag{2}$$

where λ_1 and λ_2 are Lagrangian multipliers associated with the two constraints on θ. As long as $\tau^* - \tau$ is sufficiently small, we obtain an interior solution as

$$\theta = \frac{1}{\gamma}\frac{(\tau^* - \tau)\rho(k)\rho(\bar{k}-k)}{(1-\tau)\rho(\bar{k}-k) + (1-\tau^*)\rho(k)} \equiv \theta(k, \tau). \tag{3}$$

The optimal choice of θ is obtained as a function of τ and k. We write it as $\theta(k,\tau)$ henceforth. We derive some properties of $\theta(k,\tau)$ below.

Lemma 1. *$\theta(k,\tau)$ defined in (3) is strictly decreasing and strictly concave in τ.*

Proof. See Appendix A.1. ■

Lemma 1 states that firms shift more profits outside the country when tax rates are higher. It is also decreasing in γ as high γ means profit-shifting is costly. Note that $\theta(k,\tau)$ is neither increasing nor decreasing in k and that depends on the values of tax rate and investment.

2.2 Stage 3: Opportunistic Type's Re-optimization

The opportunistic-type government reoptimizes its tax rate after the firms' investments are realized. It takes the aggregate investment K and aggregate profits before shiftin

$\Lambda(K)$ as given. It also internalizes firms' aggregate profit-shifting choice Θ.[5] Tax revenue maximization problem of the opportunistic type is defined as

$$\max_{\tau^O \in [0,1]} \tau^O \left[\Lambda(K) + \Theta\left(K, \tau^O\right) - \frac{\gamma}{2} \frac{\Theta\left(K, \tau^O\right)^2}{\Lambda(K)} \right]. \tag{4}$$

The first-order condition of the problem is obtained as

$$\Lambda + \Theta^O - \frac{\gamma}{2} \frac{\Theta^{O2}}{\Lambda} + \tau^O \left[1 - \frac{\gamma \Theta^O}{\Lambda} \right] \frac{\partial \Theta}{\partial \tau^O} = 0, \tag{5}$$

where we drop the arguments of functions Λ and Θ for the ease of notation. Subscripts denote partial derivatives to the variable and Θ^O denotes the profit-shifting under τ^O. The opportunistic type essentially chooses the best response deviation tax rate to a given level of commitment tax rate τ^R and aggregate investment K that is determined subsequently, and hence is a function of aggregate investment $\tau^O(K)$. As will be discussed later, the key difference between the opportunistic type and the commitment type is that the commitment type internalizes firms' investment decisions while the opportunistic type does not. Hence, the opportunistic type will impose a tax rate different from the commitment type's tax rate and hence, the equilibrium where the two types choose different tax rates trivially becomes the consistent equilibrium in this game. Hence, we solve for the equilibrium where the opportunistic type does not mimic the commitment type and firms expect it to happen henceforth.

Intuitively, the best response of opportunistic type to a given level of commitment tax rate τ^R is less than 1 because firms will shift all the profits to the foreign economy and make tax base zero if the opportunistic type deviates to tax away all the profits ($\tau^O = 0$). Also, the best response deviation tax rate is decreasing in τ^R and not always higher than a given τ^R as shown in Figure 2 when $\gamma = 1.25$ and $p = 0.5$. This is primarily due to introducing firms' profit-shifting choice in the model.

When τ^R is low, this attracts investment and increases firms' profit $\Lambda(K)$. The opportunistic type can exploit high investment by deviating to a higher tax rate in that case as the marginal tax revenue is high in equation (5).[6] However, as the commitment tax rate

[5] We impose a unit measure of homogeneous, atomistic firms so the aggregation of profit-shifting and profits yield that the values of individual choices of profit-shifting and investment are equal to the aggregated values. In other words, $k = K$, $\rho(k) = \Lambda(K)$, and $\theta(k, \tau) = \Theta(K, \tau)$ by aggregation.

[6] The marginal tax revenue increases in capital K and $\frac{\partial}{\partial K} \left[\Lambda(K) + \Theta(K, \tau^O) - \frac{\gamma}{2} \frac{\Theta(K, \tau^O)^2}{\Lambda(K)} \right] > 0$ if γ is sufficiently high. Otherwise consider the case where γ is minimal ($\gamma \approx 0$). When the tax at host country rises to an extremely high level then firms would produce some positive level of output in the host country to equate expected marginal return of investment across countries and extract all the profits out to the foreign.

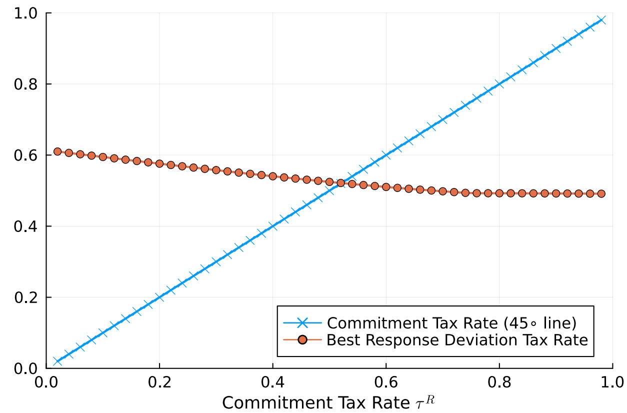


Figure 2: Best Response Deviation Tax Rate to Commitment Tax Rate when $p = 0.5$

goes up, investment gets smaller, reducing the incentive to deviate to a higher tax rate. Hence, the opportunistic type deviates to a lower tax rate. In fact, if the commitment tax rate is too high so that it deters investment too much, the opportunistic type deviates to a tax rate lower than the given commitment tax rate and induce firms to shift less profits outside or bring profits from the foreign economy to secure the tax base, thereby increasing $\Theta^O(K, \tau^O)$ in (5).

Absent profit-shifting, however, the opportunistic type always deviates to the tax rate of 1 and taxes away all the profit that the firms earned. Hence, there is a stark difference in terms of the opportunistic type's best response to a given level of commitment type's tax rate in the two models that allows profit-shifting and does not. We show that such difference generates completely different relationship between the commitment tax rate and government reputation in the next section.

2.3 Stage 2: Firms' Investment Choice

Individual firms set their investment k to maximize the expected sum of after-tax profit at the host country and the foreign. Each firm has an exogenous limit of capital $\bar{k}$ that it can invest in both countries. We impose $\bar{k}$ to satisfy $\bar{k} < \left(\frac{\alpha z}{r^*}\right)^{\frac{1}{1-\alpha}}$ so that the firm always produces at the level where the marginal revenue of capital is larger than the marginal cost of capital r^* at both countries. This simplifying assumption ensures that the firms invest nothing in either the host country or the foreign if the tax differential is too big. We also abstract from the fixed cost of FDI choice for simplicity. In this sense, we control for the extensive margin of FDI and confine the discussion to the intensive margin of FDI.

Government's time inconsistency within the period adds uncertainty to the firm's

We rule out such case by imposing a sufficiently high value of γ as discussed later in detail.

choice as in Ortigueira and Pereira (2021). To a firm, the host country's tax rate is a binary random variable that is τ^R with probability p and τ^O with probability $1-p$ as we focus on the equilibrium where the opportunistic type always deviates. While τ^R is set by the government in Stage 1 described in the next subsection, the firm can predict τ^O though it cannot affect the opportunistic government's choice of τ^O since it is atomistic.

An individual firm's profit maximization problem is set up as

$$\max_{k\in[0,\bar{k}]} \mathbb{E}_\tau \left[(1-\tau)\left[\rho(k)+\theta(k,\tau)-\frac{\gamma}{2}\frac{\theta(k,\tau)^2}{\rho(k)}\right]+(1-\tau^*)\left[\rho(k^*)-\theta(k,\tau)-\frac{\gamma}{2}\frac{\theta(k,\tau)^2}{\rho(k^*)}\right]\right] \tag{6}$$

s.t. $k+k^*=\bar{k}$,

where $\theta(k,\tau)$ is (3) and the first-order condition with respect to k is obtained as

$$\mathbb{E}_\tau\left[(1-\tau)\left(1+\frac{\gamma\theta(k,\tau)^2}{2\rho(k)^2}\right)\rho'(k)-(1-\tau^*)\left(1+\frac{\gamma\theta(k,\tau)^2}{2\rho(k^*)^2}\right)\rho'(k^*)\right]=0. \tag{7}$$

Optimal level of investment k is obtained as $k(\tau^R,\tau^O)$ which is a function of tax rate announced at the beginning of the period and the opportunistic type's optimal deviation tax rate. If there were no profit-shifting, the firm will determine its capital allocation across countries by equating the after-tax marginal profits in the two countries. Hence, higher tax in the host country will decrease the firm's investment in the host country.

When we introduce profit-shifting in the model, however, profit-shifting mitigates the tax distortion on investment by allowing firms to avoid paying taxes and preserve their after-tax investment returns which has been also discussed by Kallen (2023). This is captured by the term $\frac{\gamma\theta(k,\tau)^2}{2\rho(k)^2}$ in the equation (7). When tax rate is higher in the host country ($\tau>\tau^*$), firms invest more in the foreign country so $\rho(k)<\rho(k^*)$ and $\frac{\gamma\theta(k,\tau)^2}{2\rho(k)^2} > \frac{\gamma\theta(k,\tau)^2}{2\rho(k^*)^2}$. Profit-shifting increases marginal return of investment at both the host country the foreign, but marginal return of investment increases more in the host country. This leads to firms investing more in the host country as compared to the model without profit-shifting. This point will become more evident when we compare the two models with and without profit-shifting.

The extent to which profit-shifting mitigates distortionary effect of corporate tax on investment depends on the cost of profit-shifting γ. With a high γ, profit-shifting θ is minimal to counter the distortionary effect. Vice versa holds for a low γ.[7] Hence, raising

[7] In an extreme case where $\gamma\to 0$, there can be a case where higher τ induces higher investment as firms can choose to produce massively in the host country and shift most of its before-tax profits to foreign when $\tau>\tau^*$. We rule out such case by imposing a moderate value of γ in the baseline analysis, namely, the mean

tax is not as distortionary as in the model without profit-shifting.

2.4 Stage 1: Commitment Type's Optimal Taxation

In the beginning of the period, the commitment-type government chooses the optimal tax rate τ^R to maximize tax revenue while internalizing the firms' choices of investments and contingent profit-shifting plans. When it internalizes firms' investment choices, it takes account that the opportunistic type announces the same tax rate in the beginning of the period but deviates to its best response tax rate τ^O later in Stage 3. In this sense, the commitment-type government's revenue maximization problem can be written as

$$\max_{\tau^R \in [0,1]} \tau^R \left[\Lambda(K(\tau^R, \tau^O)) + \Theta(K(\tau^R, \tau^O), \tau^R) - \frac{\gamma}{2} \frac{\Theta(K(\tau^R, \tau^O), \tau^R)^2}{\Lambda(K(\tau^R))} \right]. \tag{8}$$

The first-order condition with respect to τ^R is obtained as

$$\Lambda + \Theta^R - \frac{\gamma}{2} \frac{\Theta^{R^2}}{\Lambda} + \tau^R \left[\left[1 - \frac{\gamma \Theta^R}{\Lambda} \right] \frac{\partial \Theta}{\partial \tau^R} + \frac{\partial}{\partial K} \left[\Lambda + \Theta^R - \frac{\gamma}{2} \frac{\Theta^{R^2}}{\Lambda} \right] \frac{\partial K}{\partial \tau^R} \right] = 0, \tag{9}$$

where subscript notation is the same as in equation (5) and Θ^R denotes the profit-shifting amount under τ^R.

The optimal tax rate τ^R is obtained as the solution to equation (9). Terms inside the large bracket in equation (9) signify the distortionary effect of higher tax rate on tax base. The first term inside the large bracket reflects decrease in tax base due to firms' profit-shifting. The second term inside the bracket reflects that the commitment type internalizes distortionary effect of tax on capital K, which is not considered in the optimal condition (5) of the opportunistic government's optimization problem. The term captures that a higher tax rate decreases investment and less investment changes the tax base in turn. We can rewrite this second term inside the bracket as

$$\frac{\partial}{\partial K} \left[\Lambda + \Theta^R - \frac{\gamma}{2} \frac{\Theta^{R^2}}{\Lambda} \right] \frac{\partial K}{\partial \tau^R} = \Bigg[\underbrace{\left(1 + \frac{\gamma}{2} \frac{\Theta^{R^2}}{\Lambda^2} \right) \frac{\partial \Lambda}{\partial K}}_{>0} + \underbrace{\left(1 - \frac{\gamma \Theta^R}{\Lambda} \right) \frac{\partial \Theta^R}{\partial K}}_{\text{indeterminate}} \Bigg] \frac{\partial K}{\partial \tau^R}. \tag{10}$$

There are two different forces that determine the size of tax base loss due to tax distortion on capital, which are captured by the two terms inside the bracket on the right hand side of equation (10). First term captures the direct effect of a higher tax rate on tax base

value of γ estimated by Kallen (2023).

as investment goes down. Lower investment reduces tax base by amount of marginal pre-tax profit $\partial\Lambda/\partial K$. Also, there is an additional loss of tax base due to higher cost of profit-shifting which is captured by $\gamma{\Theta^R}^2/2\Lambda^2$. The second term captures the change in tax base as lower capital changes the amount of profit-shifting by firms in turn. The sign of this term, however, is indefinite because of $\partial\Theta^R/\partial K$.[8] Throughout the paper, we focus on the case where this second indirect effect is dominated by the first term by imposing a sufficiently large value of the profit-shifting cost parameter γ. This is equivalent to saying that higher investment increases the government's tax base with the following inequality

$$\frac{\partial}{\partial K}\left[\Lambda+\Theta^R-\frac{\gamma}{2}\frac{{\Theta^R}^2}{\Lambda}\right]=\left[\left(1+\frac{\gamma}{2}\frac{{\Theta^R}^2}{\Lambda^2}\right)\frac{\partial\Lambda}{\partial K}+\left(1-\frac{\gamma\Theta^R}{\Lambda}\right)\frac{\partial\Theta^R}{\partial K}\right]>0. \tag{11}$$

We can further show that the deviation tax τ^O determined at Stage 3 is higher than the optimal commitment tax rate τ^R in equilibrium. The best-response deviation tax rate τ^O is always higher than τ^R in equilibrium as long as tax decreases aggregate investment. Though deviation tax rate as the best response to a commitment tax rate might be lower than the given commitment tax rate for some levels of commitment tax rate as discussed before, we obtain that the commitment type chooses the optimal tax rate such that the opportunistic type deviates to a higher tax rate in Proposition 1.

Proposition 1. *The deviation tax rate τ^O is higher than the optimal commitment tax rate τ^R in equilibrium as long as investment K is decreasing in τ^R and firms' profit net of profit-shifting is increasing in capital K.*

Proof. See Appendix A.2. ■

As stated earlier, we study the case where corporate tax is distortionary despite the alleviating role of profit-shifting and aggregate investment K is decreasing in τ^R in equilibrium. In such an equilibrium, Proposition 1 provides that the opportunistic type always deviates to a higher tax rate in the equilibrium. In this static game, firms' profit-shifting alone cannot enforce the opportunistic type to commit to the Ramsey tax rate.

In reality, the deviation tax rate τ^O could be also interpreted as $\tau^O=\tau^R+\Delta$ where τ^R is the statutory tax rate stated by law and $\Delta>0$ reflects any impediment or cost as-

[8]When we differentiate the profit-shifting function in (3) with respect to capital K, we obtain

$$\frac{\partial\Theta}{\partial K}=\frac{\tau^*-\tau}{\gamma}\frac{(1-\tau)\Lambda'(K)\Lambda(\bar{K}-K)^2-(1-\tau^*)\Lambda'(\bar{K}-K)\Lambda(K)^2}{\left[(1-\tau^*)\Lambda(K)+(1-\tau^*)\Lambda(\bar{K}-K)\right]^2},$$

where $\bar{K}$ is the total amount of capital that firms can invest which is equal to $\bar{k}$. The sign of the partial derivative is indefinite.

sociated with retrieving of profit. Δ could be a non-tax cost associated with taking profit out of the country. In this sense, the opportunistic type's deviation reflects both retroactive corporate taxation and amendments to non-tax costs of profit repatriation in reality. Proposition 1 states that the opportunistic type always makes such deviation under optimal taxation of the commitment type as long as taxation distorts investment choice of firms.

2.5 Equilibrium

Equilibrium in this economy consists of firms' capital investment and profit-shifting choice $\{k, \theta\}$ and government's optimal tax rates $\{\tau^R, \tau^O\}$ depending on types that are jointly obtained as a solution to equations (3), (5), (7), and (9). As mentioned before, we focus on a pooling equilibrium where both types of government choose the same tax rate τ^R at Stage 1, and this is the pooling equilibrium that the commitment type prefers the most and also a weak perfect Bayesian equilibrium.

3 Results and Discussion

3.1 Comparative Statics

We solve the model while imposing parameter values as summarized in Table 1. The key parameter is γ that governs the cost of profit-shifting. We use the mean estimate by Kallen (2023). With the given set of parameters, we change the value of p, the government's reputation level, and see how the aggregate investment K, amount of profit-shifting Θ, and realized government's tax rate changes varies across the reputation level.

Table 1: Parameter Values

Parameter	z	α	γ	τ^*	r^*	$\bar{k}$
Value	1	0.66	1.25	0.3	0.04	10

Comparative statics on investment K, profit-shifting Θ, and tax rates $\{\tau^R, \tau^O\}$ are summarized in Figures 3 and 4 across reputation p which is the probability that government is the commitment type. Consistent with what we observed in data, the static model provides that investment increases with higher government reputation. As will be discussed later with the commitment type's Laffer curve, optimal commitment tax rate is chosen at the level such that deviation tax rate as the best response to it is higher. Hence, higher reputation means that the expected tax rate from the firms' perspective is lower. Thus, better reputation p raises the expected return of investment and fosters investment.

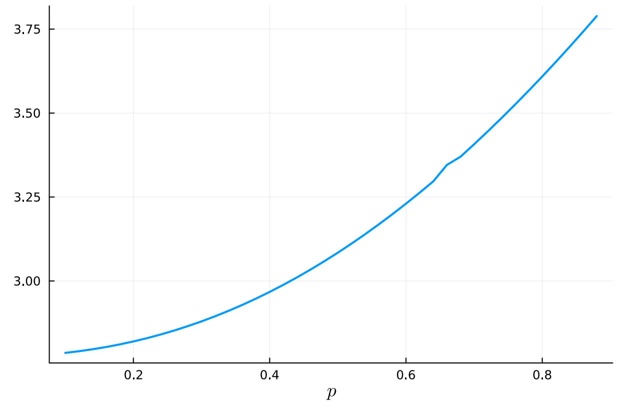
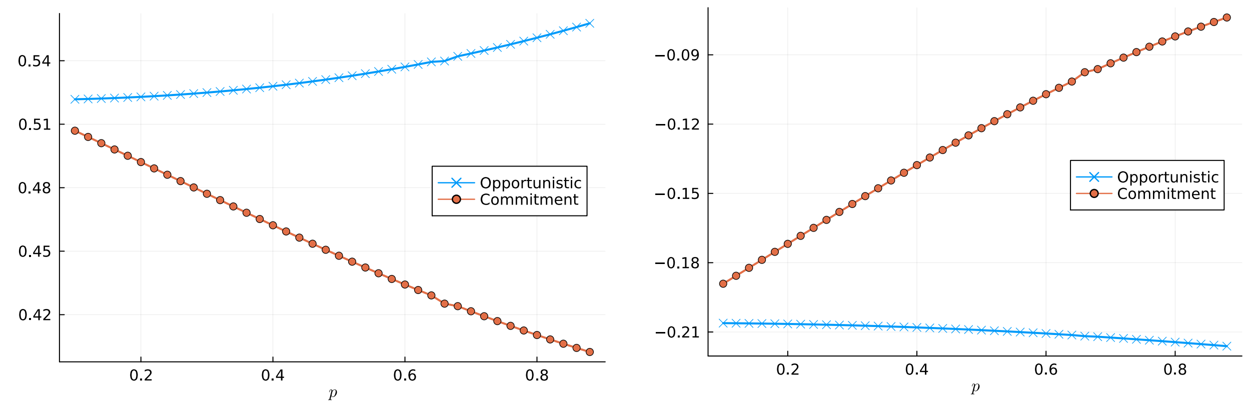


Figure 3: Government Reputation p and Aggregate Investment K

As shown in Proposition 1, the firms' profit-shifting does not provide a sufficient punishment enough to prevent the opportunistic government from deviating when it comes to Stage 3. That is, in this static game, the government is incentivized to deviate at Stage 3 and the deviation tax rate is higher as the reputation level gets higher. This is because the firms invest more when the government has a higher reputation, so the government's benefit of deviating gets higher with higher investment and higher reputation. This is why the deviation tax rate τ^O increases across the reputation level.

Note that τ^R is lower than deviation tax τ^O as the government internalizes firms' investment choices. However, it is also decreasing in reputation p because it internalizes firms' profit-shifting choice. As firms invest more as the reputation gets better, the cost of profit-shifting gets cheaper as profit before tax and profit-shifting $\rho(k)$ gets bigger. If the government imposes higher tax rate τ^R when reputation p goes up, then the firms will shift a significantly larger fraction of profits outside the country and the tax base will shrink. Thus, the commitment type prefers to secure the tax base by decreasing tax rate as its reputation gets better despite the marginal tax revenue it can raise by increasing tax rate. Hence, firms can more easily shift their profits outside the country as reputation p gets higher, so the commitment type internalizes this fact when choosing τ^R by lowering tax rates to secure its tax base. Thus, profit-shifting disciplines the government with better reputation to impose lower tax rates than those with worse reputation. This difference will become more evident when we compare optimal commitment tax rates in models with and without profit-shifting.

In terms of comparing the model results to the stylized facts we observed in the data, one challenge arises because we do not directly observe the type of government in the



(a) Tax Rate τ (b) Profit-Shifting Portion $\frac{\theta}{\rho(k)}$

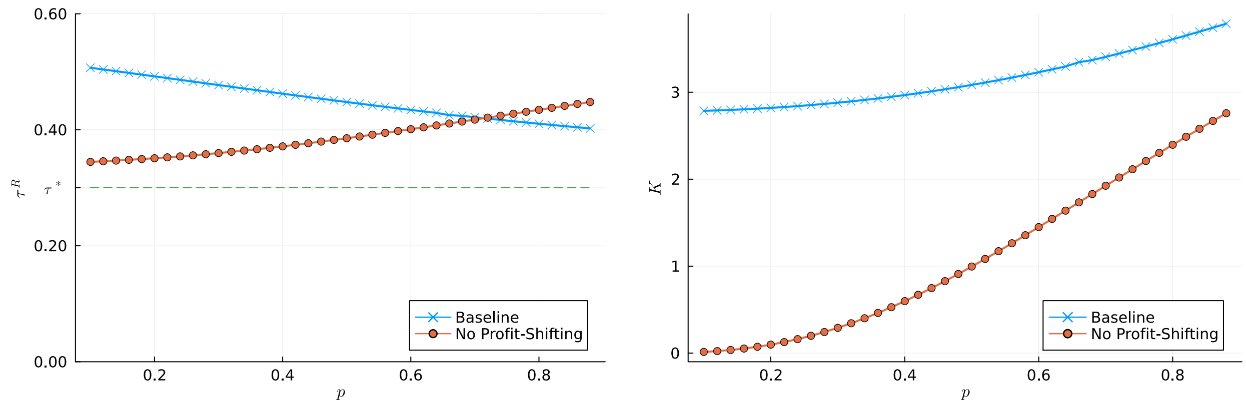
Figure 4: Government Reputation and Equilibrium Outcome

data. Hence, we separately compare each of the two equilibria under the commitment type and the opportunistic type to the patterns in the data. Under the commitment type, the optimal tax rate is lower when the government reputation is higher and this generates both investment and profit-shifting to be increasing in reputation. In the equilibrium with the opportunistic type, however, the optimal tax rate is higher as reputation gets higher and this induces profit-shifting to be decreasing in reputation. That is, firms shift more profits outside from countries with good reputation when the government is opportunistic, which is the opposite to the empirical patterns of profit-shifting and effective tax rates. We later build a two-period model to induce the opportunistic type to imitate the commitment type in the first period to maintain high reputation in the second period, thereby making the equilibrium outcome with opportunistic type be consistent with the empirical facts.

The result that the commitment-type government's optimal tax rate τ^R is decreasing in its reputation p primarily comes from introducing firms' profit-shifting into the model. Before proceeding to the two-period model, we discuss the role of profit-shifting in the model by comparing two models with and without profit-shifting.

3.2 Role of Profit-Shifting

While profit-shifting in the baseline model has been insufficient to deter the opportunistic government from deviating to a higher tax rate at Stage 3, we argue that profit-shifting still disciplines the commitment-type government's optimal choice. In other words, introducing profit-shifting in the model induces the optimal commitment tax rate τ^R to be decreasing in reputation p. This is not true in the model without profit-shifting. In such a model, the commitment type raises tax rate with better reputation as can be seen in Figure 5. This is primarily because introducing profit-shifting makes the optimal deviation tax rate a decreasing function of the commitment tax rate set at the beginning of the period.



(a) Commitment Tax Rate τ^R

(b) Investment k

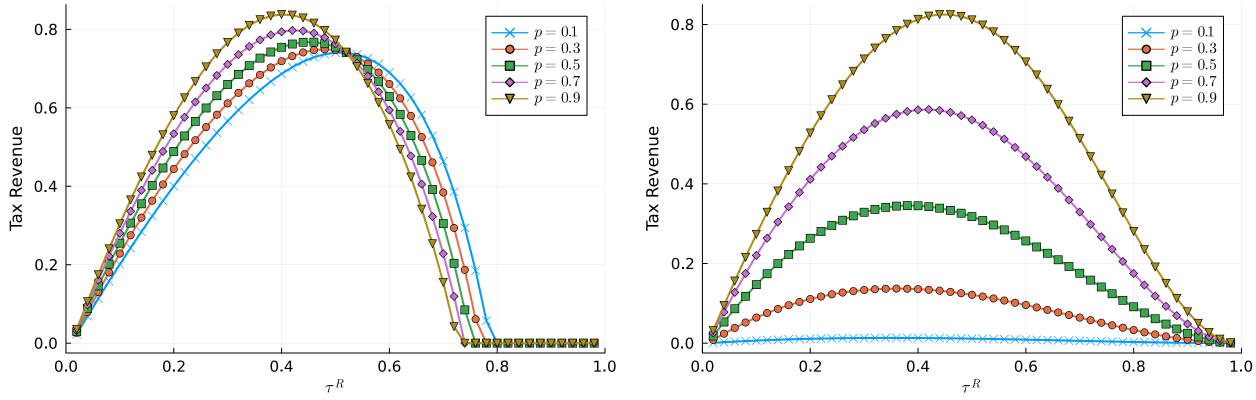
Figure 5: Model Results with and without Profit-Shifting

Consider an alternative version of the model where we eliminate choice of profit-shifting in the firms' problem.[9] When firms cannot shift profits, the opportunistic type will always deviate to a tax rate of 1. Without profit-shifting, the opportunistic type's reoptimization at Stage 3 reduces to maximizing the tax revenue $\tau^O \Lambda(K)$ where $\Lambda(K)$ is preset by investment decision of firms at Stage 2. There is no way for the firms to prevent the opportunistic government from taxing away all the profit at Stage 3 when we shut down profit-shifting, so τ^O is 1 trivially.

This is why equilibrium investment K is much lower in the model without profit-shifting as shown in Figure 5. Investment is significantly lower without profit-shifting because the downside risk of losing profits under the opportunistic type is too big in this case. Opportunistic type basically takes away all the profits if firms are unable to shift profits, so firms do not invest as much as when they can shift profits outside the country when the government deviates. Taking this into account, it is optimal for the commitment type to raise the optimal tax rate as reputation gets higher when there is no profit-shifting. This is opposite to what happens in the baseline model with profit-shifting as we can see by comparing the Laffer curves in the two models in Figure 6.

To understand why optimal commitment tax rate τ^R is increasing in reputation p in the model without profit-shifting, we consider the problem of commitment-type government's revenue maximization problem. First, a representative firm's profit maximization

[9]This is equivalent to making $\gamma \to \infty$.



(a) Baseline Model

(b) No Profit-Shifting

Figure 6: Laffer Curves under Different Values of Reputation p

problem is

$$\max_{k\in[0,\bar{k}]} p\left[\left(1-\tau^R\right)\rho(k) + \left(1-\tau^*\right)\rho(\bar{k}-k)\right] + (1-p)\left(1-\tau^*\right)\rho(\bar{k}-k) \tag{12}$$
$$= p\left(1-\tau^R\right)\rho(k) + \left(1-\tau^*\right)\rho(\bar{k}-k).$$

Solving the problem yields that the investment is increasing in the reputation p and decreasing in the tax rate τ^R as higher p and lower τ^R raises the return of investing in home country.[10] Hence, the aggregate profit is increasing in p and decreasing in τ^R in this setting.

Then the commitment type chooses the optimal tax rate that maximizes its tax revenue $\tau^R\Lambda(K(\tau^R,p))$ since aggregate investment is obtained as a function of τ^R and p. The first-order condition for optimal tax rate is obtained as below. The commitment type chooses the tax rate that equates the gains and losses of raising taxes as

$$0 = \Lambda(K(\tau^R,p)) + \tau^R\frac{\partial K(\tau^R,p)}{\partial\tau}\frac{\partial\Pi(K(\tau^R,p))}{\partial K}. \tag{13}$$

As seen in the equation (13), standard trade-off arises because a marginal increase in tax rate increases tax revenue by $\Lambda(K(\tau^R,p))$ but reduces tax base by the second term in (13) as investment is distorted.

[10] We can also verify this by applying Topkis's theorem because the firm's expected after-tax profit function is strictly supermodular for pairs (k,p) and $(k,-\tau^R)$.

Total differentiation of the government's optimal condition (13) yields

$$\frac{d\tau^R}{dp} = \underbrace{-\frac{1}{2}\left[\frac{\partial K(\tau^R,p)}{\partial \tau}\right]^{-1}}_{>0}\left[\underbrace{\frac{\partial K(\tau^R,p)}{\partial p}}_{>0} + \underbrace{\tau^R \frac{\partial}{\partial p}\frac{\partial K(\tau^R,p)}{\partial \tau}}_{<0}\right], \tag{14}$$

where we impose the second derivatives are minimal considering the functional form of production technology. The term outside the bracket is positive because investment is decreasing in tax rate. Inside the bracket, the first term denotes positive effect of reputation on investment as better reputation lowers firms' expected tax rate and attracts more investment. The second term denotes reputation's effect on tax distortion. Higher reputation implies that firms respond more to a given tax hike because they think the announced tax rate is more credible. Hence, reputation amplifies tax distortion on investment so this term is negative.

In the model without profit-shifting, the first term inside the bracket is large while the second term is negligible. Better reputation significantly increases investment in the model without profit-shifting as can be seen in from the slope of the investment curve dK/dp in Figure 5 (line with circles) because higher p raises the expected return of investing in host country dramatically as the probability of losing everything goes down. Tax base increases by far, inducing the government to prefer to raise the tax rate in turn. Hence, we observe that the tax rate τ^R is increasing in reputation p in the model without profit-shifting.

This is the opposite result to what we obtain in the baseline model. Introducing profit-shifting into the model induces the optimal commitment tax rate to be decreasing in reputation p. This is a combination of two effects in equation (14): the first term inside the bracket shrinks because better reputation does not always increase the tax base for the government, and reputation amplifies distortion significantly so that it makes tax base become more elastic to the tax rate.

First, better reputation does not always increase the tax base for the government, and even it does, tax base increases only slightly. Recall that the best response deviation tax rate to a given commitment tax rate is decreasing in commitment tax rate and can be even lower than the given commitment tax rate if it is too high so that investment is too small. Consider these two cases separately. When the commitment tax rate is set at the level such that the best response deviation tax rate is higher than it, higher reputation p directly reduces expected tax rate and increases investment. This raises the optimal deviation tax rate in turn and undermines the reduction in expected tax rate. Hence, the expected tax rate of firms falls only slightly and investment also slightly rises. In the other case when the commitment tax rate is higher than the best response deviation tax rate, higher reputation raises the expected tax rate of firms and decreases investment. Therefore, higher reputation reduces the expected tax rate only slightly or may even raise the expected tax rate depending on the value of commitment tax rate. Investment and tax base do not strictly increase with better reputation correspondingly.

Even if better reputation decreases the expected tax rate and increases investment, firms' profit-shifting undermines the increase in tax base. Since real cost of profit-shifting is decreasing in firms' profits before tax and profit-shifting, $\Lambda(K)$, higher investment makes profit-shifting cheaper for the firms.[11] Hence, when reputation p improves, firms can shift more profits outside the country at a cheaper cost, so profit-shifting becomes more aggressive given the same tax rate. Therefore, tax base does not increase as much even though investment becomes higher as reputation goes up.

Second, tax distortion is amplified by a greater magnitude under higher reputation and tax base becomes more elastic to tax rate. In Figure 6, we observe that the Laffer curves have steeper slopes under higher values of reputation. This is because the probability that the commitment tax rate τ^R is imposed gets higher so firms become more responsive to the choice of commitment tax rate. Note that this effect is also present in the model without profit-shifting. However, as discussed earlier, higher reputation increases the tax base tremendously in the model without profit-shifting and that effect dominates the effect of reputation on elasticity of investment to tax rate. In the baseline model where we allow for profit-shifting, this second effect makes tax base be not strictly increasing with reputation when combined with the first effect.

Hence, better reputation does not increase tax revenue throughout all values of $\tau^R \in [0, 1]$ when firms can shift their profits. Panel (a) of Figure 6 shows that there exists a point where the Laffer curves under different levels of reputation coincide, which corresponds to the threshold level of τ^R where tax base actually decreases with better reputation because the optimal deviation rate is lower than the commitment tax rate beyond that level. To the left of this point, the Laffer curve goes up with reputation because tax base increases with higher investment, but the increment is small as compared to the model without profit-shifting. Again, this is because the expected tax rate does not fall much so firms do not increase investment much and profit-shifting chips away the increment in tax base. Hence, the peak of the Laffer curve moves leftward as reputation p gets higher, and in equilibrium, firms make more investments only slightly as can be seen from the

[11]Technically, when $\tau^R > \tau^*$ and there is much more investment in the foreign economy than at the host country such that $(1-\tau^R)\rho'(k)\rho(\bar{k}-k)^2 - (1-\tau^*)\rho'(\bar{k}-k)\rho(k)^2 > 0$, $\theta(k, \tau^R)$ is decreasing in k. The equilibrium results satisfy this condition and the profit-shifting function $\theta(k, \tau^R)$ is submodular in τ^R and K.

flatter slope of investment curve in panel (b) of Figure 5 (line with crosses).

Incorporating firms' profit-shifting choice in the model generates the optimal commitment tax rate to be decreasing in reputation. Though profit-shifting alone does not prevent the opportunistic type's deviation in this static game, it flips the sign of effect of reputation on the government's optimal tax rate when we compare it to a more general model without profit-shifting.[12]

3.3 Different Levels of Profit-shifting Cost

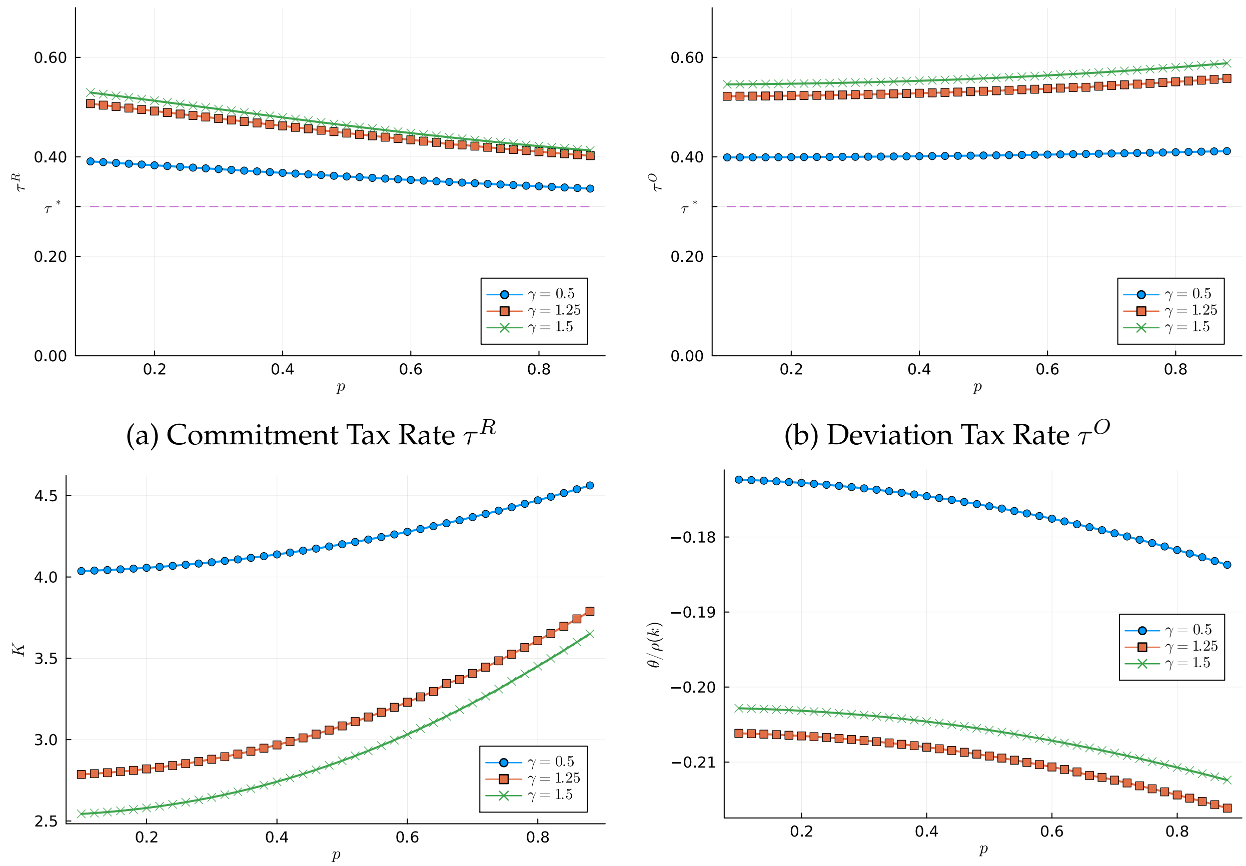
We also impose different values of γ as $\gamma = 0.5$ and $\gamma = 1.5$ and compare the results to the baseline case of $\gamma = 1.25$ to provide additional comparative statics. Figure 7 (a) and (b) depict tax rates under both types of government with the three different values of γ. We observe that the both types of government impose higher tax rates under higher values of γ. Both types of government takes an advantage of the high profit-shifting costs for firms as the firms get trapped in the economy with high profit-shifting costs when γ is high.

Because tax rates are higher with higher values of γ, we observe that investment is lower when γ is high. However, the fraction of profits shifted outside does not have a monotone relationship with γ. When $\gamma = 1.5$ and profit-shifting is more expensive than the baseline model, firms invest less and shift a smaller fraction of their before-tax profits to foreign as in Figure 7 (c) and (d). The opposite is true for the case with $\gamma = 0.5$ and in this case, the government prefers to impose lower tax rate to keep firms from shifting a large fraction of their profits to the foreign economy as profit-shifting gets more mobile with lower γ. Hence, firms invest more but shift less portion of profits outside. Hence, higher γ implies higher tax rates and lower investments though its effect on the fraction of profits shifted outside $\theta/\rho(k)$ is not monotone because investment decreases in the profit-shifting cost parameter γ.

3.4 Implication on Tax Competition

Our baseline static model abstracts from the tax competition across countries as it models a strategic game between a government and multinational firms, our model has an

[12]One implicit assumption we make through this analysis is that there is no capital endowed in the country before firms invest. While this makes it infeasible for the government to take advantage of its reputation and charge a high tax rate to firms in the model, relaxing the assumption and allowing for the capital endowment at the beginning of the period that increases in reputation p such as $k_0(p) = \exp(ap), a > 0$ still yields the similar result in the model with profit-shifting unless the capital endowment is extremely high with a large value of a. When firms can shift profits, elasticity of capital investment to reputation significantly decreases as compared to the model without profit-shifting and this generates that optimal commitment tax rate τ^R decreases in reputation p.



(a) Commitment Tax Rate τ^R

(b) Deviation Tax Rate τ^O

(c) Investment K

(d) Profit-shifting Portion $\frac{\theta}{\rho(k)}$

Figure 7: Equilibrium Results under Different γ

implication relevant to the international tax competition. Tax competition is the situation in which countries compete by lowering their tax rates, and that implies that the optimal domestic tax rate as the best response to a given foreign tax rate increases in the foreign tax rate. In other words, it is optimal for the government to lower its tax rate when other countries lower tax rates.

We check whether this property also holds in the model by computing optimal tax rates of both the commitment type and the opportunistic type under different levels of foreign tax rate τ^*. Indeed, host country's tax rate increases in the foreign tax rate as can be seen in Figure 8. Figure 8 displays optimal tax rates of the commitment type and the opportunistic type when $p = 0.5$ and $\gamma = 1.25$. When foreign tax rate increases, multinational firms make more investments into the host country and shifts less profits out of it. Hence, tax base is higher under a higher foreign tax rate τ^* while all other parameters remain the same and government optimally exploits this with a higher tax rate.

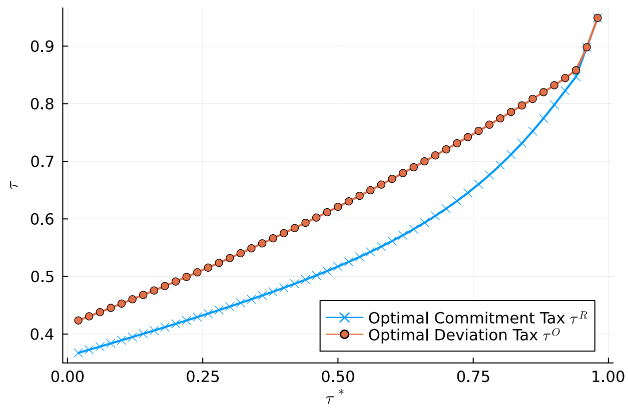


Figure 8: Optimal Tax Rate as a Best Response to Foreign Tax Rate

While abstracting from the strategic choice of governments in the context of tax competition, the model generates that the domestic tax rate increases in the foreign tax rate and has a similar implication on tax competition with previous studies on tax competition such as Devereux et al. (2008).[13]

4 Dynamic Model

We extend the static model in the previous section to a two-period model. We observe in the static model that profit-shifting alone does not prevent the opportunistic government from deviating to a higher tax rate in equilibrium. Hence, we incorporate a dynamic setting where the government's deviation in the first period gets punished by a fall in investment in the second period as its reputation deteriorates. In the two-period setting, we repeat the static game twice. Timing of the model within each period is exactly the same as in the static model, but after the first period ends, firms update their beliefs about the government's type for the second period depending on the tax rate in the first period.

A key feature of the dynamic model is that reputation of the opportunistic type is determined endogenously by its choice to impose either the commitment tax rate or the deviation tax rate. Given an initial level of reputation, if an opportunistic government does not deviate in the first period, it can maintain its reputation at a high level in the second period. If it deviates, then the government type is revealed at the end of the first period and the firms would know that the government is opportunistic before making investment decisions at the beginning of the second period.

For simplicity, we assume that capital fully depreciates away in each period. This

[13]See Proposition 3 of Devereux et al. (2008).

makes the dynamic game a simple repetition of two consecutive static games from firms' perspective because capital investment in the first period does not affect decision in the second period. If we allow for capital accumulation over time, however, firms will become even more reluctant to invest in countries with bad reputation but the overall implication of the model would not change. However, their belief of the probability of the government to impose the commitment tax rate in the second period depends on past behavior of the government in the first period as in previous studies on government reputation such as Dovis and Kirpalani (2020, 2021).

In each period, equilibrium values of investment, tax rates, and profit-shifting depend on the government's probability of imposing the commitment tax rate. In the static model, that was equivalent to prior p since the opportunistic type always deviates. In the two-period model, this is different from prior p as the opportunistic type can choose to impose the commitment tax rate with some positive probability. Throughout the model, we denote $\pi = \Pr(\tau_1 = \tau_1^R) \in [0,1]$ as the probability of that the commitment tax rate is imposed in the first period where the subscript is index for time. Tax revenue in equilibrium depends on this probability π and the tax rate $\tau \in \{\tau^R, \tau^O\}$ that the government imposes. Therefore, we denote the tax revenue as a function $R(\pi, \tau)$ henceforth. Both types of government maximize the present discounted sum of tax revenues in the two periods.

In the following subsections, we describe the problems of governments and firms in period 1. Choice of tax rates, investment, and profit-shifting in period 2 will be exactly the same as in the static model except that firms update their beliefs on the government's type. We solve for the equilibrium via backward induction. We explain how government reputation evolves over the two periods and then set up the government and firms' problems in a reverse order of decision-making in the following subsections.

4.1 Government Reputation Dynamics

Before setting up problems of the two types of governments, we define $\pi(p)$ as the probability that the commitment tax rate is imposed in the first period when the government reputation is p. $\pi(p)$ reflects the probability that the opportunistic government imitates the commitment type by not deviating. Formally, we can write this as

$$\begin{aligned}\pi(p) &= \Pr(\tau_1 = \tau_1^R) \\ &= \Pr(\text{Commitment}) + \Pr(\text{Commit} \mid \text{Opportunistic}) \times \Pr(\text{Opportunistic}) \\ &= p + \sigma(1-p), \end{aligned} \tag{15}$$

where $\sigma \in [0,1]$ denotes the probability that the opportunistic government does not deviate and mimics the commitment type. σ is be determined as the optimal strategy of the opportunistic type that is consistent with firms' beliefs in this Bayesian game.

In the first period, firms think that the government will impose the commitment tax rate with probability $\pi(p)$ because they do not know the type of the government. They update the government's reputation in the second period depending on either the government commits to τ^R or not. Reputation in the second period $\pi'(p)$ follows Bayes' rule,

$$\pi'(p) = \frac{p}{p + \sigma(1-p)}. \tag{16}$$

If the opportunistic type deviates in the first period, then its reputation falls to zero as firms learn of its type before investing in the second period. Hence, the opportunistic type can preserve its reputation in the second period by imposing the commitment tax rate in the first period. This incentive disciplines its behavior in the first period.

4.2 Opportunistic Government's Problem

The opportunistic government chooses optimal deviation tax rate in the first period τ_1^O, tax rates in the second period $\{\tau_2^{RO}, \tau_2^{OO}\}$, and probability σ that it imposes the commitment tax rate in the first period to maximize the discounted sum of tax revenues in two periods. It optimizes while taking the commitment tax rate τ_1^R set in the beginning of period 1 and firms' belief $\tilde{\sigma}$ on the probability it imposes the commitment tax rate as given. Hence, when it optimally chooses the mixed strategy σ, it does not internalize how firms form their belief $\tilde{\sigma}$.[14]

The revenue maximization problem of the opportunistic type with prior reputation p is constructed as

$$\max_{\sigma, \tau_1^O, \tau_2^{RO}, \tau_2^{OO}} \sigma \left[R\left(\pi, \tau_1^R\right) + \beta R\left(\pi', \tau_2^{RO}\right) \right] + (1-\sigma) \left[R\left(\pi, \tau_1^O\right) + \beta R\left(0, \tau_2^{OO}\right) \right] \tag{17}$$
$$\text{s.t. } \pi = p + \tilde{\sigma}(1-p)$$
$$\pi' = \frac{p}{p + \tilde{\sigma}(1-p)}.$$

Note that the optimal deviation tax rates τ_1^O, τ_2^{RO}, and τ_2^{OO} are determined in the same manner as in the static model. For instance, tax rates in period 2, τ_2^{RO} and τ_2^{OO}, are optimal

[14] As will be explained later, consistency of beliefs in an equilibrium under a given τ_1^R necessitates $\sigma = \tilde{\sigma}$. We solve for a optimal mixed strategy σ to guarantee that such consistent equilibrium exists under any level of τ_1^R.

deviation tax rates that the opportunistic type chooses under reputation levels of π' and 0. The variable of interest in this problem is the opportunistic type's choice to commit, σ.

To better understand how σ is determined, we rewrite the expected tax revenue of the opportunistic type as

$$\begin{aligned} &\sigma\left[R\left(\pi,\tau_1^R\right)+\beta R\left(\pi',\tau_2^{RO}\right)\right]+(1-\sigma)\left[R\left(\pi,\tau_1^O\right)+\beta R\left(0,\tau_2^{OO}\right)\right] \\ =&\ \sigma\Bigg[\underbrace{\beta\left(R\left(\pi',\tau_2^{RO}\right)-R\left(0,\tau_2^{OO}\right)\right)}_{\text{Reputation Gain}}-\underbrace{\left(R\left(\pi,\tau_1^O\right)-R\left(\pi,\tau_1^R\right)\right)}_{\text{Deviation Gain}}\Bigg] \\ &+\underbrace{R\left(\pi,\tau_1^O\right)+\beta R\left(0,\tau_2^{OO}\right)}_{\text{Deviation Tax Revenue}}. \end{aligned} \tag{18}$$

Since the opportunistic takes firms' beliefs π and π' as given, choice of σ follows a simple rule. If the reputation gain in equation (19) is higher than the deviation gain, it imposes the commitment tax rate and pretends to be a commitment type. If reputation gain is smaller than deviation gain, it deviates to τ_1^O. If the two are the same, it mixes with a probability $\sigma \in [0,1]$.

The key parameters that affect the choice of σ are time discount factor β and prior reputation p. First, if the government is patient and β is high, it values reputation gain more so it would choose to commit to τ_1^R in the first period *ceteris paribus*. Second, prior government reputation p affects choice of σ in mixed ways depending on what firms believe about $\tilde{\sigma}$. Under a given τ_1^R, if firms believe that the government would commit and $\tilde{\sigma}=1$, then $\pi=1$ and $\pi'=p$, so reputation gain is increasing in p while deviation gain is constant. Hence, σ is more likely to be 1 with higher p in that case. On the other hand, if firms believe that the government would deviate and $\tilde{\sigma}=0$, then $\pi=p$ and $\pi'=1$. In this case, deviation gain is increasing in p because with higher p, there will be more investment so that the government can exploit more of it by deviating. So σ is more likely to be 0 with higher p. Which one of these would be a consistent equilibrium depends on the optimal commitment tax rate τ_1^R that is set in the beginning of the first period.

Finally, commitment tax rate τ_1^R does not have a monotone effect on the opportunistic type's deviation choice. Higher τ_1^R decreases the deviation gain as long as the best response deviation to a given commitment tax rate is to raise the tax to a higher level ($\tau^O > \tau^R$). Intuitively, the opportunistic type would have less incentive to raise tax rate if it is already set at a high level. Hence, higher commitment tax rate can make the opportunistic type not deviate as long as its optimal deviation is to raise the tax. However, if commitment tax rate is too high and even higher than the best response deviation tax rate, however, then the opportunistic type would deviate to a lower tax rate to attract profit-shifting at the expense of revealing its type. This will be further analyzed as we construct the commitment type's problem in following sections.

4.3 Firm's Investment and Profit-Shifting Choice

Firms choose investment and profit-shifting given a commitment tax rate τ_1^R. As in the static model, they are atomistic so they cannot internalize the opportunistic government's optimal deviation tax rate but can expect the optimal deviation tax rate when making its choice. A representative firm's profit maximization problem is constructed as

$$\max_{k\in[0,\bar{k}]} \mathbb{E}_\tau \left[(1-\tau)\left[\rho(k)+\theta(k,\tau)-\frac{\gamma}{2}\frac{\theta(k,\tau)^2}{\rho(k)}\right]+(1-\tau^*)\left[\rho(k^*)-\theta(k,\tau)-\frac{\gamma}{2}\frac{\theta(k,\tau)^2}{\rho(k^*)}\right]\right] \tag{19}$$

$$\text{s.t. } k+k^*=\bar{k}$$

$$\rho(k)=k^\alpha-r^*k$$

$$\tau=\begin{cases}\tau_1^R & \text{with probability } \pi=p+(1-p)\tilde{\sigma}\\ \tau_1^O & \text{with probability } 1-\pi\end{cases},$$

where the profit-shifting function $\theta(k,\tau)$ is obtained in the same manner as in the static model. Note that firms have belief $\tilde{\sigma}$ on the probability that the opportunistic type does not deviate in the first period. This is because they are atomistic so that they cannot induce the opportunistic type not to deviate. However, consistency of equilibrium requires this $\tilde{\sigma}$ is equal to the optimal σ that the opportunistic type chooses given the investment made by firms. The level of capital and profit-shifting they choose with belief σ should also induce the government to deviate with that probability σ. Hence, we solve for optimal choices of k and σ as mutual best responses of firms and the opportunistic type given a commitment tax rate τ_1^R.

This hints that there is a set of consistent equilibrium values of $\{k,\theta,\tau_1^O,\sigma\}$ in each subgame under each level of commitment tax rate that is preset at the beginning of period 1. Since choice of commitment tax rate τ_1^R will take the firms and opportunistic type's optimal choices as implementability conditions as in Dovis and Kirpalani (2021), determining the optimal level of commitment tax rate τ_1^R is equivalent to picking a consistent equilibrium that yields the highest revenue to the commitment type.

4.4 Commitment Government's Problem

The commitment-type government chooses its optimal tax rate for the two periods in the beginning of each period. Choice of τ_2^R follows the same manner as in the static model except that the government reputation is updated to π' which will be then affected by the equilibrium outcome in the first period.

When choosing tax rate τ_1^R in the first period, the government internalizes firms' optimal level of investment and the opportunistic type's optimal deviation choice as well as its deviation tax rates. The opportunistic type optimally chooses to commit with probability σ to maximize (17 and its deviation tax rates $\{\tau_1^O, \tau_2^{RO}, \tau_2^{OO}\}$ are determined by equation (5). Firms' investment and profit-shifting choices in the two periods $\{k_1, \theta_1, k_2, \theta_2\}$ are determined by optimal conditions (3) and (7) where firms expect commitment tax rate to be imposed with probability π in the first period and probability p in the second period. These choices enter the commitment type's problem as implementability constraints as it is essentially picking the level of τ_1^R which subsequently induces a consistent equilibrium in the subgame described in Sections 4.2 and 4.3 that yields the highest present discounted sum of tax revenue. We denote the set of values of investment, profit-shifting, deviation choice, and deviation tax rates in the two periods as $X \equiv \{k_1, \theta_1, k_2, \theta_2, \sigma, \tau_1^O, \tau_2^{RO}, \tau_2^{OO}\}$ and the optimal decision rules of firms and opportunistic type given commitment tax rates τ_1^R, τ_2^R, and prior p as $\Phi(\tau_1^R, \tau_2^R, p)$. The implementability constraint requires that $X = \Phi(\tau_1^R, \tau_2^R, p)$.

The commitment type's revenue maximization problem in the first period is

$$\begin{aligned} \max_{\tau_1^R, \tau_2^R} \; & R(\pi, \tau_1^R) + \beta R(\pi', \tau_2^R) \\ \text{s.t. } & X = \Phi(\tau_1^R, \tau_2^R, p) \\ & \pi = p + (1-p)\sigma \\ & \pi' = \frac{p}{p + (1-p)\sigma}. \end{aligned} \tag{20}$$

The implementability constraint $X = \Phi(\tau_1^R, \tau_2^R, p)$ means that the commitment type's choice of τ_1^R and τ_2^R determine the subgame equilibrium values of firms' investment, profit-shifting, and the opportunistic type's taxation. Hence, the commitment type's problem is essentially choosing between inducing the opportunistic type's deviation, commitment, or mixing between deviation and commitment. Hence, the problem can be restated as

$$\max \left\{ R(p, \tilde{\tau}_1^R) + \beta R(1, \tilde{\tau}_2^R), R(1, \hat{\tau}_1^R) + \beta R(p, \hat{\tau}_2^R), R(\pi, \bar{\tau}_1^R) + \beta R(\pi', \bar{\tau}_2^R) \right\} \tag{21}$$

$$\text{where } \{\tilde{\tau}_1^R, \tilde{\tau}_2^R\} = \arg\max_{\tau_1^R, \tau_2^R} R(p, \tau_1^R) + \beta R(1, \tau_2^R) \tag{OC_D}$$

$$\text{s.t. } R(p, \tilde{\tau}_1^O) + \beta R(0, \tilde{\tau}_2^{OO}) > R(p, \tilde{\tau}_1^R) + \beta R(1, \tilde{\tau}_2^{RO}) \tag{IC_D}$$

$$\{\hat{\tau}_1^R, \hat{\tau}_2^R\} = \arg\max_{\tau_1^R, \tau_2^R} R(1, \tau_1^R) + \beta R(p, \tau_2^R) \tag{OC_C}$$

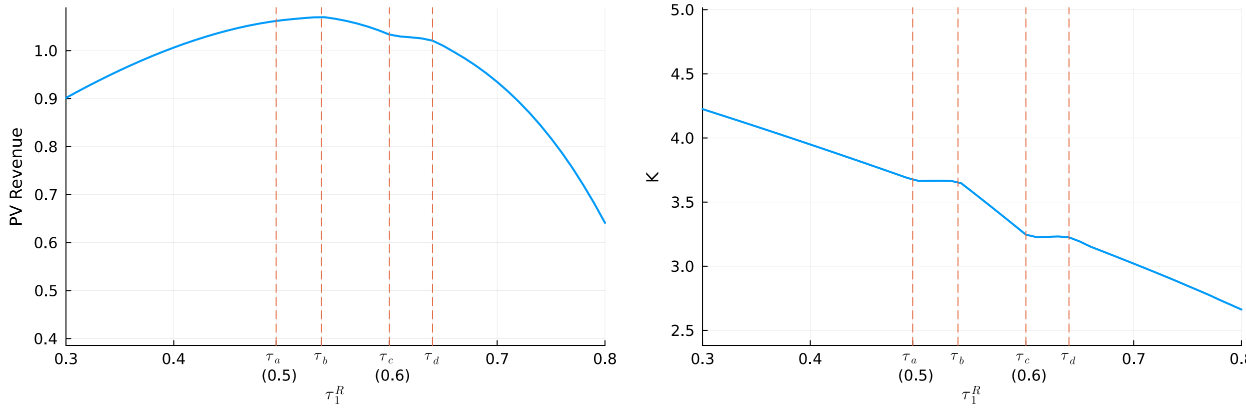
$$\text{s.t. } R(1, \hat{\tau}_1^R) + \beta R(p, \hat{\tau}_2^{RO}) > R(1, \hat{\tau}_1^O) + \beta R(0, \hat{\tau}_2^{OO}) \tag{IC_C}$$

$$\{\bar{\tau}_1^R, \bar{\tau}_2^R\} = \arg\max_{\tau_1^R, \tau_2^R} R(\pi, \tau_1^R) + \beta R(\pi', \tau_2^R) \tag{OC_M}$$

$$\text{s.t. } R(\pi, \bar{\tau}_1^R) + \beta R(\pi', \bar{\tau}_2^{RO}) = R(\pi, \bar{\tau}_1^O) + \beta R(0, \bar{\tau}_2^{OO}). \tag{IC_M}$$

We abstract from writing the reputation dynamics and implementability conditions for investment and profit-shifting choices for brevity. We denote $\hat{\tau}_1^R$ as the optimal tax rate that yields the largest revenue while inducing opportunistic type's commitment and $\tilde{\tau}_1^R$ as the optimal tax rate that yields the largest revenue while inducing opportunistic type's deviation. Similarly, $\bar{\tau}_1^R$ is the optimal tax rate that induces opportunistic type's mixing. Equations (OC_D), (OC_C), and (OC_M) are optimal conditions for the commitment type when it induces deviation, commitment, or mixing of the opportunistic type, respectively. Conditions (IC_D), (IC_C), and (IC_M) are implementability conditions associated to each cases accordingly. One of these implementability conditions hold true for a given level of τ_1^R, so there are separate regions of τ_1^R where the opportunistic type deviates, commits, or mixes.

One might think that implementability constraint (IC_D) holds only for low values of τ_1^R so that the commitment type has to impose a low tax rate to signal its type while (IC_C) holds only for high τ_1^R and it has to impose a high tax rate to hide its type. While such intuition holds true for the model without profit-shifting (discussed later), in this model, τ_1^R does not have a monotone effect on the opportunistic type's choice of σ. This is essentially because the optimal deviation tax rate to a given commitment tax rate within a period is lower than the commitment tax rate if it is too high as shown in Section 3.2. To get a better understanding of commitment type's optimal choice, we draw the Laffer curve and study how choice of τ_1^R shapes firms' investment size and opportunistic type's deviation choice. Figures 9 and 10 display the commitment type's tax revenue and associated subgame equilibrium values of firms' investment and the opportunistic government's deviation choice given each level of commitment tax rate τ_1^R.[15]



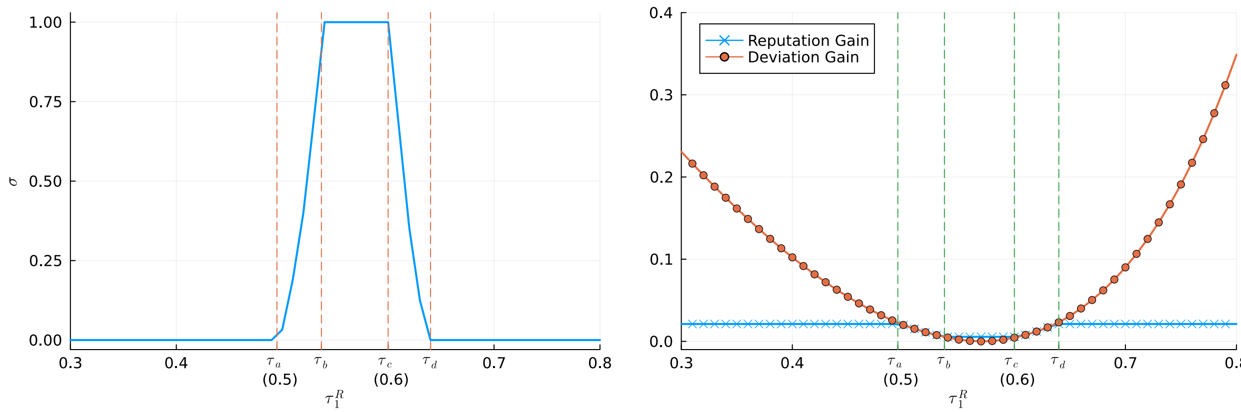
(a) Commitment Government's Laffer Curve (b) Investment

Figure 9: Laffer Curve and Investment

We fix parameter values at $p = 0.5$ and $\beta = 0.6$ to analyze what happens under different levels of commitment tax rate τ_1^R. Laffer curve of the commitment type looks similar to that we obtained in the static model in Figure 9 and there are four threshold levels of τ_1^R that determine the deviation choice of the opportunistic type denoted as $\{\tau_a, \tau_b, \tau_c, \tau_d\}$. Actual values of these thresholds depend on parameter values. We observe that the opportunistic type deviates when $\tau_1^R < \tau_a$ and $\tau_1^R > \tau_d$ but it commits when $\tau_1^R \in (\tau_b, \tau_c)$. Hence, the implementability constraint (IC_D) holds when $\tau_1^R < \tau_a$ and $\tau_1^R > \tau_d$, which we call the deviation zone henceforth, and (IC_C) holds when $\tau_1^R \in (\tau_b, \tau_c)$, which we call the commitment zone henceforth. (IC_M) holds when $\tau_1^R \in [\tau_a, \tau_b]$ and $\tau_1^R \in [\tau_c, \tau_d]$ which are ranges in between the deviation zone and the commitment zone.

While the Laffer curve and firms' investment seem to be standard, deviation choice of the opportunistic type is determined in a nontrivial way as displayed in Figure 10. First, when τ_1^R is lower than τ_a, opportunistic type deviates as deviation gain is larger than reputation gain when $\tau_1^R < \tau_a$. Deviation gain decreases as τ_1^R gets bigger in this region because higher commitment tax rate reduces the incentive to raise tax rate. When $\tau_1^R \in [\tau_a, \tau_b]$, deviation gain and reputation gain cancel each other so the opportunistic type mixes between committing and deviating. As tax rate goes up beyond τ_b up to τ_c, deviation gain falls below the reputation gain. The optimal deviation tax rate is still larger than commitment tax rate at $\tau_1^R = \tau_b$ as can be seen in Figure 11 but gets smaller, so deviating to that higher tax rate only generates a minimal gain. We also see that the deviation gain begins to increase at some point in (τ_b, τ_c), where the commitment tax rate becomes higher than the best response deviation tax rate, but it is still smaller than the reputation

[15] I display cases when $\tau_1^R \in [0.3, 0.8]$ for clarity.



(a) Commitment Probability σ

(b) Trade-off of Deviation Choice

Figure 10: Opportunistic Type's Optimal Choice under τ_1^R

gain. Thus the opportunistic type chooses not to deviate. As tax rate becomes higher than τ_c, deviation increases and cancels out the reputation gain, so the opportunistic type mixes when $\tau_1^R \in [\tau_c, \tau_d]$. Lastly, when commitment tax rate is higher than τ_d, the best response deviation tax rate is lower than the commitment tax rate because there is little amount of investment, so deviation yields higher revenue to the opportunistic type even though it loses reputation in the second period. The benefit of deviating to a lower tax rate and securing the tax base by attracting profit-shifting yields higher revenue in that region, so $\sigma = 0$ in that region and the opportunistic type deviates.

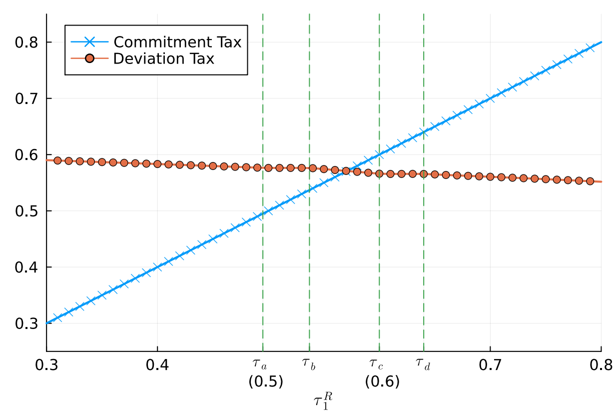


Figure 11: Optimal Deviation Tax Rate under τ_1^R

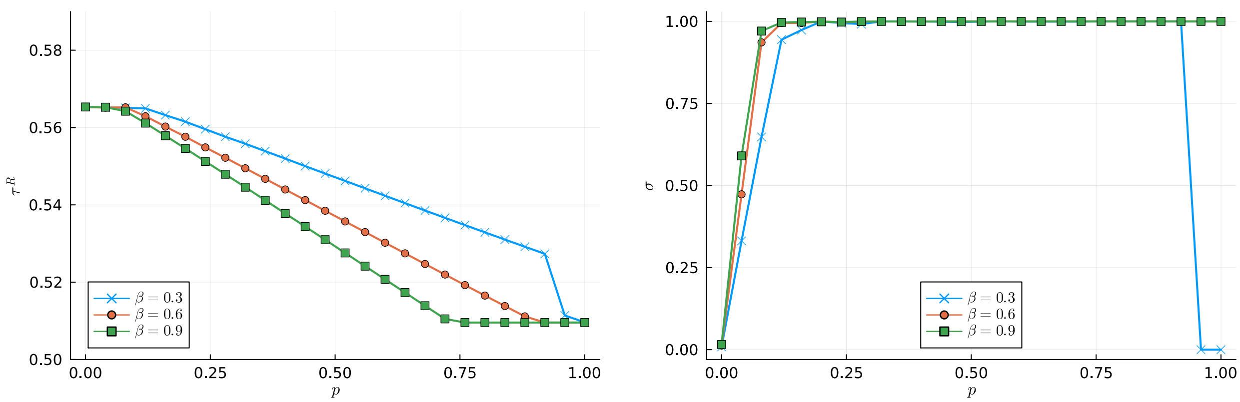
One thing to note is that the optimal signalling tax rate $\tilde{\tau}_1^R$ is in the zone $\tau_1^R < \tau_a$ because of much lower investment in the deviation zone $\tau_1^R > \tau_d$ and is lower than the optimal hiding tax rate $\hat{\tau}_1^R$. Hence, the commitment type optimally chooses between a low tax rate that induces the opportunistic type's deviation and a high tax rate that induces the opportunistic type's commitment. Expansion of commitment zone weakly decreases $\hat{\tau}_1^R$

as the commitment type can induce commitment with a even lower tax rate and thereby reducing the tax distortion on capital investment and tax base. On the other hand, expansion of deviation zone weakly increases $\tilde{\tau_1}^R$ as the commitment type does not have to bear the low tax rate to signal its type. Keeping this in mind, we now examine how parameters β and p affect the optimal tax rate choice of the commitment type in the following section.

5 Equilibrium of Dynamic Model

5.1 Comparative Statics

We solve the equilibrium of the two-period model by backward induction under the same parameters that we imposed to solve the static model in Table 1 while varying the time discount factor β across three values $\{0.3, 0.6, 0.9\}$. Figure 12 displays how different values of β and prior p affect the optimal tax rate of the commitment type.



(a) Commitment Tax Rate τ_1^R

(b) Probability to Commit σ

Figure 12: Government's Choice and Reputation in Two-period Model

First, when time discount factor β becomes higher, reputation gain of the opportunistic type increases in all three implementability constraints (IC_D - IC_M). This loosens (IC_C) and the commitment type can induce opportunistic type's commitment with a lower tax rate $hat\tau_1^R$ with less distortion on tax base. However, a higher β tightens (IC_D) so the commitment type has to bear a lower tax revenue with a lower optimal signalling tax rate $\tilde{\tau}_1^R$. These two effects make the commitment type prefer to induce the opportunistic type to commit with a higher probability as time discount factor β increases. Hence, we observe that the probability to commit, σ, is higher as β goes up and the commitment tax rate τ_1^R is lower as the commitment type can implement opportunistic type's commitment with a lower tax rate.

Second, prior p has mixed effects on the commitment type's choice. When p is very low so that $p \approx 0$, the commitment type cannot implement the equilibrium where the opportunistic type commits because (IC_C) is too tight. At the same time, inducing deviation is suboptimal because it has to impose a very low tax rate to signal its type as (IC_D) is too tight. Hence, it chooses to implement mixing when $p \approx 0$. As p goes up and both (IC_D) and (IC_C are loosened, it optimally chooses to impose $\hat{\tau}_1^R$ and induce the opportunistic type's commitment as in Figure 12.

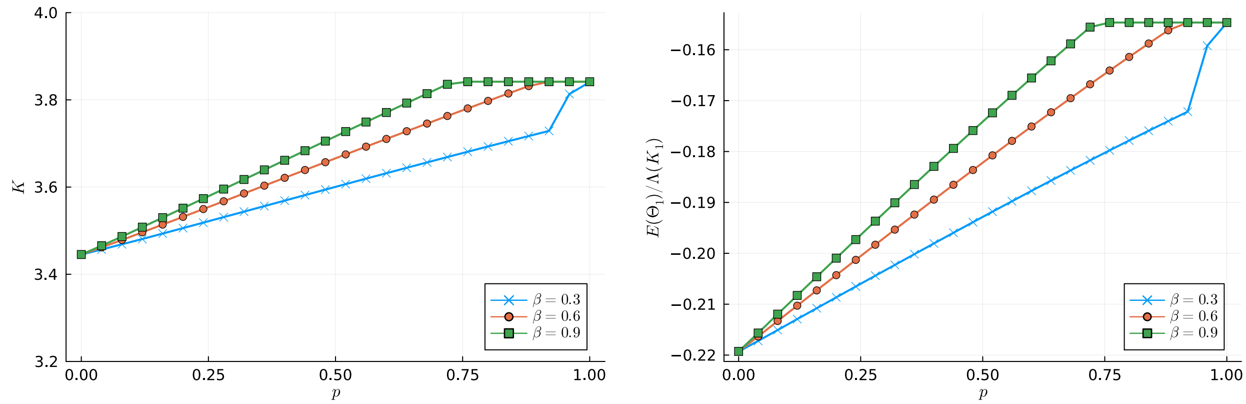
Note that the commitment type prefers opportunistic type's commitment to deviation when $R(1, \hat{\tau}_1^R) - R(p, \tilde{\tau}_1^R) > \beta \left[R(1, \tilde{\tau}_2^R - R(p, \hat{\tau}_2^R)\right]$. Higher p loosens both (IC_D) and (IC_C) so the optimal hiding tax rate $\hat{\tau}_1^R$ weakly goes down and the optimal signalling tax rate $\tilde{\tau}_1^R$ weakly goes up. As a result, first-period revenues $R(1, \hat{\tau}_1^R)$ and $R(p, \tilde{\tau}_1^R)$ both go up. How p affects these two revenue functions depend on the time discount factor β. When β is sufficiently high, then higher p loosens the implementability constraint (IC_C) by more than (IC_D). The optimal signalling tax rate $\tilde{\tau}_1^R$ does not rise much, so $R(p, \tilde{\tau}_1^R)$ does not increase much but $R(1, \hat{\tau}_1^R)$ may increase with higher p. Moreover, $\beta \left[R(1, \tilde{\tau}_2^R - R(p, \hat{\tau}_2^R)\right]$ decreases in p. Hence, when β is sufficiently high, higher reputation p makes the commitment type to induce opportunistic type's commitment and the optimal tax rate weakly decreases in p as (IC_C) is loosened.

However, when β is sufficiently low, such logic might not hold. The constraint (IC_C) is tighter with lower β while (IC_D) is looser. In that case, the optimal signalling tax rate $\tilde{\tau}_1^R$ and associated tax revenue $R(p, \tilde{\tau}_1^R)$ go up as reputation p gets higher, so $R(1, \hat{\tau}_1^R) - R(p, \tilde{\tau}_1^R)$ decreases in p. As $p \to 1$, this can actually become negative and the commitment type may prefer to induce opportunistic type's deviation. This is why we observe that $\sigma = 0$ for high levels of reputation p when $\beta = 0.3$ in Figure 12. There is a discontinuity in the optimal tax rate τ_1^R when p is close to 1 and $\beta = 0.3$ because the optimal signalling tax rate $\tilde{\tau}_1^R$ is strictly lower than the optimal hiding tax rate $\hat{\tau}_1^R$.

In sum, we obtain that the optimal commitment tax rate is decreasing in both reputation p and time discount factor β. Also, we obtain that the commitment type optimally induces opportunistic type's commitment for most values of reputation p so the opportunistic type does not deviate in the first-period in this two-period model. This offers our first testable hypothesis.

Hypothesis 1. Corporate tax rate is lower under better government reputation.

Now turning to firms' choices in the first period, we display aggregate investment K_1 and the fraction of expected profit-shifting $E\Theta_1 = \pi\Theta_1(K_1, \tau_1^R) + (1 - \pi)\Theta_1(K_1, \tau_1^O)$ in



(a) Investment K_1

(b) Expected Profit-Shifting Portion $E\Theta_1/\Lambda(K_1)$

Figure 13: Firms' Choice and Reputation in Two-period Model

aggregate profit $\Lambda(K_1)$ in Figure 13. The opportunistic type commits with a higher probability when its time discount factor is high enough so it imposes a tax rate decreasing in reputation p in the first period. Hence, we obtain that aggregate investment and profit-shifting all increase in reputation p in Figure 13 mainly because of the lower tax rate. We derive the other two testable hypotheses from this.

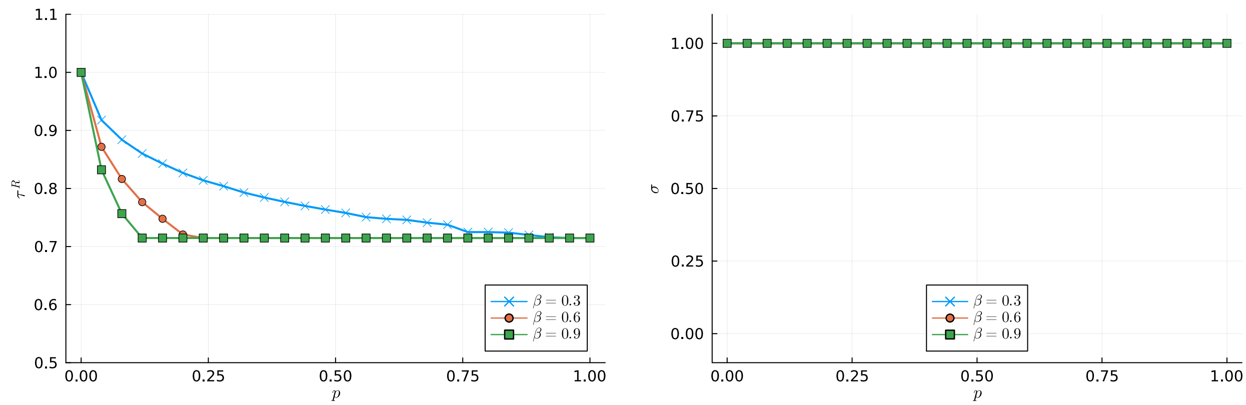
Hypothesis 2. FDI inflows are higher under better government reputation.

Hypothesis 3. Profit-shifting is less aggressive under better government reputation.

We check our hypotheses in the last part of the paper by qualitatively assessing the effects of government reputation on statutory corporate income tax rate, FDI net inflows, and aggregate profit-shifting in the data.

5.2 Comparison to Model without Profit-Shifting

Before discussing the stylized facts on the effects of government reputation, we compare the two-period models with profit-shifting and without profit-shifting. For this, we solve for a version of the two-period model where firms cannot shift profits. Results without profit-shifting are illustrated in Figure 14. The optimal commitment tax rate is set at the level that makes opportunistic type to commit throughout all values of reputation $p \in [0, 1]$. Also, for reasonably high values of time discount factor β, reputation is irrelevant to the optimal tax rate for $p > 0.25$. In the model without profit-shifting, tax revenue loss that the commitment-type government has to bear when it signals its type is enormous because investment is much lower as in panel (b) of Figure 5. Moreover, the implementability condition (IC_D) gets tighter while (IC_C) is more slack since $R(0, \tilde{\tau}_2^{OO}) = R(0, \hat{\tau}_2^{OO}) = 0$ as firms invest nothing if reputation falls to zero. These two effects result in the commitment type to always prefer to hide its type.



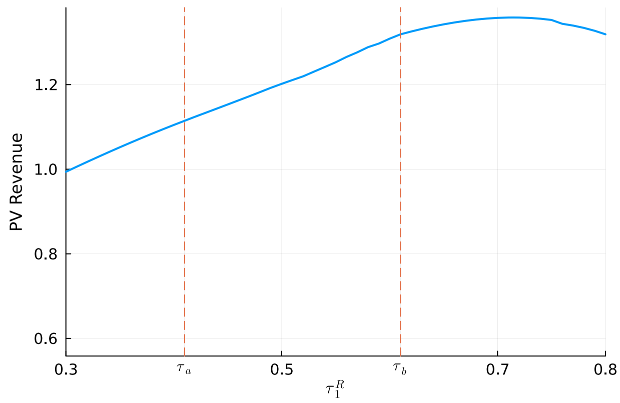
(a) Commitment Tax Rate τ_1^R

(b) Commitment Probability σ

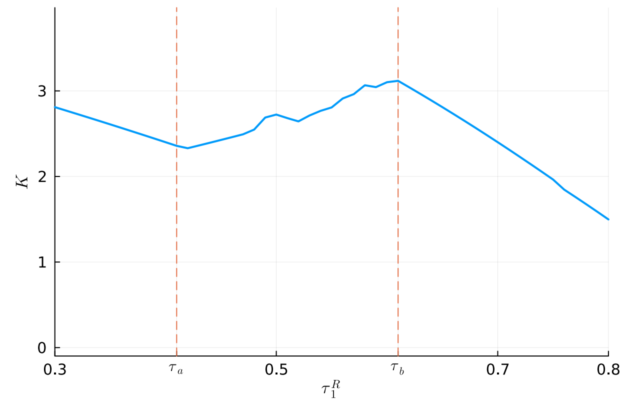
Figure 14: Model Results without Profit-Shifting

The optimal tax rate does not change under different levels of reputation p once reputation goes beyond a certain threshold. When commitment type hides its type, reputation p does not directly affect its tax revenue in the first period as can be seen in (OC_C) but only (IC_C) gets looser as p goes up. This expands the range of τ_1^R that induces opportunistic type's commitment so weakly decreases the optimal hiding tax rate. In the model without profit-shifting, this range expands quickly as p gets higher so that optimal hiding tax rate does not change with p when p is sufficiently high. In the model with profit-shifting, it only expands slightly with better reputation p because the marginal increment of $R(p, \hat{\tau}_2^{RO})$ with respect to p is small and (IC_C) is loosened only slightly.

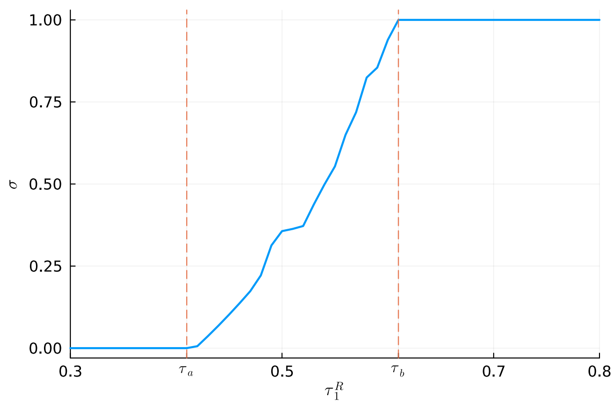
We draw the Laffer curve in the model without profit-shifting to inspect the underlying decision rule for both types of government in Figure 15. Panel (a) displays Laffer curve of the commitment type when there is no profit-shifting when $p = 0.5$ and $\beta = 0.6$. There are two threshold points upon which the opportunistic type's choice is determined. When $\tau_1^R < \tau_a$, the opportunistic type deviates to a tax rate of 100% in period 1. Capital investment is decreasing in τ_1^R in that region because firms expect the opportunistic type to deviate. When τ_1^R is in $[\tau_a, \tau_b]$, the opportunistic type mixes and the probability of committing gets higher with higher τ_1^R. Investment generally increases in τ_1^R because the probability of committing σ goes up in τ_1^R and lowers the expected tax rate in that region. Lastly, the opportunistic type commits in the first period if $\tau_1^R > \tau_b$ and investment decreases as the tax rate, which is going to be imposed with certainty, rises. We obtain that



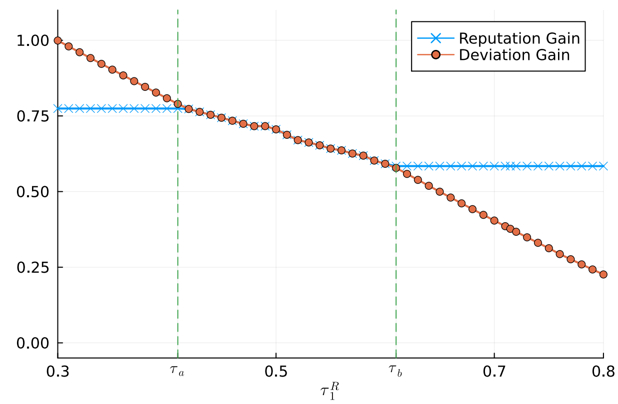
(a) Commitment Government's Laffer Curve



(b) Investment



(c) Commitment Probability σ



(d) Trade-off of Deviation Choice

Figure 15: Laffer Curve and Optimal Choices under τ_1^R without Profit-Shifting

tax revenue is maximized in the region where $\tau_1^R > \tau_b$ with a small amount of distortion in capital investment.

In sum, the model without profit-shifting yields that the commitment type always induces the opportunistic type's commitment. Also, reputation does not generate much variation in tax rate and investment. On the contrary, introducing profit-shifting into the model makes reputation to be more relevant to the outcome of the model as the optimal tax rate varies more across different levels of reputation.

6 Validation of Hypotheses

Our two-period model offers a set of hypotheses about the impact of government reputation on corporate income tax rate, FDI, and profit-shifting. We check the validity of the hypotheses by qualitatively examining them in relation to the data.

6.1 Connecting the Data to the Model

We use investment profile risk score provided in the International Country Risk Guide (ICRG) written by the PRS Group to proxy government reputation that multinational firms would consider when deciding FDI and profit-shifting. The risk score proxies investment risk that are not explained by a country's economic and financial components. It reflects three dimensions of risks associated in the business activities of multinationals: risk associated with government's capital expropriation and contract viability, risk associated with profit repatriation activity, and risk in terms of potential payment delays. In this sense, it essentially captures the degree of government's time inconsistency in terms of policy tools related to multinational firms' business activities. Hence, we consider this proxy to be an empirical counterpart of government reputation p in the theoretical model. The risk score measures investment risk in a scale of $[0, 12]$, so we convert this score to $Risk = 12 - Risk\ Score$. Hence, higher value of $Risk$ means that investing in a country is riskier because of potential impediments to fulfilling investment contracts or retrieving profits.

In the theoretical model, we have focused on the relationship between government reputation and the commitment tax rate τ_1^R, investment K_1, and profit-shifting as a portion of firms' profit $\Theta_1/\Lambda(K_1)$ in period 1. We consider empirical counterpart of the commitment tax rate to be statutory corporate tax rate written in law because both tax rates are announced before the actual investments are made. Also, we consider FDI net inflows from the foreign into a country as an empirical counterpart of investment K_1 in the theoretical model. We use data of countries' foreign direct investment (FDI) net inflows from the World Bank Development Indicators Database. FDI net inflows is defined as new investments minus disinvestments. Countries' statutory corporate tax rates are collected from Enache (2022). In total, we use an annual country-level panel data that consists of country-level FDI inflows, corporate tax rates, and risk scores from 2000 to 2021.

We also use data on multinational firms' profit-shifting across countries and define profit-shifting as a portion of a country's GDP as the empirical counterpart to $\Theta_1/\Lambda(K_1)$ in the model. One challenge that arises in terms of analyzing the country-level profit-shifting data is that the public data on multinational firms' profits in each country has been provided only recently by OECD. We use a set of cross-sectional profit-shifting estimates by countries in 2016 estimated by Garcia-Bernardo and Jansky (2021) based on OECD Country-by-Country-Reporting (CbCR) of corporate profits.[16] To be specific, we

[16] Delis, Delis, Laeven, and Ongena (2022) provide a country panel of profit-shifting index from 2009 to 2017, but it is hard to convert the index value to money value of profit-shifting. We use the money-value estimates of profit-shifting of Garcia-Bernardo and Jansky (2021) for this reason despite its time coverage.

use profit-shifting estimates from the misalignment model proposed by Garcia-Bernardo and Jansky (2021) which adjusts reported profits in each country according to the economic activity in the country. The data also includes mean and median effective tax rates as well as the profit-shifting estimates.

We do not exclude countries that are pointed out to be tax havens in studies by Hines (2010) and Tørsløv, Wier, and Zucman (2022) from the sample. Considering the scope of this paper, tax havens are countries that set a very low tax rate to attract FDI and profit-shifting with a minimal risk of deviation. We view these countries to maintain a good reputation to keep their positions as tax havens and include them in the sample.

6.2 Empirical Facts

We validate the three hypotheses derived from the two-period model by documenting empirical facts about the relationship between government reputation on time inconsistency and three variables of interest: statutory corporate income tax rate, FDI net inflows, and profit-shifting as a portion of GDP. We establish three stylized facts from the data and confirm that the hypotheses from the model are consistent with these facts.

1. Corporate tax rates are lower in countries with better reputation.
2. There are more FDI net inflows into countries with better reputation.
3. There are less profits shifted out from, or more profits shifted into countries with better reputation.

We show that these facts hold when we control as exchange rate volatility and capital control which we proxy with the ICRG exchange rate risk score and capital control index provided by Fernandéz, Klein, Rebucci, Schindler, and Uribe (2016), respectively.[17] Previous works by Klein and Rosengren (1994) and Desai, Foley, and Hines (2006) focus on the role of exchange rate movements or capital controls on firms' FDI, and we show that government reputation have effects on FDI and profit-shifting even when we control these other sources of investment risk.

First, we find that corporate tax rates are higher in countries with worse reputation. We plot countries' average statutory tax rates and investment risk scores from 2000 to 2021 in Figure 16 and find a positive relationship.[18]

[17] ICRG exchange rate risk score assigns a score in $[0, 10]$ depending on the volatility of a country's bilateral exchange rate to USD. Throughout this section, higher exchange rate risk means that the degree of either currency depreciation or appreciation with respect to USD is greater.

[18] Figure 16 presents a reasonable summary of the relationship between a country's statutory corporate

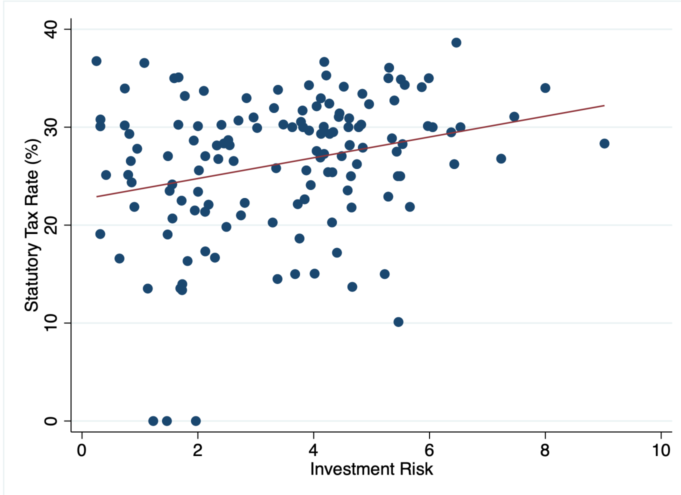


Figure 16: Government Reputation and Statutory Corporate Income Tax Rate

We confirm the positive relationship when we regress statutory corporate income tax rate on government reputation of the previous year while controlling for log-value of real GDP and GDP growth rate in Table 2. Riskier countries impose higher statutory tax rates on average, consistent with what we showed in our two-period model.

Table 2: Regression of Statutory Corporate Income Tax Rate

	(1)	(2)
Risk_{t-1}	0.2331*	
	(0.1152)	
Standardized Risk_{t-1}		0.5659**
		(0.2674)
$\log \text{GDP}_t$	2.3540	2.3515
	(1.9003)	(1.9121)
ΔGDP_t	0.0319	0.0330
	(0.0322)	(0.0324)
R^2	0.8212	0.8214
N	135	135

Note: Standard errors are clustered by country and year. * and ** denote significance at 90% and 95% levels, respectively.

Because tax rates are lower in countries with better reputation, we observe higher FDI net inflows and less aggressive profit-shifting in these countries. We plot each country's

income tax rate and FDI net inflows that it receives, in the sense that the risk scores are persistent with the AR(1) coefficient of 0.7521 with a standard error of 0.0660 when we control for country and year-fixed effects.

average log-value of real FDI net inflows from 2000 to 2021 with average risk score in Figure 17. We observe a negative relationship between FDI net inflows and investment risk of countries in Figure 17. There are less FDI inflows to countries that are riskier on average.

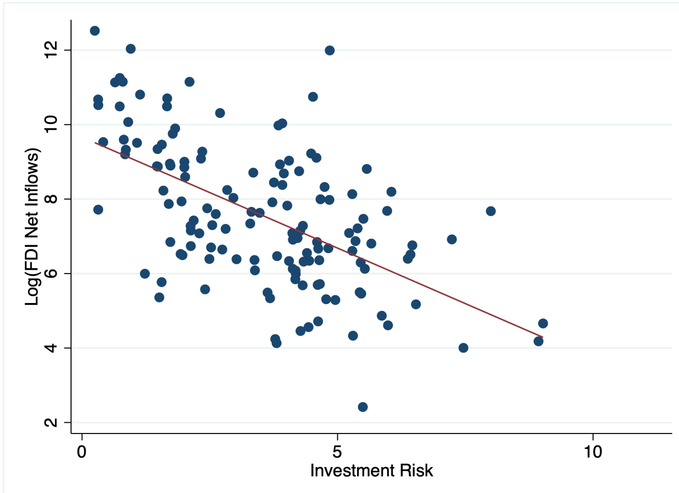


Figure 17: Government Reputation and FDI Net Inflows

We confirm that this relation still holds when we control for other country characteristics in Table 3 and validate our hypothesis on FDI. To be specific, we regress log-values of FDI net inflows on government reputation of the previous year while controlling for FDI net inflows and real GDP of the previous year, real GDP growth rate, gross fixed capital formation growth rate, capital control index, and exchange rate risk score. We also employ an alternative measure of reputation by standardizing the countries' risk scores within each year so that it reflects how risky a country is relative to the rest of the world. Regression results are summarized in Table 3. Table 3 shows that there are less FDI net inflows into countries that were riskier in the previous year. Regressions (3) and (4) provide that such relationship holds when we control for capital controls and exchange rate risk of each country in that year. Multinational firms would invest less in a country with worse reputation as the expected investment return decreases.

Lastly, we validate our hypotheses on profit-shifting. We find a negative relationship between multinational firms' profit-shifting and country's reputation as in Figure 18. Negative value of profit-shifting means that firms shift profits out from the country to other countries. Figure 18 shows that multinational firms shift more profit out of countries with higher investment risk. This fact might be puzzling at a first glance because firms shift profits instantaneously to avoid paying high corporate taxes in essence, so tax differentials, not government reputation, should be the key determinant of profit-shifting. We

Table 3: Regression of log FDI Net Inflows

	(1)	(2)	(3)	(4)
Risk_{t-1}	-0.0371**		-0.0519**	
	(0.0142)		(0.0196)	
Standardized Risk_{t-1}		-0.0760**		-0.0964**
		(0.0285)		(0.0438)
Capital Control_t			-0.0397	-0.0389
			(0.0920)	(0.0919)
Exchange Rate Risk_t			-0.0081	-0.0023
			(0.0202)	(0.0317)
$\log \text{FDI}_{t-1}$	0.4356***	0.4369***	0.3658***	0.3674***
	(0.0472)	(0.0471)	(0.0407)	(0.0407)
$\log \text{GDP}_{t-1}$			0.3340	0.3598
			(0.2424)	(0.2456)
ΔGDP_t			0.0300***	0.0301***
			(0.0047)	(0.0048)
ΔI_t			0.0045***	0.0045***
			(0.0013)	(0.0013)
R^2	0.8789	0.8789	0.8714	0.8712
N	137	137	119	119

Note: Standard errors are clustered by country and year. ** and *** denote significance at 95% and 99% levels, respectively.

attribute this to higher statutory tax rates in riskier countries in Table 2, consistent with what our model implies.

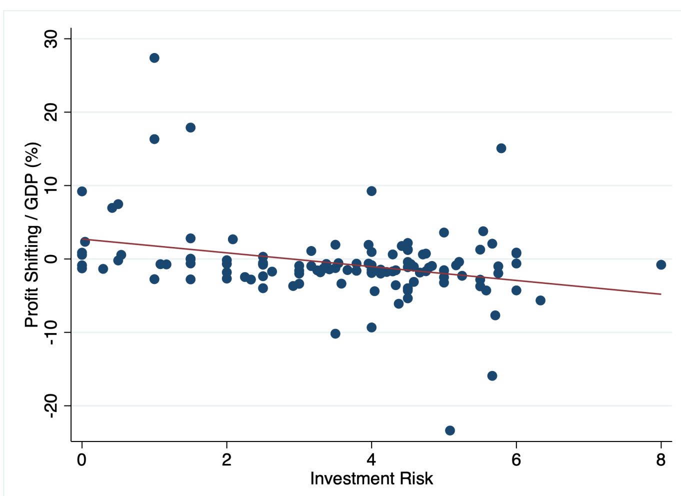


Figure 18: Government Reputation and Profit-Shifting / GDP (%)

Negative relationship holds when we control for capital control index, exchange rate risk, real GDP growth rate, manufacturing share of GDP, and growth rate of FDI as a fraction of GDP. The regression results in Table 4 show that investment risk induces firms to shift more profits outside contemporaneously.[19]

Table 4: Regression of Profit-shifting/GDP

	(1)	(2)	(3)	(4)
$Risk_t$	-0.9844***	-0.9288**	-0.8110***	-0.7402**
	(0.3453)	(0.4048)	(0.2856)	(0.3481)
Capital $Control_t$	-2.2289	-2.1167	-1.3246	-1.1759
	(1.4297)	(1.5010)	(1.2701)	(1.3273)
Exchange Rate $Risk_t$		-0.1261		-0.1532
		(0.3889)		(0.4011)
ΔGDP_t	0.0806	0.0664	0.0512	0.0347
	(0.1531)	(0.1835)	(0.1537)	(0.1870)
Manufacturing Share of GDP_t	0.0511	0.0432	0.0843	0.0748
	(0.1076)	(0.1169)	(0.0933)	(0.1037)
$\Delta FDI_t/GDP_t$			-0.1376***	-0.1384***
			(0.0514)	(0.0519)
R^2	0.1248	0.1198	0.2398	0.2367
N	116	115	116	115

Note: Standard errors are robust to heteroskedasticity. ** and *** denote significance at 95% and 99% levels, respectively.

We also find that effective tax rates are higher in countries with worse reputation, which implies more realizations of impediments to business activities in those countries. Table 5 summarizes regression results of median effective tax rates on accrued corporate income on the investment risk and other country characteristics. We consistently find higher effective tax rates in riskier countries with low reputation. Riskier countries have higher effective tax rates even when we control for the statutory tax rate in regressions (3) and (4). This implies that there are additional tax-related costs to business activities other than statutory taxes in these countries.

Since only a cross-section of data for one year is available for the profit-shifting data and the risk score is discrete, the empirical trend present here might have been affected by outliers in the data. Hence, we check the validity of these observations documented here by employing a different proxy of the degree of government's time inconsistency in terms

[19]Regressing on government reputation of the previous year does not qualitatively affect the results, but we use reputation of the current year because profit-shifting is an instantaneous activity that does not necessarily depend on government's past reputation.

Table 5: Regression of Median Effective Tax Rate

	(1)	(2)	(3)	(4)
Risk_t	2.6441***	2.4480*	2.0262**	2.4658**
	(0.9351)	(1.2400)	(0.8520)	(1.1971)
Capital Control_t	5.5904**	4.5777*	2.1303	1.0946
	(2.7176)	(2.6248)	(2.7795)	(3.0208)
ΔGDP_t	-1.2017		-1.1682	
	(0.8096)		(0.7703)	
$\log\text{GDP}_t$		-1.1445		-0.1746
		(1.1219)		(1.0873)
ΔI_t		-0.0951		-0.0859
		(0.1338)		(0.1190)
$\text{Statutory Tax Rate}_t$			0.7664***	0.7429***
			(0.1511)	(0.1793)
R^2	0.1271	0.1091	0.2159	0.1860
N	115	103	115	103

Note: Standard errors are robust to heteroskedasticity. *, **, and *** denote significance at 90%, 95%, and 99% levels, respectively.

of taxation in Appendix. To be specific, we employ the Government Effectiveness Index provided by the World Bank Development Indicators database which captures the degree of government's commitment associated with policy for robustness check. By plotting it with the variables of interest in this section, we confirm a similar relationship holds between government reputation, statutory tax rates, FDI net inflows, and profit-shifting in Appendix C.

7 Conclusion

This paper studies the relationship between government reputation and optimal corporate tax rate through a lens of a Bayesian game with two types of government, the commitment type and the opportunistic type, which differ in terms of their commitment to the corporate tax rate. Our model adds government reputation and firms' profit-shifting choice to a simple model of capital taxation studied by Chari et al. (1988). While reputation has counteracting effects on optimal tax rate, we show that higher reputation significantly amplifies tax distortion on investment when we introduce profit-shifting in the model. Hence, higher reputation does not increase tax base as much as in the model without profit-shifting and it is optimal for the commitment-type government to impose lower tax rates as its reputation goes up. There is more investment and less profit-shifting with better reputation accordingly when the government is commitment type. We then extend the model to a two-period setting where firms update their belief about the government type in the second period based on the outcome in the first period. Our results show that commitment type optimally induces the opportunistic type's commitment, and the optimal tax rate decreases in reputation and generate higher investment and less profit-shifting. The model predictions are qualitatively consistent with stylized facts in the data.

While this paper focuses on a game between a government and multinational firms, our framework can be further extended to the context of international tax competition. Our model provides that the optimal tax rate increases in foreign tax rate, consistent with Devereux et al. (2008). Incorporating the notion of tax competition into a corporate taxation model with government reputation studied in this paper can be an interesting avenue for future studies.

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Appendix A Proofs and Derivations

A.1 Proof of Lemma 1

First and second derivatives of $\theta(k, \tau)$ with respect to k and τ are

$$\begin{aligned}\frac{\partial\theta}{\partial\tau} &= \frac{1}{\gamma}\frac{-\rho(k)\rho(\bar{k}-k)\left((1-\tau)\rho(\bar{k}-k)+(1-\tau^*)\,\rho(k)\right)+(\tau^*-\tau)\,(\rho(\bar{k}-k))^2\rho(k)}{\left((1-\tau)\rho(\bar{k}-k)+(1-\tau^*)\,\rho(k)\right)^2}\\ &= -\frac{1}{\gamma}\frac{(1-\tau^*)\,\rho(k)\rho(\bar{k}-k)\left(\rho(k)+\rho(\bar{k}-k)\right)}{\left((1-\tau)\rho(\bar{k}-k)+(1-\tau^*)\,\rho(k)\right)^2} \qquad \text{(A1)}\\ \frac{\partial^2\theta}{\partial\tau^2} &= -\frac{1}{\gamma}\frac{(1-\tau^*)\,\rho(k)\rho(\bar{k}-k)\left(\rho(k)+\rho(\bar{k}-k)\right)}{\left((1-\tau)\rho(\bar{k}-k)+(1-\tau^*)\,\rho(k)\right)^3}\times(-\rho(\bar{k}-k))\times(-2)\\ &= -\frac{2}{\gamma}\frac{(1-\tau^*)\,\rho(k)(\rho(\bar{k}-k))^2\left(\rho(k)+\rho(\bar{k}-k)\right)}{\left((1-\tau)\rho(\bar{k}-k)+(1-\tau^*)\,\rho(k)\right)^3}, \qquad \text{(A2)}\end{aligned}$$

where the profits $\rho(k)$ and $\rho(\bar{k}-k)$ are positive. The fractions multiplied to $-1/\gamma$ and $-2/\gamma$ in the two equalities are positive, so both first and second derivatives of $\theta(k, \tau)$ with respect to τ are negative.

A.2 Proof of Proposition 1

We prove this by contradiction. Since $\frac{\partial\Lambda}{\partial\tau^R}$ is non-zero, $\tau^R \neq \tau^O$ always holds. Hence, assume $\tau^O < \tau^R$. Then by Lemma 1, we have that $\Theta^O > \Theta^R$. Also we have that $\frac{\partial K}{\partial\tau^R} < 0$ and $\frac{\partial}{\partial K}\left[\Lambda + \Theta^R - \frac{\gamma\Theta^{R^2}}{2\Lambda}\right] > 0$ by assumption. Then optimal conditions (5) and (9) yield

$$\Lambda + \Theta^R - \frac{\gamma}{2}\frac{\Theta^{R^2}}{\Lambda} + \tau^R\left[1 - \frac{\gamma\Theta^R}{\Lambda}\right]\frac{\partial\Theta}{\partial\tau^R} = -\tau^R\frac{\partial}{\partial K}\left[\Lambda + \Theta^R - \frac{\gamma\Theta^{R^2}}{2\Lambda}\right]\frac{\partial K}{\partial\tau^R} > 0, \qquad \text{(A3)}$$

$$\Lambda + \Theta^O - \frac{\gamma}{2}\frac{\Theta^{O^2}}{\Lambda} + \tau^O\left[1 - \frac{\gamma\Theta^O}{\Lambda}\right]\frac{\partial\Theta}{\partial\tau^O} = 0, \qquad \text{(A4)}$$

$$\therefore \underbrace{\Lambda + \Theta^R - \frac{\gamma}{2}\frac{\Theta^{R^2}}{\Lambda}}_{A_1} + \underbrace{\tau^R\left[1 - \frac{\gamma\Theta^R}{\Lambda}\right]\frac{\partial\Theta}{\partial\tau^R}}_{B_1} > \underbrace{\Lambda + \Theta^O - \frac{\gamma}{2}\frac{\Theta^{O^2}}{\Lambda}}_{A_2} + \underbrace{\tau^O\left[1 - \frac{\gamma\Theta^O}{\Lambda}\right]\frac{\partial\Theta}{\partial\tau^O}}_{B_2}. \qquad \text{(A5)}$$

Also firms' optimal profit-shifting choice (3) yields

$$\frac{\gamma\Theta}{\Lambda} = \frac{(\tau^*-\tau)\rho^*(k)}{(1-\tau)\rho^*(k) + (1-\tau^*)\rho(k)} < 1, \qquad \text{(A6)}$$

$$\frac{\partial}{\partial \tau}\left(\Theta - \frac{\gamma}{2}\frac{\Theta^2}{\Lambda}\right) = \frac{\partial \Theta}{\partial \tau}\left(1 - \frac{\gamma\Theta}{\Lambda}\right) < 0. \tag{A7}$$

Since the level of investment K and profit Λ are the same after all at Stage 3, the inequality above implies

$$A_1 = \Lambda + \Theta^R - \frac{\gamma}{2}\frac{\Theta^{R2}}{\Lambda} < \Lambda + \Theta^O - \frac{\gamma}{2}\frac{\Theta^{O2}}{\Lambda} = A_2. \tag{A8}$$

To compare B_1 and B_2, we get the following. Note that $\frac{\partial\Theta}{\partial\tau^R} < \frac{\partial\Theta}{\partial\tau^O} < 0$ because Θ is a strictly concave function of τ.

$$1 - \frac{\gamma\Theta^R}{\Lambda} > 1 - \frac{\gamma\Theta^O}{\Lambda}, \tag{A9}$$

$$\tau^R\left(1 - \frac{\gamma\Theta^R}{\Lambda}\right) > \tau^O\left(1 - \frac{\gamma\Theta^O}{\Lambda}\right), \tag{A10}$$

$$B_1 = \tau^R\left(1 - \frac{\gamma\Theta^R}{\Lambda}\right)\frac{\partial\Theta}{\partial\tau^R} < \tau^O\left(1 - \frac{\gamma\Theta^O}{\Lambda}\right)\frac{\partial\Theta}{\partial\tau^O} = B_2. \tag{A11}$$

Inequalities (A8) and (A11) imply that $A_1 + B_1 < A_2 + B_2$ which is a contradiction. Hence, it must be that $\tau^O > \tau^R$.

Appendix B Asymmetric Cost of Profit-Shifting

In the baseline static model, we assumed that the cost of profit-shifting is same across countries but this may not be true in reality. Some countries can have more obstacles to profit-shifting in forms of legal or financial institutions than other countries, or can be better at monitoring and regulating profit-shifting activities. In a broader sense, government reputation in the data can be correlated to such differences in terms of institutional quality associated with profit-shifting. Hence, we consider an extension of the model where γ is different from γ^* which governs the cost of profit-shifting at home and foreign, respectively.

However, while γ can reflect the institutional quality of governments on regulating profit-shifting, it can also reflect individual firms' ability to shift profits. As Kallen (2023) points out, the extent to which individual firms can exercise income shifting and transfer pricing can be different depending on the each firms' asset structure or business strategy. Since γ can be thought as being jointly determined by country and firm characteristics, we do not set up γ as a strategic choice of the government.

Imposing $\gamma \neq \gamma^*$ only affects firm's profit-shifting choice at Stage 4. With asymmetric

γ's, firm's optimal profit-shifting problem changes to

$$\max_{-\rho(k)\le\theta\le\rho^*(k)} (1-\tau)\left[\rho(k)+\theta-\frac{\gamma}{2}\frac{\theta^2}{\rho(k)}\right]+(1-\tau^*)\left[\rho^*(k)-\theta-\frac{\gamma^*}{2}\frac{\theta^2}{\rho^*(k)}\right]. \tag{A12}$$

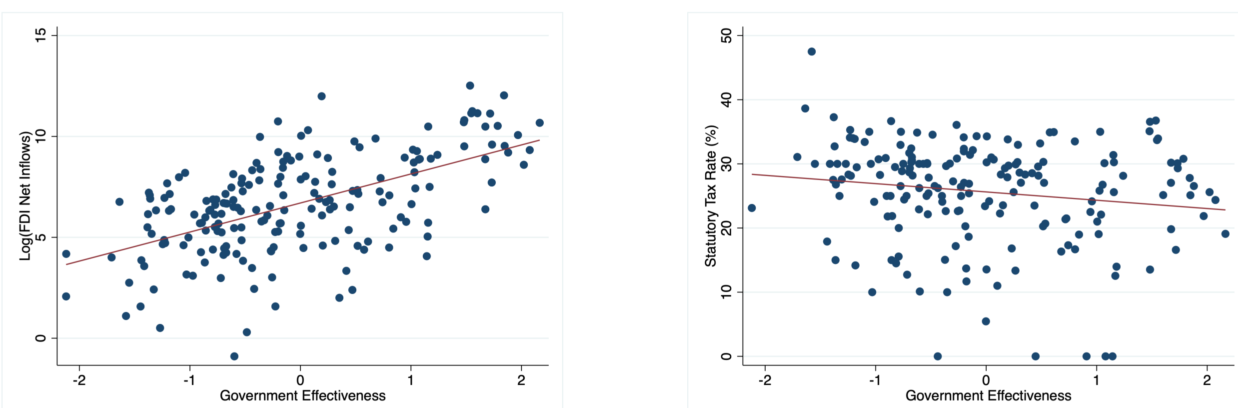
The first-order condition with respect to θ yields

$$\theta=\frac{(\tau^*-\tau)\rho(k)\rho^*(k)}{\gamma(1-\tau)\rho^*(k)+\gamma^*(1-\tau^*)\rho(k)}, \tag{A13}$$

when the constraints on θ do not bind. Profit-shifting θ obtained from equation (A13) is different from the original profit-shifting function (3) in terms of the denominator. Raising γ^* to be higher than the baseline level of γ implies lesser degree of profit-shifting across countries as profit-shifting becomes more costly in one country. While this diminishes the role of profit-shifting of alleviating the tax distortion, the equilibrium outcome is qualitatively similar to the baseline results.

Appendix C Additional Figures

We plot each countries' average FDI net inflows, average statutory corporate tax rate, and average Government Effectiveness index in Figure A1. The index reflects overall quality of governance including the extent to which the government commits to its policy and is also used as a proxy for government's reputation in terms of its commitment by Dovis and Kirpalani (2020). We observe that countries with better governance quality have more FDI net inflows and lower statutory tax rates on average in Figure A1.

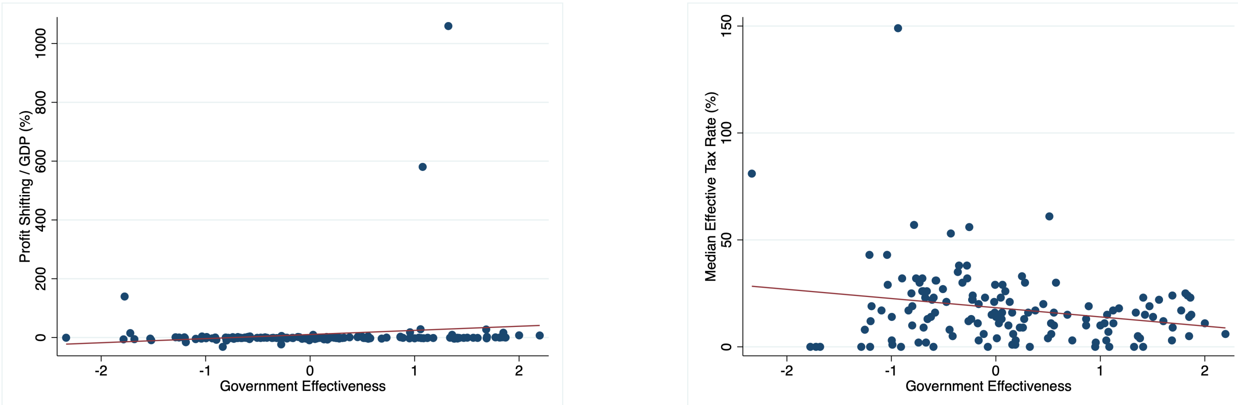


(a) log FDI Net Inflows

(b) Statutory Corporate Tax Rate

Figure A1: Government Effectiveness, FDI Net Inflows, and Statutory Corporate Tax Rate

Plotting government effectiveness with profit-shifting as a fraction of GDP and median effective tax rate, we observe a pattern consistent with what we observe in Section 6.2 in Figure A2. Untabulated results confirm that the relationship holds when we exclude the outliers.

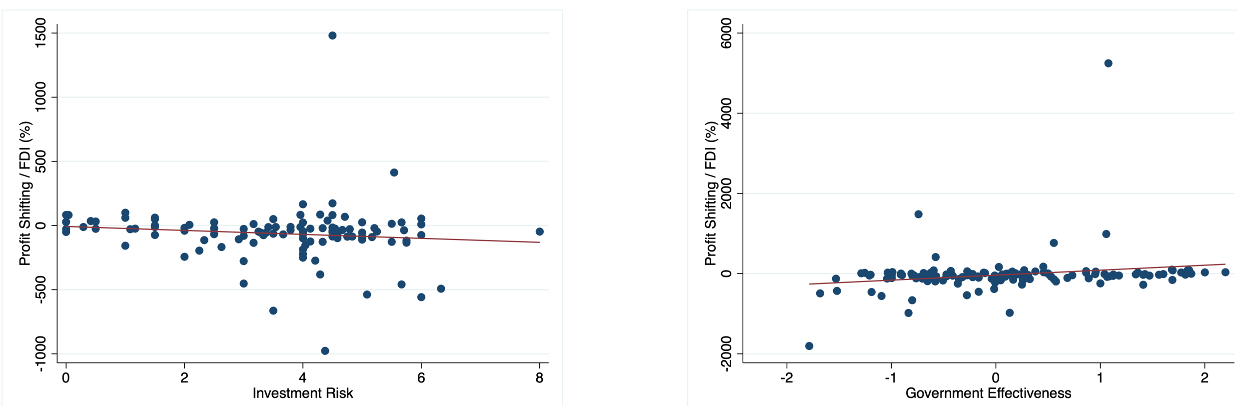


(a) Profit-Shifting / GDP (%)

(b) Median Effective Tax Rate (%)

Figure A2: Government Effectiveness, Profit-Shifting, and Effective Tax Rate

Normalizing profit-shifting estimates by the size of foreign direct investment in that year also yields a similar relationship between profit-shifting and the two risk measures, regardless of whether we exclude the tax haven countries or not.



(a) Investment Risk

(b) Government Effectiveness

Figure A3: Profit-Shifting / FDI (%) and Risk Measures