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## Corporate Taxation, Tax Administration and Financial Development

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## Corporate Taxation, Tax Administration and Financial Development

*Mohammed Mardan*

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# Corporate Taxation, Tax Administration and Financial Development

## Abstract

This paper analyzes corporate tax-related policies and the difference between them in developed and developing countries. I show that the relationship between financial development and corporate income tax rates as well as the tax administrations' effectiveness follows a U-shaped pattern, a discrepancy to the observation that developing countries usually have the weakest administrative structures. However, this observation can be explained under the premise that the tax administration's effectiveness is determined at a later stage, and not simultaneously with the corporate tax rate. Moreover, I show that, under this premise, fighting tax havens increases tax revenues in developed countries, but decreases them in developing countries. Instead, if policies are simultaneously considered, the fight against tax havens will also benefit developing countries.

JEL-Codes: H250, O230, F230.

Keywords: developing countries, profit shifting, tax administration, tax competition, tax haven.

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“...optimal policy requires simultaneous consideration of the design of the tax code and of the administrative structure created to enforce it.”

– McLaren, (2003), p.v

## 1 Introduction

Developing and advanced economies differ in a variety of aspects. In terms of economic structure, for example, developing countries are typically characterized by a large informal sector in which many small-scale firms are operating. The absence of formal record keeping and third party reporting makes it literally impossible for governments in developing countries to tax income generated in the shadow economy. The large informal sector in developing countries is one of the main reasons why advanced economies are able to raise a higher fraction of tax revenue relative to their gross domestic product (GDP).<sup>1</sup> With regard to developing countries, the IMF has therefore encouraged the establishment of large taxpayer units, generally multinational firms, on which scarce tax administration resources should be concentrated (Keen, 2012). Given these circumstances, it is not surprising that, in contrast to developed countries, which to a great extent raise revenue from taxing personal income, corporate income tax revenue is a very important revenue source in developing countries and generally amounts to over 25 per cent of total revenue (Avi-Yonah, 2015).

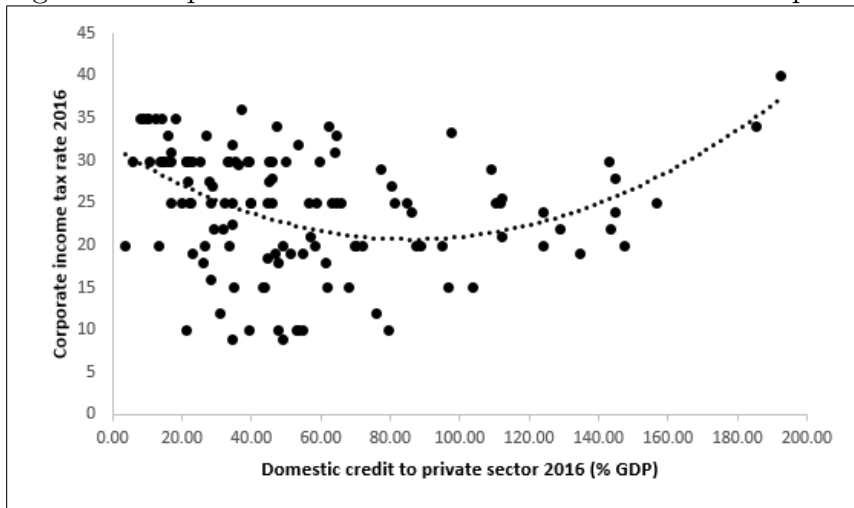
Although developing countries are much more reliant on corporate income tax revenue than developed countries, there is still a great lack of knowledge in understanding the differences between tax policies in developing versus advanced economies. So far, the literature has focused on corporate tax policies and their consequences for developed countries and paid much less attention to these issues in the context of developing countries. A simple explanation could be that the implications of tax policies do not

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<sup>1</sup>While tax revenues relative to GDP have been the highest in high-income countries with roughly 30% between 1980-2009, this share amounts to only 15% for the group of low-income countries, see IMF (2011).

differ qualitatively between developed and developing countries.<sup>2</sup> However, in practice, there are indeed qualitative differences in corporate tax policies across countries, as indicated by Figures 1 and 2.

Figure 1: Corporate income tax rates and financial development



Sources: World Bank World Development Indicators, Ernst & Young Worldwide Corporate Tax Guide (2016) and KPMG’s corporate tax table.

Figure 1 illustrates the relationship between financial development and the level of corporate income tax rates.<sup>3</sup> From Figure 1, it becomes apparent that this relationship is, on average, U-shaped.<sup>4</sup> That is, highly developed countries, on average, set a higher corporate income tax rate than countries with a medium-high level of development, while countries with a medium-low level of development set, on average, a lower

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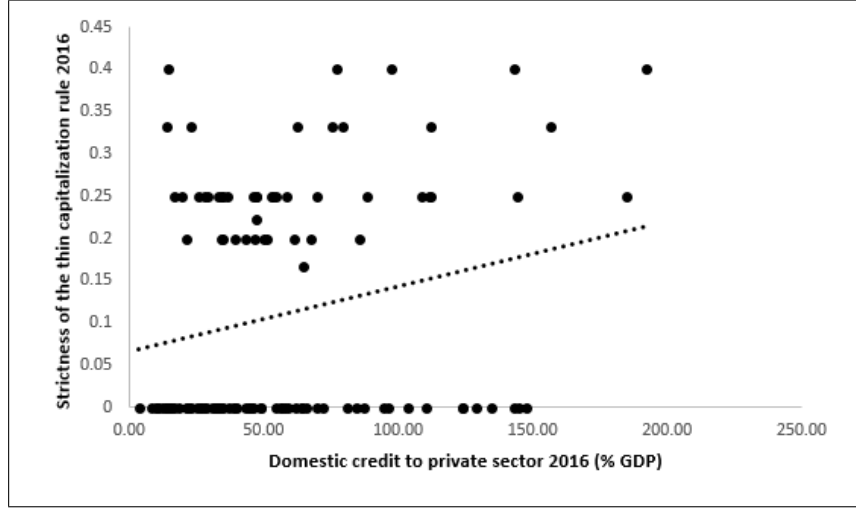
<sup>2</sup>The literature has, however, recognized that the size of the shadow economy plays a major role in, for example, understanding optimal VAT policies in developing countries (Emran and Stiglitz, 2005; Keen, 2008). Moreover, Auriol and Warlters (2005) argue that the size of the shadow economy is actually a choice by governments and related to their taxing incentives.

<sup>3</sup>Figure 1 comprises a total of 126 countries. I excluded countries classified as tax havens by Hines (2005). Financial development is measured by the amount of domestic credit to the private sector (as % of GDP) for the year 2016 provided by the World Bank. A list of all countries can be found in Appendix A.5.

<sup>4</sup>A simple OLS regression shows that both the linear and the quadratic term are significantly different from zero at the 1% level even if I exclude the two outliers with the highest credit-to-GDP ratio (USA and Japan).

corporate income tax rate as compared to the least developed countries.<sup>5</sup>

Figure 2: Effectiveness of the tax administration and financial development



Sources: World Bank World Development Indicators, Ernst & Young Worldwide Corporate Tax Guide (2016).

Figure 2 displays the relationship between financial development and countries' effectiveness to curb the extent of profit shifting by multinational firms.<sup>6</sup> In line with empirical evidence (Fuest et al. 2011; Crivelli et al., 2016; Johannesen et al., 2017),

<sup>5</sup>The predominance of high corporate income tax rates in the least developed countries does not originate from resource-rich countries' incentives to tax the rents from natural resource extraction. From the top 30 countries in terms of income from natural resources (in % of GDP) in my sample, 21 countries have a low financial development (credit-to-GDP ratio < 40%). For 17 out of the 21 countries, the E&Y World Corporate Tax Guide (2016) provides more details on industry specific rates. Only four of these 17 countries do not differentiate corporate income tax rates across industries while all other countries tax companies that are active in extractive industries at different rates. Among these four countries only the Republic of Congo and Mozambique set high rates of 30%, respectively 32 %, while Azerbaijan and Algeria set quite low rates of 20%, respectively 19%.

<sup>6</sup>Figure 2 comprise a total of 115 countries, for which information on the thin capitalization rule is available. Otherwise, the description is equivalent to Figure 1. Countries' strictness of the thin capitalization rule serves as a proxy for the effectiveness of the tax administration and is measured by safe haven debt-to-asset ratios, which reference to 2016. Lower safe haven debt-to-asset ratios imply more lenient rules, where zeros indicate countries without a thin capitalization rule in place. In order to limit the reduction in the sample size due to the switch of some countries to earnings stripping rules, I have referred to the old safe haven debt-to-equity rule.

Figure 2 shows that countries' ability to curb profit shifting increases with the level of development.<sup>7</sup>

Given the high level of corporate taxation in combination with low capabilities to fight profit shifting in the least developed countries, the question arises whether the observed patterns of policies in developing countries are at all optimal. If governments in developing countries seek to maximize corporate tax revenues, instituting a more effective tax administration in order to curb the extent of profit shifting by multinational firms, and hence to better protect the tax base, seems optimal.

Thus, a primary purpose of this paper is to explore whether the observed policies in developing countries are indeed the outcome of policy optimization. To this end, I set up a model of two small, symmetric non-haven countries and a multinational firm which has one operating affiliate in each non-haven country and a profit center in a tax haven. The multinational firm decides on the size of its investments in both affiliates and the amount of profit shifting into the tax haven. The governments in each country maximize tax revenues by non-cooperatively setting the level of the corporate income tax rate and the effectiveness of the tax administration in order to curb the extent of profit shifting into the tax haven.

The key element of the model is a resource constraint of the multinational firm that restricts the amount of capital it can allocate to its operating affiliates. The resource constraint originates from a country's level of financial development, which determines the amount of capital the multinational firm can raise from national credit markets, and is tighter, the lower the country's stage of development. Empirical evidence suggests that financing frictions also play an important role for multinational firms, which implies that they shift scarce resources to affiliates in countries with a weak financial development (Egger et al., 2014). Generally, however, the use of internal resources can only partially compensate the lack of external finance in countries with a weak financial development (Desai et al., 2004). In this paper, I argue that (financial) development

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<sup>7</sup>A simple OLS regression shows that the positive relationship is significant at the 5% level. This relationship remains intact if I instead use the broader measure of government effectiveness provided by the World Bank as a proxy for the effectiveness of the tax administration.



is the relevant determinant in explaining the different patterns displayed in Figures 1 and 2.

I show that for governments of developed (developing) countries, it is optimal to set a higher corporate income tax rate and to have a more effective tax administration as compared to governments of countries with a relatively lower (higher) level of development when policies are simultaneously optimized. The reason is that for developed countries tax base effects are much more relevant while for developing countries base elasticity effects are dominant. Thus, an improvement in financial development for developed countries increases the tax base through higher investments. This implies a higher taxing incentive and thus an increase in the tax rate and in the effectiveness of the tax administration. In contrast, because base elasticity effects dominate in developing countries, an improvement in financial development will lead to lower tax rates and a weaker tax administration due to the strong competition between the countries for additional investments.

Hence, the model shows that the U-shaped relationship between the setting of corporate income tax rates and financial development is not coincidental, but emerges from countries' optimal policies given their stage of financial development. However, and in contrast to the predictions of the model, Figure 2 shows that tax administrations in developing countries are the weakest, raising the question of why this is the case. I show that if the effectiveness of the tax administration is determined at a later stage, and not simultaneously with the corporate tax rate, it is indeed the case that the effectiveness of the tax administration increases monotonically with financial development as depicted in Figure 2. Importantly, the U-shaped pattern between corporate income tax rates and development remains unaffected. The model therefore suggests that the weak tax administrative structures in developing countries cannot be solved by increasing the resources of the tax administration alone, but necessarily depend on governments following a more holistic approach, i.e., the simultaneous consideration of reforms to tax policy and administration, as recently suggested by the International Monetary Fund, the Organisation for Economic Co-operation and Development, the United Nations and the World Bank (IMF, OECD, UN and World Bank, 2016).

Finally, I analyze whether a fight against tax havens, such as the one started by the OECD's Harmful Tax Practices Initiative, affects tax revenues in developed and developing countries differently. I show that a fight against tax havens intended to reduce multinational firms' use of tax avoidance opportunities increases tax revenues in developed countries, because reduced profit shifting increases the tax base. In contrast, tax revenues of developing countries will decrease if the effectiveness of the tax administration is determined at a later stage, as the reduction in MNEs' shifted profits to the tax haven increases tax competition between non-haven countries. The results suggest that, although base erosion and profit shifting are a global concern, and even though the OECD's initiative may have been well-intentioned, the implications of base erosion and profit shifting concerns can be very diverse for differently developed countries. However, if governments of developing countries follow a more holistic approach, the fight against tax havens will also benefit them and thus eliminate the conflict of interest between developed and developing countries.

The remainder of the paper is organized as follows. Section 2 embeds the paper into the literature. In section 3, I set up the basic model to analyze optimal firm and government behavior. Then, in section 4, I analyze optimal tax policies for countries in different stages of development, while section 5 investigates the implications of fighting tax havens. Finally, in section 6, I conclude.

## 2 Related literature

From a general perspective, my study relates to the literature of taxation and development. Important contributions have been made in highlighting the differences in tax practices among diversely developed countries.<sup>8</sup> As far as I am aware, there are only a few contributions with a specific focus on corporate taxation in an international con-

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<sup>8</sup>For a theoretical analysis that rationalizes differences in tax policies between developed and developing countries, see Gordon and Li (2009). For more general discussions, see Tanzi and Zee (2000) as well as Besley and Persson (2013).

text.<sup>9</sup> Gresik et al. (2015) show that developing countries need to be lenient in their thin capitalization rules in order to attract foreign direct investment, but foreign direct investment might lower welfare due to the enormous profit shifting opportunities of multinational firms. Mardan (2017) shows that governments in developing countries set, on average, more generous thin capitalization rules to compensate firms for restricted access to external finance despite increased opportunities of profit shifting. Finally, Mardan and Stimmelmayer (2018) analyze the relationship between corporate income tax rates and country risk across countries with different levels of development. The present paper differs from these studies by highlighting the interaction between corporate tax rate setting and the role of the tax administration in optimal tax policy. Second, this paper relates to the literature on tax administration<sup>10</sup>. Mostly, the standard economic approach to taxation ignores administrative issues. In the rare cases in which tax administration plays a more central role, the analysis usually centers around individual avoidance and evasion.<sup>11</sup> However, I am not aware of any study in the context of corporate taxation dealing with the question of how governments should institute their tax administrative capacities in response to multinational firms' profit shifting activities. While Bird (1992) summarizes three essential ingredients for an effective tax administration, i.e. political will to implement the tax system effectively, a clear goal-setting strategy, and adequate resources for the tax administration, my analysis contributes to this discussion by showing that the simultaneous consideration of tax policies is an overarching element in the context of corporate taxation.

Finally, my study relates to the literature which deals with the question of whether tax havens are beneficial or not for non-haven countries. While there is a continuing concern among policy makers that multinational firms' tax haven operations have a detrimental effect on non-haven countries' welfare because they erode the tax base (Slemrod and

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<sup>9</sup>For a more general overview of base erosion and profit shifting in developing countries, see Fuest and Riedel (2013).

<sup>10</sup>See Bird (2014) for a discussion of tax policy design and the relation to administration.

<sup>11</sup>See, Slemrod and Yitzhaki (2002) for an overview and Keen and Slemrod (2017) for a recent contribution.

Wilson, 2009; Johannesen, 2012), there is also the alternative view that tax havens are beneficial because they allow governments to effectively tax discriminate between differently mobile firms (Hong and Smart, 2010), or reduce tax competition between non-haven countries (Johannesen, 2011).<sup>12</sup> My paper contributes to this literature by highlighting the importance of a country’s level of development for whether tax havens are beneficial or not.

## 3 The Model

### 3.1 The basic framework

I consider a one-period model of two small non-haven countries, labeled  $a$ ,  $b$ , which levy corporate income taxes  $t_i, i \in \{a, b\}$ , and a tax haven levying a tax rate  $t_0$ . Corporate income taxes are modeled as proportional taxes on profits and are imposed by the source country of the investment.<sup>13</sup> I assume that countries  $a$  and  $b$  are symmetric and determine their tax rates endogenously, whereas the tax rate of the tax haven country  $t_0$  is exogenously given. There is one representative multinational enterprise (MNE) with operating affiliates in countries  $a$  and  $b$  and a profit center in country 0.<sup>14</sup> Each operating affiliate produces a homogeneous good and sells it at the world market at

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<sup>12</sup>For a critical summary of these views, see Dharmapala (2008). See also Dharmapala and Hines (2009) for an analysis of which countries become tax havens.

<sup>13</sup>The source principle of taxation, where the profits of an affiliate are tax-exempt in the country of the parent firm, is followed by the majority of OECD countries, including the U.S. since 2018.

<sup>14</sup>In my analysis, I abstract from purely national firms. A justification for this assumption is that in developing countries the bulk of value added is produced by many small and a few large firms, a phenomenon called the "missing middle" (Dharmapala et al., 2011). Because small firms are usually exempt from taxation, the lion share of corporate income tax revenues comes from large, generally multinational, firms. This is the case even in developed countries where a larger fraction of value added is produced by medium-sized firms. Moreover, recent empirical evidence suggests that most informal firms will not formalize unless forced to do so (de Andrade et al., 2016). One explanation is that formal and informal firms operate in different markets and going formal at some point in time is usually not a widespread strategy among informal firms (La Porta and Shleifer, 2014).

a price normalized to one. The good is produced according to the technology  $f(k_i)$ , with positive but decreasing returns to investment, i.e.  $f'(k_i) > 0 > f''(k_i)$ , where  $k_i$  is capital investment in country  $i$ . Moreover, for tractability  $f'''(k_i) = 0$ . Decreasing returns to scale in production imply the existence of a fixed factor, that is a firm-specific asset which is related to, e.g., a patent, that gives rise to positive pure profits.

I assume capital  $k_i$  to be the only production input. The MNE raises capital at an exogenous interest rate  $r$  from national credit markets, but the total amount of capital the MNE can raise depends on the financial development of the countries. I assume that the total amount of capital the MNE can raise is insufficient to ensure that the marginal return on investment equates the marginal costs in the optimum. By how much operating affiliates' marginal return on investment exceeds the marginal cost, i.e. how severe affiliates' finance constraint is, depends on the financial development of the countries.

The assumption of restricted finance is in line with empirical evidence showing that credit market frictions also play an important role for affiliates of MNEs located in countries with a weak financial development. While it is true that MNEs have better opportunities to overcome adverse conditions in the local credit market through the use of intra-group loans (Gopalan et al., 2007), these resources are usually not sufficient to compensate for the lack of external funds and, in turn, to meet the financial needs (Desai et al., 2004). This financing gap implies that internal resources are scarce and allocated to where they generate the highest return (Egger et al., 2014). Due to the fact that MNEs cannot fully compensate the lack of external finance with internal loans, the MNE's resource constraint is given by  $k_i + k_j = \bar{k}$ ,<sup>15</sup> where  $\bar{k}$  is the MNE's total amount of capital and determined by the financial development of the countries.<sup>16</sup>

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<sup>15</sup>This modeling is a reduced form of a standard moral hazard problem in which an agent (or a manager) chooses an unobservable effort level which also influences the success probability of an investment and external lenders restrict their funds to incentivize the manager. A moral-hazard based relationship between the capital market and the financial development can be found in Holmstrom and Tirole (1997) and Aghion et al. (1999).

<sup>16</sup>Strictly speaking, the resource constraint reads  $k_i + k_j = \bar{k}_i + \bar{k}_j$  since the MNE raises funds from national credit markets. However, because in a symmetric equilibrium  $\bar{k}_i = \bar{k}_j = \bar{k}$ , I immediately use

Additionally, the MNE may shift a fraction  $\alpha_i \in [0, 1]$  of an operating affiliate's profits, e.g. via transfer pricing, to its profit center located in the tax haven, country 0. Profit shifting is associated with a cost defined as  $C = \mu l_i \frac{(\alpha_i)^2}{2} \phi_i$ , with  $\mu > 0$ , which captures that a given absolute amount of shifted profits is easier to conceal from the tax administration when the underlying profit tax base,  $\phi_i$ , is larger. Concealment costs increase over-proportionally with the share of profits  $\alpha_i$  the MNE shifts to the tax haven. Moreover, a more effective tax administration,  $l_i$ , makes it more costly for the MNE to shift profits abroad. Finally, the concealment costs also imply that if the MNE does not shift profits ( $\alpha_i = 0$ ) or the government does not control profit shifting, ( $l_i = 0$ ), (marginal) costs of profit shifting are zero.

### 3.2 The multinational firm

Economic profits of the MNE in country  $i$  are given by the income from selling output less the cost of capital

$$\pi_i = f(k_i) - rk_i \equiv \phi_i. \quad (1)$$

I assume that capital costs are fully tax-deductible.<sup>17</sup> Because the MNE can shift a fraction of each operating affiliate's profits to the tax haven, total after-tax profits of the MNE read

$$\Pi = \psi_i \phi_i + \psi_j \phi_j. \quad (2)$$

where  $\psi_i = \left[ (1 - t_i)(1 - \alpha_i) + (1 - t_0)\alpha_i - \mu l_i \frac{(\alpha_i)^2}{2} \right]$ . The MNE maximizes its profits by choosing its optimal investment levels and the optimal share of shifted profits. Since the MNE's total capital is fixed to  $\bar{k}$ , capital is allocated to each operating affiliate such that in equilibrium the net returns are equalized across the two affiliates. Optimal

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this notational shortcut (and neglect the scale parameter 2) for convenience.

<sup>17</sup>My results are qualitatively unaffected if only a fraction of capital costs can be deducted from the tax base. The reason is, as will become clear below, that the MNE equates the marginal net return of its affiliates' investments. In a symmetric equilibrium the size of the tax-deductions will not matter for the optimal investment levels when the marginal benefit exceeds the marginal costs.

capital investments are thus given by

$$\psi_i[f'(k_i) - r] = \psi_j[f'(k_j) - r] > 0. \quad (3)$$

From the first-order condition of capital investments, I can derive the effects of tax rates and the tax administrations' effectiveness on optimal capital investment in countries  $i$  and  $j$ . Totally differentiating equation (3) yields

$$\begin{aligned} \frac{\partial k_i}{\partial t_i} &= \frac{(1 - \alpha_i)[f'(k_i) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} < 0, & \frac{\partial k_i}{\partial t_j} &= -\frac{(1 - \alpha_j)[f'(k_j) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} > 0, \\ \frac{\partial k_i}{\partial l_i} &= \frac{\mu \frac{(\alpha_i)^2}{2} [f'(k_i) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} < 0, & \frac{\partial k_i}{\partial l_j} &= -\frac{\mu \frac{(\alpha_j)^2}{2} [f'(k_j) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} > 0. \end{aligned} \quad (4)$$

A higher tax rate in one country reduces the incentives to invest in this country and leads to an outflow of capital to the other country. However, the tax elasticity of capital depends on the MNE's ability to shift profits. The larger the amount of profits the MNE can shift into the tax haven, the lower the tax elasticity of capital. This is in line with empirical evidence by, for example, Overesch (2009) and Büttner et al. (2018) who find that profit shifting lowers the tax sensitivity of real investment. Second, a more effective tax administration increases the costs of shifting profits, which leads to an outflow of capital because a higher fraction of the return on the investment is taxed at the higher tax rate of the host country instead of the tax haven's rate.

The optimal share of profits shifted by affiliate  $i$  is determined by

$$\alpha_i = \frac{t_i - t_0}{\mu l_i}, \quad (5)$$

which states that the MNE shifts profits from its operating affiliate in country  $i$  to its profit center in the tax haven until the marginal tax savings are equal to the marginal concealment costs. From equation (5), I can derive the effects of changes in the tax rates and the tax administrations' effectiveness on  $\alpha_i$ , which are given by

$$\begin{aligned} \frac{\partial \alpha_i}{\partial t_i} &= \frac{1}{\mu l_i} > 0, & \frac{\partial \alpha_i}{\partial l_i} &= -\frac{t_i - t_0}{\mu (l_i)^2} = -\frac{\alpha_i}{l_i} < 0, \\ \frac{\partial \alpha_i}{\partial t_j} &= 0, & \frac{\partial \alpha_i}{\partial l_j} &= 0. \end{aligned} \quad (6)$$

A higher tax rate in the host country increases the incentives of the MNE to shift profits from its operating affiliate to the tax haven. Instead, a more effective tax administration reduces profit shifting because the associated costs go up. Moreover, the foreign tax rate  $t_j$  and the effectiveness of the foreign tax administration  $l_j$  do not affect the MNE's profit shifting incentives related to affiliate  $i$ .

### 3.3 Governments

Turning to the governments, I assume their objective to be tax revenue maximization, an assumption frequently made in the international tax literature. However, in the context of my analysis, two additional reasons can be brought forward to justify this assumption. First, tax revenue considerations play an important role in developing countries which usually raise a large fraction of their revenues from the taxation of MNEs. Also for developed countries, tax revenue considerations are relevant not only because of severe revenue shortfalls due to profit shifting, but also due to equality-of-treatment concerns. Together these concerns exert strong political as well as practical pressures on governments to increase revenues from this source.<sup>18</sup> Second, tax revenue maximization abstracts from other channels that affect policies differently in developed and developing countries. For example, the extent to which policies are affected by the opportunity of corruption, lobbying or favorable policies toward a ruling elite may very well culminate in welfare functions differing between developed and developing countries. I show that tax policies as illustrated by Figures 1 and 2 can be explained even in the absence of such differences.

Tax revenues of country  $i$  are given by

$$T_i = t_i(1 - \alpha_i)\phi_i - \kappa(l_i), \quad (7)$$

where  $\kappa(l_i)$  is the cost of increasing the effectiveness of the tax administration and is assumed to be convex, i.e.  $\kappa'(l_i), \kappa''(l_i) > 0$ . I further assume that  $\kappa'(0) = 0$ , which

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<sup>18</sup>See, for example, the motivation for the OECD's base erosion and profit shifting (BEPS) initiative (OECD, 2013, Chapters 1 and 2).



ensures that the government has an incentive to control profit shifting at least to some extent.

Differentiating tax revenues given in equation (7) with respect to  $t_i$  and  $l_i$  implicitly determines the optimal tax rate and the optimal effectiveness of the tax administration, which are respectively given by

$$\frac{\partial T_i}{\partial t_i} = (1 - \alpha_i)\phi_i + t_i \frac{(1 - \alpha_i)^2 [f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} - t_i \frac{\phi_i}{\mu l_i} = 0, \quad (8)$$

$$\frac{\partial T_i}{\partial l_i} = t_i \left[ \frac{(1 - \alpha_i) [f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2}}{\psi_i f''(k_i) + \psi_j f''(k_j)} + \phi_i \frac{\alpha_i}{l_i} \right] - \kappa'(l_i) = 0. \quad (9)$$

The first-order condition for the optimal tax rate (8) states that raising the statutory tax rate  $t_i$  increases tax revenues due to increased tax payments by the local affiliate of the MNE (first term). However, a higher tax rate also reduces tax revenues because of lower investments by the local affiliate (second term) and more profit shifting to the tax haven (third term). Evaluating equation (8) at  $t_i = 0$  shows that the second and third terms vanish and the derivation is positive at  $t_i = 0$ .

The first-order condition for the optimal effectiveness of the tax administration (9) states that increasing the tax administration's effectiveness reduces tax revenues because it decreases the local affiliate's capital investment due to the lower net return on capital (first term). However, it also increases tax revenues due to the reduction in profit shifting (second term). Evaluating condition (9) at  $l_i = 0$  shows that the first term vanishes because  $\alpha_i$  approaches 1. Since the costs of increasing the effectiveness of the tax administration are negligible for  $l_i = 0$ , i.e.  $\kappa'(0) = 0$ , the first-order condition is positive at  $l_i = 0$ .

The previous analysis shows that governments have an incentive to limit the amount of profit shifting by the MNE in order to tax the income generated through production. However, the extent of profit shifting control and corporate taxation may vary with the countries' level of financial development. I analyze this question in the next section.

## 4 Optimal tax policies and financial development

In this section, I analyze how a change in countries' financial development affects optimal corporate income tax rates and the effectiveness of the tax administrations. The purpose of this exercise is to evaluate whether optimal tax policies differ between developed and developing countries.<sup>19</sup> Totally differentiating the first-order conditions for  $t_i$  and  $l_i$  leads to

$$\begin{bmatrix} \theta_1 & \theta_2 \\ \theta_3 & \theta_4 \end{bmatrix} \begin{bmatrix} dt_i \\ dl_i \end{bmatrix} = \begin{bmatrix} -\theta_5 \\ -\theta_6 \end{bmatrix} d\bar{k}, \quad \text{where} \quad (10)$$

$$\begin{aligned} \theta_1 &= \frac{\partial^2 T_i}{\partial (t_i)^2} < 0, & \theta_2 &= \frac{\partial^2 T_i}{\partial t_i \partial l_i} = \frac{\partial^2 T_i}{\partial l_i \partial t_i} = \theta_3, \\ \theta_4 &= \frac{\partial^2 T_i}{\partial (l_i)^2} < 0, & \theta_5 &= \frac{\partial^2 T_i}{\partial t_i \partial \bar{k}} > 0, & \theta_6 &= \frac{\partial^2 T_i}{\partial l_i \partial \bar{k}} > 0, \end{aligned} \quad (11)$$

where Appendix A.2 provides details on the derivation of the  $\theta$ -terms. Applying Cramer's rule to the equation system given in (10) yields

$$\frac{dt_i}{d\bar{k}} = \frac{\theta_2 \theta_6 - \theta_4 \theta_5}{|A|}, \quad \frac{dl_i}{d\bar{k}} = \frac{\theta_2 \theta_5 - \theta_1 \theta_6}{|A|}, \quad (12)$$

where  $|A| = \theta_1 \theta_4 - (\theta_2)^2 > 0$  to obtain a maximum. In general, the effect of an improvement in development, that is an increase in  $\bar{k}$ , on the corporate income tax rate and the effectiveness of the tax administration is ambiguous because the sign of  $\theta_2$  is undetermined.

To draw inferences about the effects given in (12), I make the following distinction between developed and developing countries: The fact that a lower development is associated with a lower level of  $\bar{k}$  implies that the marginal net return on investment  $f'(k) - r$  in developing countries is high, whereas it is low in developed countries.

Using this differentiation and the symmetry condition, Appendix A.3 shows that the effects of an increase in the level of development depend on the initial level of devel-

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<sup>19</sup>For brevity, I will refer to development or developed (developing) countries instead of financial development or financially developed (developing) countries in what follows.

opment.<sup>20</sup> I begin with the analysis for developed countries. Starting from a high level of  $\bar{k}$ , Appendix A.3 shows that the effects on the corporate income tax rate and the effectiveness of the tax administration are given by

$$\frac{dt_i}{d\bar{k}} > 0, \quad \frac{dl_i}{d\bar{k}} > 0. \quad (13)$$

The comparative static results in (13) state that an improvement in development increases both the optimal tax rate and the tax administration's effectiveness. The intuition for these results originates from the fact that for a high level of  $\bar{k}$ , in developed countries tax base effects are much more relevant than base elasticity effects. This implies that the corporate income tax rate and the effectiveness of the tax administration are complements, i.e. the higher the level of the tax rate, the stronger the incentive for the government to increase the effectiveness of the tax administration, and vice versa ( $\theta_2 > 0$ ). Hence, conditional on a high level of  $\bar{k}$ , an improvement in development results in a higher tax rate and a more effective tax administration.

Next, I analyze how the optimal corporate income tax rate and the optimal effectiveness of the tax administrations are affected if the initial level of development is low (low  $\bar{k}$ ). Appendix A.3 shows that the effects are given by

$$\frac{dt_i}{d\bar{k}} < 0, \quad \frac{dl_i}{d\bar{k}} < 0. \quad (14)$$

Interpreting (14) for a reduction in  $\bar{k}$ , the comparative static results state that both the optimal tax rate and the tax administration's effectiveness increase if development declines.

These results originate from the fact that in developing countries, where the level of  $\bar{k}$  is low, base elasticity effects are much more relevant than tax base effects. Contrary to developed countries, this implies that the corporate income tax rate and the effectiveness of the tax administration become substitutes, i.e. the higher the level of the tax

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<sup>20</sup>The symmetry assumption of the analysis implies that the MNE is either active in two developed or two developing countries, but not in two countries with large differences in development. Such a constellation is supported by the empirical literature which shows that the bulk of multinational firms owns only a small number of foreign affiliates, which are usually located in similarly developed countries, see e.g. Buch et al. (2005).

rate the lower the effectiveness of the tax administration and vice versa, ( $\theta_2 < 0$ ), and via the interplay between policy instruments this indirect channel is dominant.

The reason is that although an increase in  $\bar{k}$  directly increases the incentive to raise the level of either policy instrument, the high sensitivity of capital (cf. eq. (4)) implies a fierce competition for these additional investment units between governments of developing countries. Due to the high value of the marginal unit of investment in developing countries, the latter effect is dominant and an improvement in development results in a decline in both the corporate income tax rate and the tax administration's effectiveness.

Combining the two results, the analysis suggests that by continuity the relationship between tax policies and development is U-shaped. Starting from a low level of development tax rates and tax administrations' effectiveness decrease with development. At some point the relationship reverses, which means that a further boost in development leads to higher tax rates and a more effective tax administrations. I summarize in:

**Proposition 1** *The relationship between financial development and corporate income tax rates as well as the tax administrations' effectiveness follows a U-shaped pattern.*

Proposition 1 gives an explanation of the observed relationship between corporate income tax rates and financial development, as depicted in Figure 1. My results show that this pattern is not coincidental, but emerges from policy optimization of countries given their stage of development. However, Proposition 1 also illustrates that there is a discrepancy between tax administrations' effectiveness as predicted by the model and the observed pattern in practice. Although the model shows that developing countries should institute a more effective tax administration than moderately developed countries, Figure 2 shows that the countries with the lowest development have the lowest administrative capacities.<sup>21</sup>

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<sup>21</sup>This observation is also in line with empirical studies finding that developing countries suffer the most from base erosion and profit shifting (Fuest et al., 2011; Crivelli et al., 2016, Johannesen et al., 2017).

Against this background, the question arises why, in practice, administrative structures remain so weak in developing countries. If we look at the first-order condition for the optimal effectiveness of the tax administration in isolation, equation (9) indeed shows that less developed countries have a lower incentive to institute an effective tax administration. The reason is that a lower level of development implies a lower level of capital investment, and thus a lower pre-shifting base  $\phi$ , but a higher capital elasticity. This means that the magnitude of the negative first effect in (9) is relatively larger in less developed countries, whereas the positive second effect is smaller, which culminates in a lower effectiveness of the tax administration. Hence, this might suggest that the administrative capacity is determined as if it were an isolated issue, i.e. as if the indirect effect via the change in the corporate income tax rate did not matter for the effectiveness of the tax administration.

What remains to be answered is why, in practice, this should be the case. One reason why the indirect effects via the corporate tax rate may be neglected when the effectiveness of the tax administration is determined, is that policy optimization follows a two-stage process. In the first stage, the corporate income tax rate is determined by one agency, say the finance department, taking into account the reaction of the revenue agency or the tax administration, which, in the second stage, determines the intensity of controlling profit shifting, taking the decisions made in the first stage as given.<sup>22</sup>

Indeed, in practice, it is usually the case that any change in the effectiveness of the tax administration due to, for example, new hirings or computerization, are not immediately accompanied by adjustments in the tax rate. Instead, tax rate changes are often part of a more general tax reform that includes several dimensions of the tax system, such as tax administration (for a summary of recent tax reforms, see OECD, 2018). In Norway, for example, the Stoltenberg II government set up an expert committee in March 2013 to assess the corporate tax system in light of international developments. While the commission was to consider, among other things, whether the corporate tax

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<sup>22</sup>Put differently, finance departments maximize tax revenues, whereas tax administrations only maximize the tax base, or, reversely, minimize the extent of profit shifting, given the associated administrative costs.

rate should be reduced due to the international downward trend, any change in the corporate tax rate had to be evaluated by reference to the rest of the tax system. The goal was to make the tax system as simple as possible without dramatically increasing the costs of the tax administration obliging the commission to discuss the administrative consequences.<sup>23</sup> As a specific example, the commission was to examine the possibility of reducing tax avoidance by evaluating a switch to a system, which grants companies deductions for the alternative return on equity (ACE). While the commission considered an ACE system feasible, it eventually recommended keeping the current system for taxing companies due to the additional administrative burden an ACE system would place on the tax administration.<sup>24</sup>

A reason why, specifically, in developing countries the corporate income tax rate is taken as given when the tax administration's effectiveness is determined, is that administrative capacities are often not solely determined by developing countries themselves. In fact, a wide variety of external supporters, such as the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD), the United Nations (UN) and the World Bank as well as bilateral donors such as Germany, Norway, the UK, and the USA, have been summoned by developing countries to help build capacity in their tax administrations.<sup>25</sup> While there is great heterogeneity in the capacity of tax administrations among developing countries, which calls for country-specific strategies, many external supporters are rooted in OECD countries offering advice that usually fits with their own values and priorities and not with those of developing countries (Moore et al., 2015). Moreover, the focus of assistance tends to be only on building tax capacities and improving administrative structures. Thus, although the administrative capacity and the corporate income tax rate are certainly interrelated, there is very often a lack of coordination among reforms to tax policy and administration (IMF, OECD, UN and World Bank, 2016).

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<sup>23</sup>For more details, see NOU 2014:13, Chapter 1.

<sup>24</sup>For more details, see NOU 2014:13, Chapter 5 (available only in Norwegian).

<sup>25</sup>For more details on taxing MNEs via effective transfer pricing rules, see chapter 3 in IMF, OECD, UN and World Bank (2011).

Importantly, even if policies are determined in a two-stage process will the U-shaped relationship between corporate income tax rates and development remain. This is because the effectiveness of the tax administration is not taken as given when the corporate income tax rate is determined.<sup>26</sup> Hence, the previous analysis regarding the effects on the corporate income tax rate still applies. I summarize in:

**Proposition 2** *If policies are determined in a two-stage process, the incentives to increase the tax administration's effectiveness increase with the level of financial development, but the U-shaped pattern of corporate income tax rates and financial development remains unaffected.*

Many developing countries suffer to a greater extent from base erosion and profit shifting than developed countries. In fact, the limited administrative capacity, and hence the lack of expertise to understand and administer complex international tax laws, is a common argument for why MNEs are able to shift substantial profits out of developing countries. To curtail base erosion and profit shifting, a number of developing countries have followed the advice of external supporters and have begun to increase their administrative capacity by raising the number of tax officials (Oguttu, 2016).

However, Proposition 2 highlights that due to the lack of coordination between tax policy and administration, the low capacity of the tax administration in developing countries is an optimal choice. Thus, it might well be the case that developing countries' attempts to improve the capacity of their tax administrations are just specious or undermined by political economy issues between the finance departments and the revenue agencies (IMF, OECD, UN and World Bank, 2016). Providing financial assistance to increase tax administrations' manpower as well as their employees' skills might therefore be wasted money.<sup>27</sup>

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<sup>26</sup>It is worth mentioning that irrespective of whether the indirect effect via the change in the corporate income tax rate is considered for the effectiveness of the tax administration in developed countries, the sign of  $\frac{dl_i}{dk}$  remains the same, because the corporate income tax rate and the effectiveness of the tax administration are complements.

<sup>27</sup>Such a problem has already been documented for the case of foreign aid when money is not spent

Instead, Proposition 1 emphasizes that a necessary condition for implementing a more effective and higher quality tax administration in developing countries, is that tax policy and administration are tightly coordinated. Especially against the background that policies are usually determined in a two stage process, developing countries' request to external supporters to assist them in improving their tax administrations' effectiveness offers a unique opportunity to coordinate all directly tax-relevant agencies, like the finance department and the tax administration. In fact, such a holistic approach has recently been put forward jointly by the IMF, the OECD, the United Nations and the World Bank (see Recommendation 2d in IMF, OECD, UN and World Bank, 2016). As shown in Proposition 1, such a course of action will ultimately result in a more effective and higher quality tax administration.

## 5 The implications of fighting tax havens

In the previous section, I have argued that policies may be determined in a two stage process. If a developing country's low administrative capacity is an optimal decision due to this set up, the fight against tax havens might have different implications for countries in different stages of their financial development.

In the following, I therefore analyze how countries' tax revenues will be affected by an intensified fight against tax havens. I interpret actions which aim to reduce the preferential tax treatment offered by tax havens as a rise in the exogenously given tax rate  $t_0$ .<sup>28</sup> Eventually, such practices imply weaker incentives for the MNE to shift profits to the tax haven. The total effect of an increase in  $t_0$  on tax revenues in country

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on the purpose for which it was intended. This problem has entered the literature as the so-called Samaritan's problem. It occurs when a recipient country of foreign aid has no incentive to implement costly reforms if it expects to receive assistance in any case, see, e.g., Mosley et al. (1995). Even if aid is conditional, countries often have an ex-post incentive to circumvent conditionality, see, for example, Stone (2004).

<sup>28</sup>An intensification of the fight against tax havens could also be interpreted as a rise in the parameter  $\mu$ , which rather than reduce the tax benefit of shifting, will increase the costs of profit shifting. The results are qualitatively the same and are available upon request.



$i$  is given by

$$\frac{dT_i}{dt_0} = \frac{\partial T_i}{\partial t_0} + \frac{\partial T_i}{\partial t_j} \frac{\partial t_j}{\partial t_0} + \frac{\partial T_i}{\partial l_j} \frac{\partial l_j}{\partial t_0}, \quad (15)$$

where the first term in equation (15) is the direct effect of a change in the tax haven's tax rate on country  $i$ 's tax revenues, while the last two terms capture the implications of a change in  $t_0$  for tax competition.

Differentiating equation (7) with respect to  $t_0$ , using the symmetry condition, which implies that  $\frac{\partial k_i}{\partial t_0} = 0$ , delivers the direct effect of an increase in  $t_0$

$$\frac{\partial T_i}{\partial t_0} = \frac{t\phi}{\mu l} > 0. \quad (16)$$

Equation (16) shows that the direct effect is unambiguously positive. The reason is that a higher tax rate in the tax haven implies less profit shifting by the MNE and thus a larger tax base in country  $i$ .

Next, I determine how the fight against tax havens affects tax competition between non-haven countries. To do that, I start by deriving the fiscal externalities country  $j$  exerts on country  $i$ . Differentiating equation (7) with respect to  $t_j$  and  $l_j$  respectively delivers

$$\frac{\partial T_i}{\partial t_j} = t_i(1 - \alpha_i)[f'(k_i) - r] \frac{\partial k_i}{\partial t_j} > 0, \quad (17)$$

$$\frac{\partial T_i}{\partial l_j} = t_i(1 - \alpha_i)[f'(k_i) - r] \frac{\partial k_i}{\partial l_j} > 0. \quad (18)$$

The two externalities are positive and state that an increase both in the corporate income tax rate and in the effectiveness of the tax administration in country  $j$  raises country  $i$ 's tax revenues. The reason is that a higher corporate income tax rate or a more effective tax administration in country  $j$  reduces the net-of-tax return on investment in country  $j$  and thus induces the MNE to reallocate capital from country  $j$  to country  $i$ . The higher investment in country  $i$  increases the tax base and in turn tax revenues. Plugging (16), (17) and (18) into equation (15), using (4), the total effect on tax revenues is given by

$$\frac{dT_i}{dt_0} = \frac{t\phi}{\mu l} - \frac{t(1 - \alpha)[f'(k) - r]^2}{2\psi f''(k)} \left[ (1 - \alpha) \frac{\partial t_j}{\partial t_0} + \mu \frac{\alpha^2}{2} \frac{\partial l_j}{\partial t_0} \right]. \quad (19)$$

Whether the direct effect or the indirect effects determine the sign of equation (19) depends on the level of development. If the level of  $\bar{k}$  is high, the pre-shifting tax base  $\phi$  is large, whereas the rate of return  $[f'(k) - r]$  is low. Hence, for a sufficiently high development, the first term in equation (19), that is, the direct effect, will dominate. Since this term is positive, policies that restrict the use of tax havens result in higher tax revenues for developed countries. I summarize in:

**Proposition 3** *Fighting tax havens increases tax revenues in developed countries.*

What remains to be determined, is how a change in  $t_0$  affects governments' tax revenues in developing countries. As the level of  $\bar{k}$  in developing countries is low, and the marginal return on investment is therefore high, the second term in equation (19), i.e. the effect of a change in  $t_0$  on tax competition, will determine the sign.

To sign the second term in equation (19), I totally differentiate the first-order conditions (8) and (9), which leads to the following system of equations

$$\begin{bmatrix} \theta_1 & \theta_2 \\ \theta_3 & \theta_4 \end{bmatrix} \begin{bmatrix} dt_j \\ dl_j \end{bmatrix} = \begin{bmatrix} -\theta_7 \\ -\theta_8 \end{bmatrix} dt_0, \quad \text{where} \quad (20)$$

$$\theta_7 = \frac{\partial^2 T_j}{\partial t_j \partial t_0}, \quad \theta_8 = \frac{\partial^2 T_j}{\partial l_j \partial t_0}, \quad (21)$$

and  $\theta_1$  to  $\theta_4$  are the same as in (11). Appendix A.4 shows that, under the sufficient condition that  $\alpha$  is not too low, which will be the case if  $\kappa(l)$  is sufficiently convex, an increase in  $t_0$  will lead to a downward adjustment of the corporate income tax rate in country  $j$ , i.e.

$$\frac{dt_j}{dt_0} = \frac{\theta_2 \theta_8 - \theta_4 \theta_7}{|A|} < 0. \quad (22)$$

The reason for the decline in the corporate income tax rate is that an increase in the tax haven's tax rate reduces the benefit of profit shifting and hence leads to less profit shifting, i.e. a lower level of  $\alpha$ . However, a lower level of  $\alpha$  implies a higher tax sensitivity of capital (cf. (4)) and hence fiercer competition for capital between the two non-haven countries.

Based on the insight of Proposition 2, which suggests that administrative capacities are determined in the second stage, where the corporate income tax rate is taken as given, an increase in  $t_0$  when  $\bar{k}$  is low has the following effects on the optimal effectiveness of the tax administration

$$\frac{dl_j}{dt_0} = -\frac{\theta_8}{\theta_4} < 0. \quad (23)$$

That is, fighting tax havens lowers the effectiveness of the tax administration in developing countries. Again, because less profit shifting, i.e. a lower level of  $\alpha$ , implies a higher tax elasticity of capital (cf. (4)), governments counteract by instituting a less effective tax administration, which again allows the MNE to shift more profits in order to moderate the increase in tax competition.

Because tax revenues in developing countries are primarily affected via a change in tax competition and since tax competition becomes fiercer when the fight against tax havens is intensified, policies that restrict the use of tax havens result in decreased tax revenues for developing countries. I summarize in:

**Proposition 4** *If policies are determined in a two-stage process, fighting tax havens decreases tax revenues in developing countries.*

Propositions 3 and 4 can be related to various countries' and supranational organizations' initiatives against tax havens. One of the most prominent initiative is the OECD's Harmful Tax Practices Initiative the aim of which is to increase the costs for a country of offering tax sheltering opportunities (OECD, 1998). Since then, many of the jurisdictions deemed as tax havens have agreed to make commitments to implement the OECD's standards of transparency and exchange of information. The OECD's intention behind the shutting-down of countries' tax haven activities is to curtail the depletion of OECD countries' tax bases by discouraging foreign investors from using preferential tax regimes.

However, the results of Propositions 3 and 4 highlight that whether countries benefit from such a course of action to a great extent depends on their level of development. According to Proposition 3, MNEs' reduced possibilities of shifting their profits to tax havens decreases the erosion of developed countries' tax bases and thus result in higher

tax revenues. Based on this result, it is therefore not surprising that the OECD's initiative has been driven by the interests of developed countries, whereas the interests of non-member countries, especially those of developing countries, are usually not being addressed (Oguttu, 2015). Indeed, Proposition 4 shows that the outcome of a fiercer fight against tax havens can have diametrically opposing tax revenue effects for developing countries, especially when bearing in mind that many of the jurisdictions deemed as tax havens have already started to cooperate. In the light of developing countries' need for resources to foster economic growth, the shortfall in corporate income tax revenues may make them even more dependent on outside financial assistance like development aid.

Finally, I analyze the implications of fighting tax havens when a more holistic approach is followed in developing countries, as recently suggested by the main supranational organizations (see, IMF, OECD, UN and World Bank, 2016). This implies that policies are determined simultaneously in developing countries. The question is how tax revenues will be affected in this case. The only difference from the previous analysis is that the effect on tax competition, precisely the effect of  $t_0$  on  $l_j$ , changes.

Appendix A.4 shows that if the indirect effect via changes in the corporate income tax rate is taken into account, the effect of  $t_0$  on  $l_j$  is given by

$$\frac{dl_j}{dt_0} = \frac{\theta_2\theta_7 - \theta_1\theta_8}{|A|} > 0. \quad (24)$$

The intuition for the increase in  $l_j$  upon an increase in  $t_0$  originates from the fact that because the benefit of shifting profits is smaller, the MNE reduces the amount of shifted profits, i.e.  $\alpha$  decreases. A lower level of  $\alpha$  decreases the sensitivity of capital with respect to the effectiveness of the tax administration, which implies that the cost of raising the effectiveness of the tax administration goes down. This effect is reinforced by the governments' incentive to reduce the tax rate when  $t_0$  increases.<sup>29</sup>

Because the effect of a change in  $t_0$  on tax competition is a priori unclear due to  $t_j$  and  $l_j$  moving in opposite directions, I need to determine the total effect of  $t_0$  on

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<sup>29</sup>This can easily be seen by inspecting the total effect of a change in  $t_0$  on  $\alpha_i$  which is given by  $\frac{d\alpha_i}{dt_0} = -\frac{1}{\mu l_i} + \frac{1}{\mu l_i} \frac{dt_i}{dt_0} - \frac{\alpha_i}{l_i} \frac{dl_i}{dt_0} < 0$ .

tax competition. Appendix A.4 shows that the effect on the effectiveness of the tax administration dominates, meaning that the term in squared brackets in equation (19) is positive. Hence, if governments in developing countries chose a more holistic approach when determining their policies, fighting tax havens would result in an increase in tax revenues. I summarize in:

**Proposition 5** *If policies are determined simultaneously, fighting tax havens increases tax revenues in developing countries.*

Proposition 5 highlights the fact that if a developing country coordinate reforms to tax policy and tax administration, the implications of a fight against tax havens are diametrically different. Although initiatives against tax havens are primarily driven by the interests of developed countries, Proposition 5 illustrates that there would be no conflict of interest between developed and developing countries if developing countries followed a more holistic approach when determining their policies.

## 6 Conclusions

In this paper, I have analyzed a tax competition game between two symmetric non-haven countries, which decide on the level of their corporate income tax rates and the effectiveness of their tax administrations. The aim of the analysis is to shed light on differences in policies across countries of varying stages of development. The key element of the model is a resource constraint of multinational firms that restricts the amount of capital multinationals can allocate among their affiliates. The finance constraint relates to countries' level of financial development, which implies that multinational firms' ability to raise capital is lower, the lower the countries' level of financial development.

I show that the relationship between financial development and optimal policy instruments follows a U-shaped pattern if a country's policy instruments are simultaneously optimized. While this prediction is in line with the observed patterns of corporate income tax setting, the effectiveness of tax administration is instead observed to be

increasing with financial development. However, the observed patterns in both policy instruments can be explained under the premise that administrative capacities are determined in a later stage, where the corporate income tax rate is taken as given, i.e. indirect effects via the corporate income tax rate do not affect the tax administration's effectiveness. Instead, and more fundamentally, a necessary condition for an effective tax administration in developing countries is a more holistic approach, i.e. a coordinated reform of tax policy and tax administration.

Finally, I analyze whether fighting tax havens is beneficial for non-haven countries from a tax revenue perspective. While tax revenues in developed countries increase due to reduced profit shifting opportunities of multinational firms, such a practice will lead to lower tax revenues in developing countries if administrative capacities are determined in a later stage. In this case, fighting tax havens may lead to greater dependence on financial assistance in developing countries. However, if developing countries follow a more holistic approach, the fight against tax havens will also be beneficial for them.

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## A Appendix

### A.1 Comparative statics for capital investments

The first-order condition for the optimal capital investments of the MNE is given by

$$\psi_i[f'(k_i) - r] = \psi_j[f'(k_j) - r]. \quad (\text{A.1})$$

where  $\psi_i = \left[ (1 - t_i)(1 - \alpha_i) + (1 - t_0)\alpha_i - \mu l_i \frac{(\alpha_i)^2}{2} \right]$ . Total differentiation, using the capital constraint  $k_i + k_j = \bar{k}$ , yields

$$\begin{aligned} & \psi_i f''(k_i) dk_i - [f'(k_i) - r] \left[ (1 - \alpha_i) dt_i + \alpha_i dt_0 + \mu \frac{(\alpha_i)^2}{2} dl_i \right] \\ = & -\psi_j f''(k_j) dk_i - [f'(k_j) - r] \left[ (1 - \alpha_j) dt_j + \alpha_j dt_0 + \mu \frac{(\alpha_j)^2}{2} dl_j \right] \\ + & \psi_j f''(k_j) d\bar{k}. \end{aligned} \quad (\text{A.2})$$

Rearranging terms results in

$$\begin{aligned} dk_i = & \frac{(1 - \alpha_i)[f'(k_i) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} dt_i - \frac{(1 - \alpha_j)[f'(k_j) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} dt_j \\ + & \frac{\mu \frac{(\alpha_i)^2}{2} [f'(k_i) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} dl_i - \frac{\mu \frac{(\alpha_j)^2}{2} [f'(k_j) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} dl_j \\ + & \left[ \frac{\alpha_i [f'(k_i) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} - \frac{\alpha_j [f'(k_j) - r]}{\psi_i f''(k_i) + \psi_j f''(k_j)} \right] dt_0 \\ + & \frac{\psi_j f''(k_j)}{\psi_i f''(k_i) + \psi_j f''(k_j)} d\bar{k}. \end{aligned} \quad (\text{A.3})$$

From (A.3) follow the investment responses of the MNE as given in (4).

## A.2 Deriving the $\theta$ -terms

$$\begin{aligned}
\theta_1 &= (1 - \alpha_i)[f'(k_i) - r] \frac{\partial k_i}{\partial t_i} - \phi_i \frac{\partial \alpha_i}{\partial t_i} + \frac{(1 - \alpha_i)^2 [f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} \\
&\quad - t_i \frac{2(1 - \alpha_i)[f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial t_i} + t_i \frac{2(1 - \alpha_i)^2 [f'(k_i) - r] f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial k_i}{\partial t_i} \\
&\quad - t_i \frac{(1 - \alpha_i)^2 [f'(k_i) - r]^2 f''(k_i)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_i}{\partial t_i} - t_i \frac{[f'(k_i) - r]}{\mu l_i} \frac{\partial k_i}{\partial t_i} - \frac{\phi_i}{\mu l_i} \\
\theta_2 &= (1 - \alpha_i)[f'(k_i) - r] \frac{\partial k_i}{\partial l_i} - \phi_i \frac{\partial \alpha_i}{\partial l_i} - t_i \frac{2(1 - \alpha_i)[f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial l_i} \\
&\quad + t_i \frac{2(1 - \alpha_i)^2 [f'(k_i) - r] f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial k_i}{\partial l_i} \\
&\quad - t_i \frac{(1 - \alpha_i)^2 [f'(k_i) - r]^2 f''(k_i)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_i}{\partial l_i} - t_i \frac{[f'(k_i) - r]}{\mu l_i} \frac{\partial k_i}{\partial l_i} + t_i \frac{\phi_i}{\mu (l_i)^2} \\
\theta_3 &= \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2}}{\psi_i f''(k_i) + \psi_j f''(k_j)} + \phi_i \frac{\alpha_i}{l_i} \\
&\quad - t_i \frac{[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2}}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial t_i} + t_i \frac{2(1 - \alpha_i)[f'(k_i) - r] \mu \frac{(\alpha_i)^2}{2} f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial k_i}{\partial t_i} \\
&\quad + t_i \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \alpha_i}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial t_i} - t_i \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2} f''(k_i)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_i}{\partial t_i} \\
&\quad + t_i [f'(k_i) - r] \frac{\partial k_i}{\partial t_i} \frac{\alpha_i}{l_i} + t_i \frac{\phi_i}{l_i} \frac{\partial \alpha_i}{\partial t_i} \\
\theta_4 &= -t_i \frac{\mu \frac{(\alpha_i)^2}{2} [f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial l_i} + t_i \frac{(1 - \alpha_i) \mu \alpha_i [f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial l_i} \\
&\quad + t_i \frac{2(1 - \alpha_i) \mu \frac{(\alpha_i)^2}{2} [f'(k_i) - r] f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial k_i}{\partial l_i} \\
&\quad - t_i \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2} f''(k_i)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_i}{\partial l_i} + t_i [f'(k_i) - r] \frac{\alpha_i}{l_i} \frac{\partial k_i}{\partial l_i} \\
&\quad - t_i \phi_i \frac{\alpha_i}{(l_i)^2} + t_i \phi_i \frac{1}{l_i} \frac{\partial \alpha_i}{\partial l_i} - \kappa''(l_i) \\
\theta_5 &= \left[ (1 - \alpha_i)[f'(k_i) - r] + t_i \frac{2(1 - \alpha_i)^2 [f'(k_i) - r] f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} - t_i \frac{[f'(k_i) - r]}{\mu l_i} \right] \frac{dk_i}{d\bar{k}} \\
\theta_6 &= t_i \left[ \frac{2(1 - \alpha_i)[f'(k_i) - r] \mu \frac{(\alpha_i)^2}{2} f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} + [f'(k_i) - r] \frac{\alpha_i}{l_i} \right] \frac{dk_i}{d\bar{k}} \\
\theta_7 &= (1 - \alpha_i)[f'(k_i) - r] \frac{\partial k_i}{\partial t_0} - \phi_i \frac{\partial \alpha_i}{\partial t_0} - t_i \frac{2(1 - \alpha_i)[f'(k_i) - r]^2}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial t_0} \\
&\quad + t_i \frac{2(1 - \alpha_i)^2 [f'(k_i) - r] f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial k_i}{\partial t_0} - t_i \frac{(1 - \alpha_i)^2 [f'(k_i) - r]^2 f''(k_i)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_i}{\partial t_0} \\
&\quad - t_i \frac{(1 - \alpha_i)^2 [f'(k_i) - r]^2 f''(k_j)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_j}{\partial t_0} - t_i \frac{[f'(k_i) - r]}{\mu l_i} \frac{\partial k_i}{\partial t_0}
\end{aligned}$$

$$\begin{aligned}
\theta_8 = & -t_i \frac{[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2}}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial t_0} + t_i \frac{2(1 - \alpha_i)[f'(k_i) - r] \mu \frac{(\alpha_i)^2}{2} f''(k_i)}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial k_i}{\partial t_0} \\
& + t_i \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \alpha_i}{\psi_i f''(k_i) + \psi_j f''(k_j)} \frac{\partial \alpha_i}{\partial t_0} - t_i \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2} f''(k_i)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_i}{\partial t_0} \\
& - t_i \frac{(1 - \alpha_i)[f'(k_i) - r]^2 \mu \frac{(\alpha_i)^2}{2} f''(k_j)}{[\psi_i f''(k_i) + \psi_j f''(k_j)]^2} \frac{\partial \psi_j}{\partial t_0} + t_i [f'(k_i) - r] \frac{\partial k_i}{\partial t_0} \frac{\alpha_i}{l_i} + t_i \phi_i \frac{1}{l_i} \frac{\partial \alpha_i}{\partial t_0}.
\end{aligned}$$

Using equations (3), (4), (9) and the symmetry condition yields

$$\begin{aligned}
\theta_1 &= \frac{(1 - \alpha)[f'(k) - r]^2}{\psi f''(k)} \left( (1 - \alpha) + \frac{3t(1 - \alpha)^2}{4\psi} - \frac{3t}{2\mu l} \right) - \frac{2\phi}{\mu l} \\
\theta_2 &= \frac{\alpha[f'(k) - r]^2}{\psi f''(k)} \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) + \frac{\phi\alpha}{l} + \frac{t\phi}{\mu l^2} \\
\theta_3 &= \frac{\alpha[f'(k) - r]^2}{\psi f''(k)} \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) + \frac{\phi\alpha}{l} + \frac{t\phi}{\mu l^2} \\
\theta_4 &= \frac{t\mu\alpha^2[f'(k) - r]^2}{2\psi f''(k)} \left( \frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{3(1 - \alpha)\mu\alpha^2}{8\psi} \right) - \frac{2t\alpha\phi}{l^2} - \kappa''(l) \\
\theta_5 &= \frac{[f'(k) - r]}{2} \left[ (1 - \alpha) + \frac{t(1 - \alpha)^2}{\psi} - \frac{t}{\mu l} \right] \\
\theta_6 &= \frac{t\alpha[f'(k) - r]}{2} \left[ \frac{(1 - \alpha)\mu\alpha}{2\psi} + \frac{1}{l} \right] \\
\theta_7 &= \frac{\phi}{\mu l} + \frac{t(1 - \alpha)[f'(k) - r]^2}{\psi f''(k)} \left( \frac{1}{\mu l} + \frac{(1 - \alpha)\alpha}{2\psi} \right) \\
\theta_8 &= \frac{t\alpha[f'(k) - r]^2}{2\psi f''(k)} \left( \frac{\alpha}{2l} - \frac{(1 - \alpha)}{l} + \frac{(1 - \alpha)\mu\alpha^2}{2\psi} \right) - \frac{t\phi}{\mu l^2}.
\end{aligned}$$

$\theta_1$  and  $\theta_4$  are the second-order conditions for  $t_i$ , respectively  $l_i$ , and assumed to be negative to obtain a maximum. A necessary condition for  $\theta_1 < 0$  is that  $(1 - \alpha) + \frac{3t(1 - \alpha)^2}{4\psi} - \frac{3t}{2\mu l} > 0$ . I assume this condition holds throughout the analysis, which implies that  $\theta_5 > 0$ . Similarly, a necessary condition for  $\theta_4 < 0$  is that  $\frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{3(1 - \alpha)\mu\alpha^2}{8\psi} > 0$ . Throughout the analysis, I use the slightly more restrictive condition  $\frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{(1 - \alpha)\mu\alpha^2}{4\psi} > 0$ , which ensures that  $\theta_8 < 0$ .

### A.3 Optimal policies and financial development

In what follows, I derive the effects of a change in  $\bar{k}$  on the optimal level of  $t_i$  and  $l_i$  which are given by

$$\frac{dt_i}{d\bar{k}} = \frac{\theta_2\theta_6 - \theta_4\theta_5}{|A|}, \quad \frac{dl_i}{d\bar{k}} = \frac{\theta_2\theta_5 - \theta_1\theta_6}{|A|}. \quad (\text{A.4})$$

#### Developed countries

From the previous analysis it is clear that  $\theta_5 > 0$  and  $\theta_6 > 0$ . Moreover, because  $\bar{k}$  is large for developed countries, the return on investment  $f'(k) - r$  is low and hence  $\theta_2 > 0$ . Since  $\theta_1 < 0$  and  $\theta_4 < 0$  by assumption, I immediately arrive at  $dt_i/d\bar{k} > 0$  and  $dl_i/d\bar{k} > 0$ .

#### Developing countries

In this part, I will determine the effect of  $\bar{k}$  on  $t_i$  and  $l_i$  when the initial level of  $\bar{k}$  is low and hence the return on investment  $f'(k) - r$  is high. I start with determining the sign of  $dt_i/d\bar{k}$ :

$$\begin{aligned} \theta_2\theta_6 - \theta_4\theta_5 &= \beta \\ &+ \frac{t\alpha[f'(k) - r]}{2} \left[ \frac{(1 - \alpha)\mu\alpha}{2\psi} + \frac{1}{l} \right] \\ &\times \frac{\alpha[f'(k) - r]^2}{\psi f''(k)} \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \\ &- \frac{[f'(k) - r]}{2} \left[ (1 - \alpha) + \frac{t(1 - \alpha)^2}{\psi} - \frac{t}{\mu l} \right] \\ &\times \frac{t\mu\alpha^2[f'(k) - r]^2}{2\psi f''(k)} \left( \frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{3(1 - \alpha)\mu\alpha^2}{8\psi} \right), \end{aligned}$$

where  $\beta$  captures terms with polynomials of  $[f'(k) - r]$  lower than 3. Factoring out  $\frac{\mu}{2}$  from the first bracket in the first line delivers

$$\begin{aligned} \theta_2\theta_6 - \theta_4\theta_5 &= \beta \\ &+ \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left[ \frac{(1 - \alpha)\alpha}{\psi} + \frac{2}{\mu l} \right] \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \\ &- \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left[ (1 - \alpha) + \frac{t(1 - \alpha)^2}{\psi} - \frac{t}{\mu l} \right] \left( \frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{3(1 - \alpha)\mu\alpha^2}{8\psi} \right). \end{aligned}$$

Multiplying the second and third brackets in both lines yields

$$\begin{aligned}
& \theta_2\theta_6 - \theta_4\theta_5 = \beta \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{(1-\alpha)^2\mu\alpha^2}{4\psi} + \frac{t(1-\alpha)^2\alpha}{\psi l} + \frac{3t(1-\alpha)^3\mu\alpha^2}{8\psi^2} - \frac{t(1-\alpha)\alpha^2}{4\psi l} \right) \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{(1-\alpha)\alpha}{2l} + \frac{2t(1-\alpha)}{\mu l^2} + \frac{3t(1-\alpha)^2\alpha}{4\psi l} - \frac{t\alpha}{2\mu l^2} \right) \\
& - \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{(1-\alpha)\alpha}{l} - \frac{(1-\alpha)^2}{l} + \frac{3(1-\alpha)^2\mu\alpha^2}{8\psi} \right) \\
& - \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{t(1-\alpha)^2\alpha}{\psi l} - \frac{t(1-\alpha)^3}{\psi l} + \frac{3t(1-\alpha)^3\mu\alpha^2}{8\psi^2} \right) \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{t\alpha}{\mu l^2} - \frac{t(1-\alpha)}{\mu l^2} + \frac{3t(1-\alpha)\alpha^2}{8\psi l} \right).
\end{aligned}$$

Combining terms delivers

$$\begin{aligned}
& \theta_2\theta_6 - \theta_4\theta_5 = \beta \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{t(1-\alpha)^3}{\psi l} + \frac{(1-\alpha)^2}{l} + \frac{t\alpha}{2\mu l^2} + \frac{t(1-\alpha)\alpha^2}{8\psi l} \right) \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{t(1-\alpha)}{\mu l^2} + \frac{3t(1-\alpha)^2\alpha}{4\psi l} \right) \\
& - \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{(1-\alpha)\alpha}{2l} + \frac{(1-\alpha)^2\mu\alpha^2}{8\psi} \right).
\end{aligned}$$

Because  $\alpha = \frac{t-t_0}{\mu l}$ , the first as well as the second term in the second and third lines can be added yielding

$$\begin{aligned}
& \theta_2\theta_6 - \theta_4\theta_5 = \beta \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{t(1-\alpha)^3}{\psi l} + \frac{(1-\alpha)^2}{l} + \frac{t\alpha}{2\mu l^2} + \frac{t(1-\alpha)\alpha^2}{8\psi l} \right) \\
& + \frac{t\mu\alpha^2[f'(k) - r]^3}{4\psi f''(k)} \left( \frac{t(1-\alpha)}{2\mu l^2} + \frac{t_0(1-\alpha)}{2\mu l^2} + \frac{5t(1-\alpha)^2\alpha}{8\psi l} + \frac{t_0(1-\alpha)^2\alpha}{8\psi l} \right).
\end{aligned}$$

The term  $\beta$  in the first line can be neglected for determining the sign of  $\theta_2\theta_6 - \theta_4\theta_5$ , as it contains lower polynomials of  $[f'(k) - r]$ . Because the remaining terms are all negative, I get that  $\theta_2\theta_6 - \theta_4\theta_5 < 0$  and thus  $\frac{dt_i}{dk} < 0$ .



I proceed with determining the sign of  $dl_i/d\bar{k}$ , which will be determined by the sign of

$$\begin{aligned}
& \theta_2\theta_5 - \theta_1\theta_6 = \gamma \\
& + \frac{[f'(k) - r]}{2} \left[ (1 - \alpha) + \frac{t(1 - \alpha)^2}{\psi} - \frac{t}{\mu l} \right] \\
& \times \frac{\alpha[f'(k) - r]^2}{\psi f''(k)} \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \\
& - \frac{t\alpha[f'(k) - r]}{2} \left[ \frac{(1 - \alpha)\mu\alpha}{2\psi} + \frac{1}{l} \right] \\
& \times \frac{(1 - \alpha)[f'(k) - r]^2}{\psi f''(k)} \left( (1 - \alpha) + \frac{3t(1 - \alpha)^2}{4\psi} - \frac{3t}{2\mu l} \right),
\end{aligned}$$

where  $\gamma$  captures terms with polynomials of  $[f'(k) - r]$  lower than 3. Rearranging terms such that they have the common factor  $\frac{\alpha[f'(k) - r]^3}{2\psi f''(k)}$  yields

$$\begin{aligned}
& \theta_2\theta_5 - \theta_1\theta_6 = \gamma \\
& + \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left[ (1 - \alpha) + \frac{t(1 - \alpha)^2}{\psi} - \frac{t}{\mu l} \right] \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \\
& - \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left[ \frac{t(1 - \alpha)^2\mu\alpha}{2\psi} + \frac{t(1 - \alpha)}{l} \right] \left( (1 - \alpha) + \frac{3t(1 - \alpha)^2}{4\psi} - \frac{3t}{2\mu l} \right).
\end{aligned}$$

Multiplying the second and third brackets in both lines yields

$$\begin{aligned}
& \theta_2\theta_5 - \theta_1\theta_6 = \gamma \\
& + \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{(1 - \alpha)^2\mu\alpha}{4} + \frac{t(1 - \alpha)^2}{l} + \frac{3t(1 - \alpha)^3\mu\alpha}{8\psi} - \frac{t\alpha(1 - \alpha)}{4l} \right) \\
& + \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t(1 - \alpha)^3\mu\alpha}{4\psi} + \frac{t^2(1 - \alpha)^3}{\psi l} + \frac{3t^2(1 - \alpha)^4\mu\alpha}{8\psi^2} - \frac{t^2(1 - \alpha)^2\alpha}{4\psi l} \right) \\
& - \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t(1 - \alpha)\alpha}{4l} + \frac{t^2(1 - \alpha)}{\mu l^2} + \frac{3t^2(1 - \alpha)^2\alpha}{8\psi l} - \frac{t^2\alpha}{4\mu l^2} \right) \\
& - \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t(1 - \alpha)^3\mu\alpha}{2\psi} + \frac{3t^2(1 - \alpha)^4\mu\alpha}{8\psi^2} - \frac{3t^2(1 - \alpha)^2\alpha}{4\psi l} \right) \\
& - \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t(1 - \alpha)^2}{l} + \frac{3t^2(1 - \alpha)^3}{4\psi l} - \frac{3t^2(1 - \alpha)}{2\mu l^2} \right).
\end{aligned}$$

Collecting terms and simplifying leads to

$$\begin{aligned}
\theta_2\theta_5 - \theta_1\theta_6 &= \gamma \\
&+ \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{(1-\alpha)^2\mu\alpha}{4} + \frac{t(1-\alpha)^3\mu\alpha}{8\psi} + \frac{t^2\alpha}{4\mu l^2} + \frac{t^2(1-\alpha)}{2\mu l^2} \right) \\
&+ \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t^2(1-\alpha)^3}{4\psi l} + \frac{t^2(1-\alpha)^2\alpha}{8\psi l} \right) \\
&- \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t(1-\alpha)\alpha}{2l} \right).
\end{aligned}$$

Because  $\alpha = \frac{t-t_0}{\mu l}$ , the term in the last line can be added to the last term in the second line, which yields

$$\begin{aligned}
\theta_2\theta_5 - \theta_1\theta_6 &= \gamma \\
&+ \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{(1-\alpha)^2\mu\alpha}{4} + \frac{t(1-\alpha)^3\mu\alpha}{8\psi} + \frac{t^2\alpha}{4\mu l^2} + \frac{t_0 t(1-\alpha)}{2\mu l^2} \right) \\
&+ \frac{\alpha[f'(k) - r]^3}{2\psi f''(k)} \left( \frac{t^2(1-\alpha)^3}{4\psi l} + \frac{t^2(1-\alpha)^2\alpha}{8\psi l} \right).
\end{aligned}$$

Again, because  $[f'(k) - r]$  is large, the terms subsumed in  $\gamma$  can be neglected for determining the sign. As the terms in the remaining terms are all negative, I get that  $\theta_2\theta_5 - \theta_1\theta_6 < 0$  and therefore  $dl_i/d\bar{k} < 0$ .

## A.4 Fight against tax havens

In what follows, I derive the effects of a change in  $t_0$  on the optimal level of  $t_j$  in developing countries. This effect is given by

$$\frac{dt_j}{dt_0} = \frac{\theta_2\theta_8 - \theta_4\theta_7}{|A|}.$$

The sign of the derivation is determined by  $\theta_2\theta_8 - \theta_4\theta_7$ , which reads

$$\begin{aligned} \theta_2\theta_8 - \theta_4\theta_7 = & \epsilon \\ & + \frac{\alpha[f'(k) - r]^2}{\psi f''(k)} \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \\ & \times \frac{t\alpha[f'(k) - r]^2}{2\psi f''(k)} \left( \frac{\alpha}{2l} - \frac{(1 - \alpha)}{l} + \frac{(1 - \alpha)\mu\alpha^2}{2\psi} \right) \\ & - \frac{t\mu\alpha^2[f'(k) - r]^2}{2\psi f''(k)} \left( \frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{3(1 - \alpha)\mu\alpha^2}{8\psi} \right) \\ & \times \frac{t(1 - \alpha)[f'(k) - r]^2}{\psi f''(k)} \left( \frac{1}{\mu l} + \frac{(1 - \alpha)\alpha}{2\psi} \right), \end{aligned}$$

where  $\epsilon$  captures all terms containing a polynomial of  $[f'(k) - r]$  of lower order than

4. Rearranging terms such that they have the common factor  $\frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2}$  yields

$$\begin{aligned} \theta_2\theta_8 - \theta_4\theta_7 = & \epsilon \\ & + \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)\mu\alpha}{4} + \frac{t(1 - \alpha)}{l} + \frac{3t(1 - \alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \left( \frac{\alpha}{2l} - \frac{(1 - \alpha)}{l} + \frac{(1 - \alpha)\mu\alpha^2}{2\psi} \right) \\ & - \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{\alpha}{l} - \frac{(1 - \alpha)}{l} + \frac{3(1 - \alpha)\mu\alpha^2}{8\psi} \right) \left( \frac{t(1 - \alpha)}{l} + \frac{t(1 - \alpha)^2\mu\alpha}{2\psi} \right). \end{aligned}$$

Expanding the terms in both lines results in

$$\begin{aligned} \theta_2\theta_8 - \theta_4\theta_7 = & \epsilon \\ & + \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)\mu\alpha^2}{8l} + \frac{t(1 - \alpha)\alpha}{2l^2} + \frac{3t(1 - \alpha)^2\mu\alpha^2}{16\psi l} - \frac{t\alpha^2}{8l^2} \right) \\ & - \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)^2\mu\alpha}{4l} + \frac{t(1 - \alpha)^2}{l^2} + \frac{3t(1 - \alpha)^3\mu\alpha}{8\psi l} - \frac{t(1 - \alpha)\alpha}{4l^2} \right) \\ & + \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)^2\mu^2\alpha^3}{8\psi} + \frac{t(1 - \alpha)^2\mu\alpha^2}{2\psi l} + \frac{3t(1 - \alpha)^3\mu^2\alpha^3}{16\psi^2} - \frac{t(1 - \alpha)\mu\alpha^3}{8\psi l} \right) \\ & - \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t(1 - \alpha)\alpha}{l^2} - \frac{t(1 - \alpha)^2}{l^2} + \frac{3t(1 - \alpha)^2\mu\alpha^2}{8\psi l} \right) \\ & - \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t(1 - \alpha)^2\mu\alpha^2}{2\psi l} - \frac{t(1 - \alpha)^3\mu\alpha}{2\psi l} + \frac{3t(1 - \alpha)^3\mu^2\alpha^3}{16\psi^2} \right). \end{aligned}$$

Collecting terms and simplifying leads to

$$\begin{aligned} \theta_2\theta_8 - \theta_4\theta_7 &= \epsilon \\ &+ \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)\mu\alpha^2}{8l} + \frac{(1-\alpha)^2\mu^2\alpha^3}{8\psi} + \frac{t(1-\alpha)^3\mu\alpha}{8\psi l} \right) \\ &- \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2\mu\alpha}{4l} + \frac{t(1-\alpha)\mu\alpha^3}{8\psi l} + \frac{t(1-\alpha)\alpha}{4l^2} + \frac{t\alpha^2}{8l^2} + \frac{3t(1-\alpha)^2\mu\alpha^2}{16\psi l} \right). \end{aligned}$$

Because  $\alpha = \frac{t-t_0}{\mu l}$ , the first term in the second line can be added to the third term in the third line and the second term in the second line can be added to the last term in the third line, which yields

$$\begin{aligned} \theta_2\theta_8 - \theta_4\theta_7 &= \epsilon \\ &+ \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t(1-\alpha)^3\mu\alpha}{8\psi l} \right) \\ &- \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2\mu\alpha}{4l} + \frac{t(1-\alpha)\mu\alpha^3}{8\psi l} + \frac{t(1-\alpha)\alpha}{8l^2} + \frac{t\alpha^2}{8l^2} + \frac{t(1-\alpha)^2\mu\alpha^2}{16\psi l} \right) \\ &- \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t_0(1-\alpha)\alpha}{8l^2} + \frac{t_0(1-\alpha)^2\mu\alpha^2}{8\psi l} \right). \end{aligned}$$

All terms but the one in the second line are negative. Rearranging terms delivers

$$\begin{aligned} \theta_2\theta_8 - \theta_4\theta_7 &= \epsilon \\ &- \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2\mu\alpha}{4l} + \frac{t(1-\alpha)\alpha}{8l^2} + \frac{t\alpha^2}{8l^2} \right) \\ &- \frac{t\alpha^2[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t_0(1-\alpha)\alpha}{8l^2} + \frac{t_0(1-\alpha)^2\mu\alpha^2}{8\psi l} \right) \\ &- \frac{t^2(1-\alpha)\mu\alpha^3[f'(k) - r]^4}{32\psi^3[f''(k)]^2 l} (5\alpha - \alpha^2 - 2). \end{aligned}$$

Because the terms subsumed under  $\epsilon$  can be neglected for determining the sign of  $\theta_2\theta_8 - \theta_4\theta_7$ , a sufficient condition for  $\theta_2\theta_8 - \theta_4\theta_7 > 0$  is that  $\alpha$  is not too low, which ensures that the term in the last line is negative. Under this sufficient condition I get that  $dt_j/dt_0 < 0$ .

To analyze the effects of a change in  $t_0$  on tax competition when the government follows

a more holistic approach, I need to calculate the effect of  $t_0$  on  $l_j$ , which is given by

$$\begin{aligned} \theta_2\theta_7 - \theta_1\theta_8 &= \eta \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)\mu\alpha}{4} + \frac{t(1-\alpha)}{l} + \frac{3t(1-\alpha)^2\mu\alpha}{8\psi} - \frac{t\alpha}{4l} \right) \left( \frac{1}{\mu l} + \frac{(1-\alpha)\alpha}{2\psi} \right) \\ &- \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( (1-\alpha) + \frac{3t(1-\alpha)^2}{4\psi} - \frac{3t}{2\mu l} \right) \left( \frac{\alpha}{4l} - \frac{(1-\alpha)}{2l} + \frac{(1-\alpha)\mu\alpha^2}{4\psi} \right), \end{aligned}$$

where  $\eta$  subsumes the terms with a polynomial of  $[f'(k) - r]$  of lower order than 4.

Expanding terms yields

$$\begin{aligned} \theta_2\theta_7 - \theta_1\theta_8 &= \eta \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)\alpha}{4l} + \frac{t(1-\alpha)}{\mu l^2} + \frac{3t(1-\alpha)^2\alpha}{8\psi l} - \frac{t\alpha}{4\mu l^2} \right) \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2\mu\alpha^2}{8\psi} + \frac{t(1-\alpha)^2\alpha}{2\psi l} + \frac{3t(1-\alpha)^3\mu\alpha^2}{16\psi^2} - \frac{t(1-\alpha)\alpha^2}{8\psi l} \right) \\ &- \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)\alpha}{4l} - \frac{(1-\alpha)^2}{2l} + \frac{(1-\alpha)^2\mu\alpha^2}{4\psi} \right) \\ &- \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{3t(1-\alpha)^2\alpha}{16\psi l} - \frac{3t(1-\alpha)^3}{8\psi l} + \frac{3t(1-\alpha)^3\mu\alpha^2}{16\psi^2} \right) \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{3t\alpha}{8\mu l^2} - \frac{3t(1-\alpha)}{4\mu l^2} + \frac{3t(1-\alpha)\alpha^2}{8\psi l} \right). \end{aligned}$$

Collecting terms and simplifying delivers

$$\begin{aligned} \theta_2\theta_7 - \theta_1\theta_8 &= \eta \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{t(1-\alpha)}{4\mu l^2} + \frac{11t(1-\alpha)^2\alpha}{16\psi l} + \frac{3t(1-\alpha)^3}{8\psi l} \right) \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2}{2l} + \frac{t\alpha}{8\mu l^2} + \frac{t(1-\alpha)\alpha^2}{4\psi l} \right) \\ &- \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2\mu\alpha^2}{8\psi} \right). \end{aligned}$$

Because  $\alpha = \frac{t-t_0}{\mu l}$ , the term in the last line can be added to the second term in the second line, which yields

$$\begin{aligned} \theta_2\theta_7 - \theta_1\theta_8 &= \eta \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{t(1-\alpha)}{4\mu l^2} + \frac{9t(1-\alpha)^2\alpha}{16\psi l} + \frac{3t(1-\alpha)^3}{8\psi l} \right) \\ &+ \frac{t(1-\alpha)\alpha[f'(k)-r]^4}{\psi^2[f''(k)]^2} \left( \frac{(1-\alpha)^2}{2l} + \frac{t\alpha}{8\mu l^2} + \frac{t(1-\alpha)\alpha^2}{4\psi l} + \frac{t_0(1-\alpha)^2\alpha}{8\psi l} \right), \end{aligned}$$

which is positive because the terms subsumed under  $\eta$  can be neglected for determining the sign of  $\theta_2\theta_7 - \theta_1\theta_8$ . Hence, I get that  $dl_j/dt_0 > 0$ .

Because the effects of  $t_0$  on  $t_j$  and  $l_j$  go in opposite directions, I need to determine the total effect of  $t_0$  on tax competition which, when neglecting the term subsumed under  $\epsilon$  and  $\eta$ , is given by

$$\begin{aligned}
(1 - \alpha)(\theta_2\theta_8 - \theta_4\theta_7) + \mu \frac{\alpha^2}{2}(\theta_2\theta_7 - \theta_1\theta_8) = & \\
& + \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t(1 - \alpha)^3}{8\psi l} \right) \\
& - \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)^2}{4l} + \frac{t(1 - \alpha)\alpha^2}{8\psi l} + \frac{t(1 - \alpha)}{8\mu l^2} + \frac{t\alpha}{8\mu l^2} + \frac{t(1 - \alpha)^2\alpha}{16\psi l} \right) \\
& - \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t_0(1 - \alpha)}{8\mu l^2} + \frac{t_0(1 - \alpha)^2\alpha}{8\psi l} \right) \\
& + \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{t(1 - \alpha)}{4\mu l^2} + \frac{9t(1 - \alpha)^2\alpha}{16\psi l} + \frac{3t(1 - \alpha)^3}{8\psi l} \right) \\
& + \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)^2}{2l} + \frac{t\alpha}{8\mu l^2} + \frac{t(1 - \alpha)\alpha^2}{4\psi l} + \frac{t_0(1 - \alpha)^2\alpha}{8\psi l} \right).
\end{aligned}$$

Rearranging and simplifying yields

$$\begin{aligned}
(1 - \alpha)(\theta_2\theta_8 - \theta_4\theta_7) + \mu \frac{\alpha^2}{2}(\theta_2\theta_7 - \theta_1\theta_8) = & \\
& + \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)\alpha}{8l} + \frac{t(1 - \alpha)^2\alpha}{2\psi l} + \frac{t(1 - \alpha)^3}{2\psi l} \right) \\
& + \frac{t(1 - \alpha)\mu\alpha^3[f'(k) - r]^4}{2\psi^2[f''(k)]^2} \left( \frac{(1 - \alpha)^2}{4l} + \frac{t(1 - \alpha)\alpha^2}{8\psi l} \right),
\end{aligned}$$

which is positive.

## A.5 Tables

Table A.1: Full list of countries by financial development

Country	Credit-to-GDP ratio	Corp. tax rate	Thin cap. rule
United States	192.17	40	0.4
Japan	185.00	34	0.25
China	156.71	25	0.33
Thailand	147.32	20	0
Norway	144.80	24	0
South Africa	144.41	28	0.25
Korea, Republic of	143.34	22	0
Australia	142.93	30	0.4
United Kingdom	134.41	19	0
Sweden	128.73	22	0
Malaysia	123.91	24	0
Vietnam	123.81	20	0
Chile	112.12	25.5	0.25
Portugal	112.03	21	0.33
Spain	111.34	25	0.25
Netherlands	110.26	25	0
Greece	108.78	29	0.25
Kuwait	103.62	15	0
France	97.60	33.33	0.4
Mauritius	96.36	15	0
Finland	94.82	20	0
Fiji	88.49	20	0.25
Iceland	87.32	20	0
Italy	85.72	24	0.2
Austria	84.67	25	0

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Table A.1 – *Continued from previous page*

Country	Credit-to-GDP ratio	Corp. tax rate	Thin cap. rule
Tunisia	81.16	25	0
Samoa	80.04	27	n.a.
Qatar	79.38	10	0.33
Germany	77.23	29	0.4
Oman	75.56	12	0.33
Estonia	71.93	20	0
Turkey	69.85	20	0.25
Cambodia	69.66	20	0
Latvia	67.64	15	0.2
Israel	65.58	25	0
Belgium	64.43	33	0.17
Bolivia	64.23	25	0
Morocco	64.04	31	0
Cape Verde	63.02	25	n.a
Brazil	62.19	34	0.33
Georgia	61.85	15	0
Croatia	61.27	18	0.2
Costa Rica	59.26	30	0
Mongolia	58.57	25	0.25
Saudi Arabia	57.98	20	0
Slovakia	57.00	21	0
Honduras	56.33	25	0
Poland	54.56	19	0.25
Paraguay	54.42	10	0
Bosnia and Herzegovina	53.18	10	n.a
Namibia	53.16	32	0.25
Bulgaria	52.77	10	0.25

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Table A.1 – *Continued from previous page*

Country	Credit-to-GDP ratio	Corp. tax rate	Thin cap. rule
Czech Republic	51.21	19	0.2
India	49.77	30	0.2
Montenegro	48.88	9	0
Armenia	48.75	20	0
Macedonia	47.44	10	0.25
Ukraine	47.33	18	0.22
Colombia	47.11	34	0.25
Slovenia	46.67	19	0.2
Sri Lanka	45.97	28	0.25
South Sudan	45.94	25	0
El Salvador	45.57	30	0
Guyana	44.74	27.5	0
Philippines	44.71	30	0
Bangladesh	44.45	25	n.a.
Brunai Darussalam	44.30	18.5	0
Serbia	43.44	15	0.2
Lithuania	42.97	15	0
Trinidad and Tobago	39.58	25	0
Indonesia	39.39	25	0.2
Kosovo	39.27	10	0
Solomon Islands	39.02	30	n.a.
Nicaragua	38.74	30	0
Suriname	36.76	36	0
Peru	36.21	29.5	0.25
Mexico	35.01	30	0.25
Albania	34.72	15	0.2
Mozambique	34.50	32	0

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Table A.1 – *Continued from previous page*

Country	Credit-to-GDP ratio	Corp. tax rate	Thin cap. rule
Hungary	34.45	9	0.25
Guatemala	34.30	25	0
Egypt	34.15	22.5	0.2
Kazakhstan	33.36	20	0
Senegal	33.27	30	0
Kenya	32.85	30	0.25
Jamaica	32.06	25	0
Botswana	31.68	22	0
Moldova	30.56	12	0
Ecuador	29.15	22	0.25
Dominican Republic	28.41	27	0
Romania	28.21	16	0.25
Uruguay	28.16	25	0
Burkina Faso	27.53	27.5	n.a.
Seychelles	26.91	33	0
Azerbaijan	26.57	20	0
Belarus	25.89	18	0.25
Congo, Republic of	25.02	30	0
Algeria	23.02	19	0
Papua New Guinea	22.72	30	0.33
Côte d'Ivoire	22.53	25	0
Myanmar	21.99	25	0
Benin	21.76	30	n.a.
Swaziland	21.59	27.5	0
Kyrgyzstan	21.23	10	n.a.
Rwanda	21.17	30	0.2
Angola	21.13	30	0

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Table A.1 – *Continued from previous page*

Country	Credit-to-GDP ratio	Corp. tax rate	Thin cap. rule
Ghana	19.59	25	0.25
Equatorial Guinea	18.18	35	0
Lesotho	16.81	25	0
Burundi	16.74	30	n.a.
Pakistan	16.51	31	0.25
Nigeria	15.67	30	0
Cameroon	15.62	33	0
Uganda	14.55	30	0.4
Tanzania	14.28	30	0
Argentina	13.97	35	0.33
Gabon	13.64	30	0
Madagascar	13.14	20	0
Zambia	12.04	35	0
Malawi	10.47	30	0
Chad	10.25	35	0
Guinea	9.87	35	0
Sudan	8.86	35	n.a.
Congo, Dem. Rep. of	8.02	35	0
Sierra Leone	5.54	30	n.a.
Afghanistan	3.60	20	0