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Abstract

This paper analyzes tax competition between countries, which differ in their country-specific risks. We show that the outcome of asymmetric tax competition crucially depends on the ability of multinational firms to shift profits. With high costs of profit shifting, higher-risk countries set lower tax rates than lower-risk countries whereas the opposite is true if the costs of profit shifting are low. The results provide an explanation for the patterns observed in the corporate income tax policies across countries differing in their level of development. Moreover, for intermediate costs of profit shifting, we show that countries' absolute risk level plays an important role in tax rate setting. These results carry important implication for the empirical tax competition literature.

JEL-Codes: H250, O230, F230.

Keywords: tax competition, country risk, developing countries, asymmetric countries.

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"In the process of development, states (...) undergo pronounced changes in *patterns* of taxation (...)."

– Besley and Persson (2013), p.51.

1 Introduction

In practice, the tax policies of rich and poor countries differ substantially. On average, advanced economies are able to raise a higher fraction of tax revenues relative to their gross domestic product (GDP) than developing countries,[1] and also the composition of tax revenues differs between developed and developing countries. In advanced economies, a large fraction of revenues is attributed to the collection from the personal income tax, while developing countries are more reliant on the corporate income tax as a source of revenue (Crivelli et al., 2016).

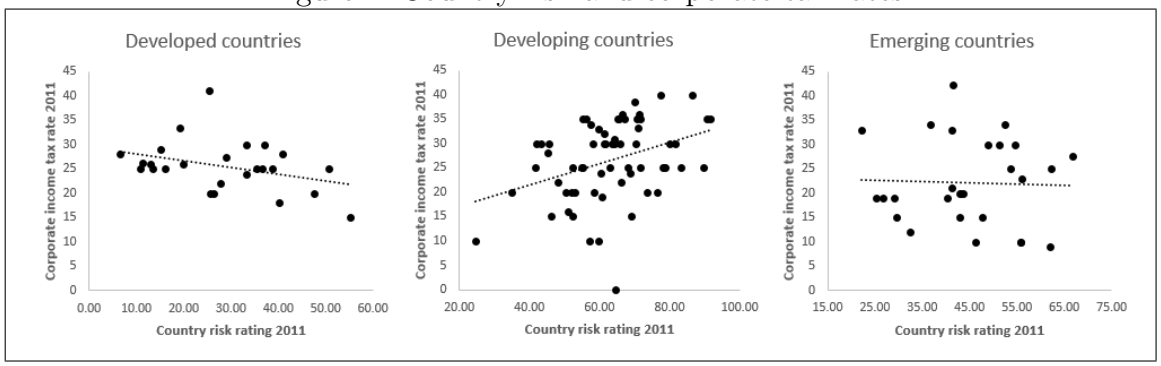
Despite the fact that the revenue from taxing corporations is an important source of income for developing countries, the literature on corporate tax competition has paid only little attention to emerging and developing countries. Especially, the exposure of firms to country-specific risks, an aspect of major relevance in the context of emerging and developing countries, has so far mostly remained outside the scope of the existing studies. Because multinational firms operate in many countries they have to respond to different economic and political environments. This may not only affect their incentives to invest in a country, but also the incentives to shift profits from or to a country.[2] It is therefore a priori unclear how country risk affects the outcome of tax competition and whether the outcome between developing or emerging countries is similar to the one between developed countries.

[1] Tax ratios have been surprisingly stable over time. While tax revenues relative to GDP have been the highest in high-income countries with roughly 30% between 1980-2009, this share is reduced when looking at less developed countries. For countries in the upper-middle income class, the tax-to-GDP ratio drops to roughly 23%, and it further declines for the group of lower-middle income and low-income countries to about 18%, respectively 15%, see IMF (2011).

[2] Wei (2000), for example, shows that corruption significantly reduces inward foreign direct investment, while Fuest et al. (2011) find that the sensitivity of intra-company loans to changes in the tax rate is twice as large in developing countries as compared to developed countries.

While the quote by Besley and Persson (2013) refers to specific features of a single country's tax structure, Figure 1 shows the different patterns of corporate tax rate policies for a cross-section of countries grouped by their level of development.[3] Specifically, it shows the relationship between the countries' risk rating and their corporate income tax rates.[4]

Figure 1: Country risk and corporate tax rates



Sources: World Bank World Development Indicators, Euromoneycountryrisk.com, Ernst & Young Worldwide Corporate Tax Guide, KPMG's corporate tax table.

For developed countries, Figure 1 shows a negative relationship between the corporate income tax rates and the levels of country risk. That is, among developed countries, higher-risk countries levy, on average, lower corporate income tax rates compared to lower-risk countries. Instead, among developing countries, the relationship between corporate income tax rates and country risk is reversed, i.e. higher-risk countries levy, on average, a higher corporate income tax rate. Among emerging countries no particular

[3]Figure 1 comprises a total of 117 countries, excluding countries classified as tax havens according to the definition in Hines (2005). The countries' state of development is proxied by financial development, which is measured as the 2011 credit-to-GDP ratio, i.e. the amount of domestic credit to private sector (as % of GDP), provided by the World Bank. Countries with a credit-to-GDP ratio larger than 80% (smaller than 40%) are classified as developed (developing) countries and the remaining ones as emerging countries. See Appendix A.5 for the full list of countries and details.

[4]Publicly accessible data on country risk ratings are provided by euromoneycountryrisk (ECR) and are only available for the year 2011 (available at `https://www.euromoneycountryrisk.com/`). The ECR index evaluates the investment risk of a country, such as the risk of default on bonds, the risk of losing direct investment, and the risk to global business relations. It is a composite measure consisting of economic (e.g. economics outlook, unemployment, currency stability), political (e.g. corruption, government stability, institutional risk) and structural (functioning of the labor market, physical and social infrastructure) factors in addition to other factors like the access to capital or credit ratings. The index ranges between 0 (no risk) to 100 (maximum risk), with higher values indicating higher risk (for convenience, we inverted the original scale). For corporate income tax rates, we retrieve data from the Ernst & Young Worldwide Corporate Tax Guide (2011, or if not available more recent issues) and KPMG's corporate tax table.

relationship between country risk and the corporate income tax rate seems to exist. In Table 1, we provide the result of a simple OLS regression, showing that the correlation between corporate tax rates and country risk among developed and developing countries is significantly different from zero, whereas for emerging countries, the correlation is not statistically different from zero.

Table 1: Correlation between corporate income tax rate and country risk rating (CRR)

	Developed countries	**Emerging countries**	**Developing countries**
const.	29.60***	23.09***	12.63***
	(1.87)	(6.11)	(3.85)
CRR	-0.142**	-0.021	0.220***
	(0.061)	(0.134)	(0.059)
# obs.	25	28	64

Note: Robust standard errors are displayed in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level.

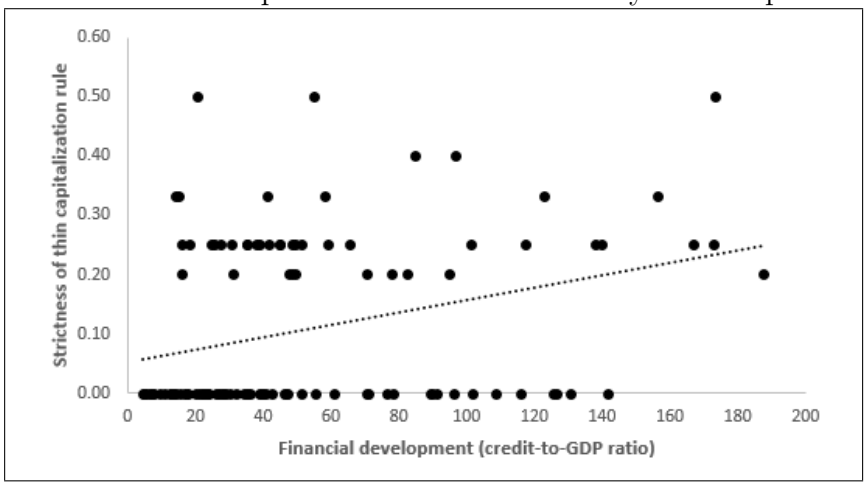
Inspired by the different patterns displayed in Figure 1, a primary purpose of this paper is to explore why the pattern between corporate income tax rates and country risk varies with countries' level of development. We will show that countries' ability to curb profit shifting – or reversely, multinational firms' ability to shift profits – plays an important role in explaining the different correlations displayed in Figure 1.

In line with our hypothesis, Figure 2 shows a large variation in the countries' ability to curb profit shifting, which is proxied by the strictness of countries' thin capitalization rule.[5] In detail, Figure 2 indicates that less developed countries set, on average, more lenient thin capitalization rules. Thus, the level of development has a crucial impact on a country's ability to curb profit shifting.[6] This pattern is also in line with empirical

[5]Figure 2 comprise a total of 116 countries, excluding the Sudan, for which information on the thin capitalization rule is not available. Otherwise, the selection and classification of countries follows the procedure described in footnote 3. The data for the debt-to-asset ratios, which reference to 2013, are taken from Mardan (2017), but inverted such that countries without a binding thin capitalization rule have a lower limit of zero. The result of a simple OLS regression confirms that the correlation displayed in Figure 2 is statistically significant at the 1% level.

[6]We are agnostic about whether developing countries are unable to curb profit shifting, due to,

Figure 2: Level of development and countries' ability to curb profit shifting



Sources: World Bank World Development Indicators, European Tax Handbook, Global Corporate Tax Handbook, Ernst & Young Worldwide Corporate Tax Guide.

studies showing that base erosion and profit shifting is more of a concern for developing countries than for advanced economies (see, for instance, Fuest et al., 2011; Crivelli et al., 2016; or Johannesen et al., 2017).

To highlight the role of profit shifting in explaining the different patterns of corporate income tax rates displayed in Figure 1, we set up a model of two small but asymmetric countries and consider a multinational firm, which has one affiliate in each country. The asymmetry originates from the fact that countries differ in their country-specific risk firms are exposed to and which affects the profitability of firm investment. The multinational firm decides on the optimal size of the investment project in each affiliate and the optimal transfer price for an intangible asset it owns and which is required for production. Governments in each country maximize national welfare by non-cooperatively setting their tax rates.

The pivotal question of our analysis is whether the higher-risk or the lower-risk country sets the lower tax rate. We show that the answer depends on the multinational firm's ability to shift profits. If the costs related to profit shifting are sufficiently high, the higher-risk country sets the lower tax rate. Instead, if profit shifting is sufficiently easy

for example, lacking resources to administer an effective tax administration, or unwilling to fight the relocation of profits by voluntarily instituting weak administrative capacities. In the following, we will refer to countries' ability to curb profit shifting to capture both dimensions.

for the multinational firm, the opposite holds, that is, the higher-risk country sets the higher tax rate.

The explanation for the polar findings rests on two opposing effects, which determine the optimal tax rate setting when a country's risk level changes. First, a decline of a country's riskiness exerts a positive impact on investment incentives and, in turn, on a country's taxing incentives. Second, a lower level of country risk increases the expected tax burden and thus the sensitivity of profit shifting, causing an incentive to lower the tax rate. For countries with good abilities to curb profit shifting, the first effect dominates, whereas for countries with limited abilities to fight profit shifting the second effect dominates. When countries have intermediate abilities to limit profit shifting, the outcome of tax competition is a convex combination of the two cases. These results are in line with corporate income tax setting in practice and provide a sound explanation for the observed differences displayed in Figure 1.

For the case of intermediate costs of profit shifting, we also show that a country's absolute risk level, in addition to the relative risk levels of the competing countries, has a crucially impact on the outcome of the tax competition game. The result emerges because the effect of a country's own risk level on its optimal tax rate is ambiguous. This implies that the two countries' tax rates are not only identical in the symmetric equilibrium, but they may also be identical when the risk levels of the two countries differ. Therefore, the absolute degree of the countries' riskiness matters for whether the higher-risk or the lower-risk country sets the higher tax rate and the relation between the two tax rates may change with the magnitude of the difference in risk levels.

These results are relevant for the empirical literature focusing on tax competition among emerging and developing countries. Essentially, our results indicate that it is not sufficient to run separate regression analyses for developed, emerging, and developing countries. Instead, it is crucial to account for the fact that taxing incentives may qualitatively change depending on the countries' risk levels.

The paper is organized as follows. Section 2 provides a discussion of the related literature. In section 3, the theoretical framework is introduced and in section 4 the tax competition game is analyzed. In section 5, we relate our results to the empirical lit-

erature on tax competition and in section 6 we discuss to what extent other channels may explain the observed pattern in corporate income tax policies across differently developed countries. In section 7, we conclude.

2 Related Literature

Our paper relates to three different strands of literature including work on (asymmetric) tax competition, on firm behavior and macroeconomic risk, and on taxation and development. While the third strand directly confronts with studies relating to developing countries, our approach is highlighting possible difference between developed, emerging, and developing countries when discussing the literature on firms and macroeconomic risk and on (asymmetric) tax competition.

By now, there exists a substantial theoretical and empirical literature on corporate income tax competition.[7] Although there is not yet a clear consensus on whether tax competition is beneficial or harmful, the outcome of tax competition is clearly noticeable in the real world. Over time and across countries, corporate income tax rates have declined significantly from a global average of 27.5% in 2006 to roughly 23.6% in 2016.[8] Many studies have empirically verified this downward trend in corporate tax rates for developed countries, see, e.g., Devereux et al. (2008), but much less weight has been put on the analysis of this issue in the context of emerging and developing countries. Exceptions are, for instance, Keen and Mansour (2010) or Abbas and Klemm (2013). Both studies conclude that the decline in corporate income tax rates has followed a similar pattern in advanced and developing countries.[9]

However, the theoretical literature has emphasized that country characteristics do shape the outcome of the tax competition game. The seminal works by Bucovetsky

[7] See, for instance, Wilson (1999) or Fuest et al. (2005) for a survey of the literature.

[8] See KPMG's corporate tax table available at `https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html`.

[9] Such a race to the bottom also manifests in other dimensions of policy competition. For instance, Davies et al. (2013) find that governments in both developed and developing countries have an incentive to relax labor standards to attract investments, however, with the strongest effects among developing countries with weak standards.

(1991) and Wilson (1991) show that country size plays an important role in explaining difference in corporate income tax rate setting. Smaller countries levy lower tax rates because their tax base elasticity is larger than those of larger countries.[10] In a similar vein, but focusing on the location of foreign direct investment (FDI), other studies point out that low corporate income tax rates can offset the disadvantage of a low market potential (see, e.g., Haufler and Stähler, 2013; Raff and Srinivasan, 1997; as well as Bénassy-Quéré et al., 2005 for empirical evidence on OECD countries).

Related to our analysis, several contributions also highlight the relevance of country risk in the competition for FDI, including, e.g., Lucas (1990), Mody and Srinivasan (1998), Janeba (2002), or Sanjo (2012). Generally, the literature emphasizes that country risk negatively affects a country's ability to attract FDI. Regarding international capital flows, FDI, however, seems to be less volatile to changes in country risk than other financial flows (Albuquerque, 2003).

Obviously, country-specific risks do not only affect the location decision of MNEs, but also their behavior once they have decided to invest in a specific country. Julio and Yook (2016) show, using the timing of national elections as a proxy for political uncertainty, that political uncertainty negatively affects cross-border flows of capital. Kesternich and Schnitzer (2010) find that higher political risk is associated with lower ownership shares in foreign affiliates by multinational firms and that the capital structure of foreign affiliates is sensitive to political risk. The direction of the deviation in the capital structure depends on the type of risk, thereby reconciling the conflicting results in Desai et al. (2004) and Desai et al. (2008).

Broadly speaking, our study relates to the theme of taxation and development.[11] Similar to our study, several papers highlight the differences in tax practices between developed and developing countries. Giavazzi et al. (2000) analyze the response of national savings

[10]This results is consistent with the observed tax rate setting by the EU-15 countries. The average corporate income tax rate of the larger EU-15 countries (countries with a population over 20 million) amounted to around 27.0% in 2016, whereas the average corporate income tax rate of the smaller EU-15 countries (countries with a population less than 20 million) was 23.9% (own calculation based on Ernst & Young Worldwide Corporate Tax Guide, 2016).

[11]See Tanzi and Zee (2000) for an overview on the theme and Fuest and Riedel (2012) for a more detailed focus on base erosion and profit shifting in developing countries.

to fiscal policy and find that, different to developed countries, responses of national savings in developing countries occur not only in the case of large fiscal contractions, but also during large fiscal expansions, and whenever a country is accumulating public debt rapidly. Emran and Stiglitz (2005) and Keen (2008) highlight the importance of the informal economy for understanding optimal VAT policy.[12] Taking into consideration that firms can operate in the shadow economy, Gordon and Li (2009) explain seemingly puzzling tax practices of developing countries.

However, there exist only a few studies with a special focus on corporate taxation and development. Similar to Gordon and Li (2009), Auriol and Warlters (2005) relate the different corporate tax policies in developing countries to the existence of the informal sector. They argue that governments in developing countries have an incentive to raise the barriers for firms to enter the formal sector to keep rents in the formal sector high, which are then expropriated via entrance fees and taxes. Gresik et al. (2015) and Mardan (2017) focus rather on the tax base than on the corporate income tax rate. Gresik et. al (2015) investigate whether attracting FDI is beneficial for a potential host country in the light of profit shifting opportunities of multinational firms. They show that a lenient control of profit shifting, i.e. a lax thin capitalization rule, might be needed in developing countries to attract FDI, but it can lead to lower welfare. Mardan (2017) shows that governments in developing countries, i.e. countries with a low financial development, set on average more generous thin capitalization rules to compensate firms for restricted access to external finance despite increased opportunities of profit shifting.

3 The model framework

We consider a one-period model with two small countries a and b, which levy corporate income tax rates t_a and t_b, respectively. In addition, we account for one representative

[12]For an analysis exploring the causes and consequences of the spread of VAT, see Keen and Lockwood (2010).

multinational enterprise (MNE) owning one subsidiary in each of the two countries.[13] Both subsidiaries produce a homogeneous output good resorting to the production technology $f(k_i)$, with positive but decreasing returns, i.e. $f'(k_i) > 0 > f''(k_i)$. For convenience we assume $f'''(k_i) = 0$ in our main analysis.[14] Decreasing returns to scale in production imply the existence of a fixed factor, i.e. a firm-specific asset, which is related to, e.g., a patent, and gives rise to positive pure profits. The goods produced are sold at the world market at a price normalized to one. Further, we assume that capital, k_i, is mobile and the only input factor and that all investments are financed by external debt.[15] The interest rate is exogenously given and normalized to one.

By assumption, the subsidiary in country a owns an intangible asset, i.e. a patent, and claims license fees for the use of the patent. Subsidiary b needs to buy one unit of the intangible asset to enable production. For simplicity, we normalize the arm's-length price of the intangible asset to zero. The MNE may shift profits from one subsidiary to the other by overpricing or underpricing the license fee to minimize its overall tax payment. We denote by g the actual transfer price charged by subsidiary a. If the MNE overstates the transfer price, i.e. $g > 0$, profits are shifted from subsidiary b to subsidiary a and vice versa.[16] Any deviation from the arm's-length price is costly for the MNE because effort is required to conceal the mispricing of the license fee. We account for this effect by specifying a quadratic concealment cost function of the form $C(\delta, g) = \frac{\delta}{2}g^2$, $\delta \in [\underline{\delta}; \bar{\delta}]$. The function implies that the MNE's costs of profit shifting are

[13] In the set-up, we neglect national firms and focus solely on multinational firms. This reflects the relevance of multinational firms for generating tax revenues in emerging and developing countries and that a significant portion of smaller and purely national firms in these countries tend to operate in the informal sector (see, e.g., Baer et al., 2002 and Auriol and Warlters, 2005) and also stay informal even if costs of becoming formal are reduced (Rocha et al., 2018). The IMF has also recognized this phenomenon and has encouraged the establishment of large taxpayer units on which scarce tax administration resources should be concentrated (Keen, 2012).

[14] In Appendix A.3, we show that our results are not qualitatively affected by this assumption.

[15] This assumption reduces the model's complexity but it is immaterial for the analysis. Neither the MNE's incentives to shift profits nor the governments' incentives to compete for profits are qualitatively affected if subsidiaries are allowed to deduct only a fraction γ of their capital cost.

[16] The modeling of profit shifting between the productive affiliates is in line with the observation that usually only the largest MNEs set up affiliates in tax havens (Davies et al., 2018). All our results are robust to the inclusion of a tax haven in the model. However, with a tax haven, a more complex concealment cost function with an affiliate-pair specific component becomes necessary to sustain the fiscal link (shifting channel) between the MNE's non-tax haven subsidiaries.

convex in the deviation of the transfer price from the arm's-length price. We interpret the parameter δ as the government's ability to curb profit shifting. If the government is very effective in preventing the MNE's profit shifting, i.e. if δ is large, the MNE's costs of manipulating the transfer price are high. Instead, if the government is not effective in curtailing the erosion of the tax base, i.e. if δ is low, the costs for manipulating the transfer price are only modest. The structure of the concealment cost function enables us to account for the observation in Figure 2 that more developed countries have better abilities to prevent profit relocation by MNEs.[17]

Given our interest in the effect of a change in a country's risk level on the MNE's and governments' behavior, we assume that the outcome of the MNE's investment is uncertain. With an exogenous probability $p_i \in [\underline{p}; \bar{p}]$ the MNE's investment project in country i is successful and the MNE can reap the benefits of the investment. However, with probability $(1 - p_i)$ the investment project fails, yielding a zero return, but the MNE still has to bear the investment cost.[18,19]

Pre-tax profit of subsidiary i is given by the expected revenue from the investment less the user cost of capital and plus/minus the license cost for the intangible asset

$$\pi_i^e \quad = \quad p_i f(k_i) - k_i + \mathbb{1} g, \tag{1}$$

where $\mathbb{1}$ is an indicator function that takes on the value of 1 for subsidiary a and -1 for subsidiary b.

In line with international tax practice, we assume that corporate income taxes are

[17] See also Gresik et al. (2015) for a similar approach.

[18] In our model, we interpret country risk as any risk, which negatively affects the firms' profitability. Economic risks, such as a weak stability of the currency, bad government finances, or a negative economic outlook, are certainly a major component of country risk, but also political risks, like corruption, regulatory policy, or weak government stability, can have a negative effect on firms' profitability. However, our analysis does not enfold risks, such as the expropriation of firm profits or firm assets, because such behavior generates additional governmental income and may lead to different implications.

[19] The modeling assumption follows the empirical evidence that firms' default probability is positively correlated to macroeconomic risks, which produce uncertainty about a country's economic situation, such as the volatility of GDP growth, stock market volatility, changes in the slope of the yield curve (as an indicator for real economic activity), or output gaps and changes in consumer expectations (as indicators for demand conditions). See, for instance, Tang and Yan (2010); Figlewski et al. (2012); or Duffie et al. (2007). The quantitative importance of country risk vs. firm idiosyncratic risk is as large as 40 per cent of the systematic variance in firms' default risk (Aretz and Pope, 2013).

imposed by the source country, where the investment is carried out. Accordingly, the host country taxes the profits of the subsidiary, whereas the parent country of the MNE exempts this income from taxation.[20] Moreover, and without loss of generality, we assume that concealment costs are not deductible from the tax base.[21] To ensure that corporate income tax rates affect the optimal investment decisions of the MNE, the tax base of subsidiary a, which receives the license fee payment, has to be negative in case its investment is unsuccessful and the tax base of subsidiary b, which pays the license fee, has to be positive if its investment is successful.[22] Under these conditions, the taxable profit of subsidiary i is given by

$$\pi_i^t = p_i[f(k_i) - k_i + \mathbb{1}g]. \tag{2}$$

Equation (2) states that the MNE may deduct the cost of capital and the expenses for the license fee only if the investment is successful, which happens with probability p_i. Using equations (1) and (2), the after-tax profit of subsidiary i amounts to

$$\pi_i = p_i(1 - t_i)[f(k_i) - k_i] - (1 - p_i)k_i + \mathbb{1}(1 - p_i t_i)g. \tag{3}$$

The MNE maximizes the sum of its subsidiaries' after-tax profits minus the costs for concealing profit shifting

$$\pi = \pi_a + \pi_b - C(\delta, g), \tag{4}$$

by choosing the optimal levels of capital investment, k_i, and the transfer price, g.

[20] The territorial system is applied by many OECD countries, and since 2018 also the United States altered their tax system in this direction. See Becker and Fuest (2010) for a discussion and analysis.

[21] This assumption is immaterial for our analysis because a government's incentive to lower its tax rate to attract profits still prevails even if concealment costs are tax-deductible.

[22] To ensure that subsidiary a's tax base is negative in case its investment is unsuccessful, $-k_a + g < 0$ needs to hold for $g > 0$. Further, to ensure that the tax base of subsidiary b is positive if its investment is successful, it must be true that $f(k_b) - k_b - g > 0$ for $g > 0$. Both constraints imply that the transfer price g should not be too large relative to the investment levels k_i or k_j. Both requirements, i.e. that the transfer price should not be too high and investment levels not too low, are more relevant in the context of developing countries, where δ and p_i are usually low. Hence, sufficient conditions for the two assumptions to hold are $\underline{\delta}$ and $\underline{p}$ not too low.

Optimal capital investments are determined by

$$f'(k_i) = \frac{1 - p_i t_i}{p_i(1 - t_i)}. \tag{5}$$

Given that capital costs can only be deducted if the investment is successful, the MNE's optimal investment decision is distorted by taxation. Differentiating (5), the effects of corporate tax rates and country risk on a subsidiary's optimal investment choice are

$$\begin{aligned} \frac{dk_i}{dt_i} &= \frac{1 - p_i}{p_i(1 - t_i)^2 f''(k_i)} < 0, \qquad \frac{dk_i}{dt_j} = 0, \\ \frac{dk_i}{dp_i} &= -\frac{1}{p_i^2(1 - t_i) f''(k_i)} > 0, \qquad \frac{dk_i}{dp_j} = 0. \end{aligned} \tag{6}$$

The first two derivatives in (6) show the standard tax effects in a model of small countries. A higher tax rate in country i reduces capital investment in country i but does not affect capital investment in country j. The other two derivatives illustrate the effect of country risk on capital investment. While country j's level of country risk has no effect on the optimal capital investment in country i, a reduction in country i's risk level (higher p_i) increases capital investment in country i.[23] This is in line with the findings of Kang et al. (2014) and Julio and Yook (2016) who show that uncertainty deters firms' investments.

The optimal level of the transfer price for the intangible asset is determined by

$$g = \frac{p_b t_b - p_a t_a}{\delta}. \tag{7}$$

From (7), the effects of taxation and country risk on the MNE's optimal transfer price

[23]Our results remain qualitatively the same if governments also compete for capital investment. With this extension, governments have a second motive for reducing their tax rate and this motive also affects the tax externalities. However, and as it will become clear in section 4, the mechanism relevant for our results to hold requires that a decline in country risk in country i positively impacts the MNE's capital investment in country i and at the same time stimulates profit shifting to country j. These incentives remain intact even if competition for mobile capital is considered in addition.

are

$$\frac{dg}{dt_a} = -\frac{p_a}{\delta} < 0, \qquad \frac{dg}{dt_b} = \frac{p_b}{\delta} > 0,$$
$$\frac{dg}{dp_a} = -\frac{t_a}{\delta} < 0, \qquad \frac{dg}{dp_b} = \frac{t_b}{\delta} > 0. \tag{8}$$

The effects derived in (8) are straightforward. A higher tax rate or a lower country risk (higher p_i) increase the incentives to shift profits to the other country because the MNE's expected tax payment in the respective country increases.

4 Tax competition and development

In this section, we provide an explanation for the observed differences in the pattern of corporate income tax policies across countries with different levels of development. For the tax competition game, we assume that governments maximize national welfare, which consists of the revenue collected from taxing the local affiliate, and a share $\phi \leq 0.5$ of the MNE's after-tax profits, given in (4), accruing to domestic citizens, who own the portion ϕ of the MNE.[24] Thus, national welfare is given by

$$W_i = t_i \pi_i^t + \phi\pi = t_i p_i \left[f(k_i) - k_i + \mathbb{1}g\right] + \phi_i \left[\pi_a + \pi_b - C(\delta, g)\right]. \tag{9}$$

Differentiating the welfare function (9) with respect to country i's tax rate, using the envelope theorem and equation (6), government i's first-order condition reads

$$\frac{\partial W_i}{\partial t_i} = (1-\phi)\left[f(k_i) - k_i + \mathbb{1}g\right] + t_i \left[[f'(k_i) - 1]\frac{\partial k_i}{\partial t_i} + \mathbb{1}\frac{\partial g}{\partial t_i}\right] = 0. \tag{10}$$

The optimal tax rate choice is determined by the standard trade off between the additional welfare generated by a marginal increase in the tax rate, the first term in (10), and the negative tax base effects defined by the terms in squared brackets in

[24] The restriction on ϕ originates from the simplifying assumption that the ownership share in the MNE is symmetric across countries and cannot exceed 100%. This restriction is not pivotal because the parameter ϕ has no qualitative impact on our results. We make this assumption to abstract from asymmetries originating from differences in the welfare function.

(10). In Appendix A.2, we prove that, despite considering an asymmetric tax competition model, a unique Nash-equilibrium in pure strategies exists under the sufficient condition $2\underline{p} - \bar{p} > 0$.

Substituting equations (5), (6) and (8) into (10) yields government i's optimal tax rate in implicit form

$$t_i^* = -\frac{(1-\phi)\left[f(k_i) - k_i + \mathbb{1}g\right]}{\frac{(1-p_i)^2}{(p_i)^2(1-t_i)^3 f''(k_i)} - \frac{p_i}{\delta}}. \tag{11}$$

Intuitively, the government accounts for the fact that taxation reduces the after-tax MNE profit, which accrues to residents at rate ϕ. As a consequence, the lower the ownership of the residents in the MNE, the higher the optimal tax rate. Moreover, the expression for the optimal tax rate indicates that the governments' taxing incentives are qualitatively the *same* across different countries. The incentive to attract profits and thus to lower the tax rate prevails for governments irrespective of their level of development, i.e. the level of δ. However, in the following we show that the effects of country risk on governments' taxing incentives will *differ* depending on the MNE's ability to shift profits.

In Appendix A.3, we derive the effect of a change in country i's and j's level of country risk on the optimal tax rate in country i, which are given by

$$\frac{dt_i}{dp_i} = \frac{\frac{(1-p_i)[(1-\phi)(1-t_i)+2t_i]}{(p_i)^3(1-t_i)^3 f''(k_i)} + \frac{(2-\phi)t_i}{\delta}}{\frac{(1-p_i)^2[(2-\phi)(1-t_i)+3t_i]}{(p_i)^2(1-t_i)^4 f''(k_i)} - \frac{(2-\phi)p_i}{\delta}}, \tag{12}$$

$$\frac{dt_i}{dp_j} = -\frac{\frac{(1-\phi)t_j}{\delta}}{\frac{(1-p_i)^2[(2-\phi)(1-t_i)+3t_i]}{(p_i)^2(1-t_i)^4 f''(k_i)} - \frac{(2-\phi)p_i}{\delta}} > 0. \tag{13}$$

A change in country i's own country risk has an ambiguous effect on its corporate income tax rate because a reduction in country i's risk level (an increase in p_i) exerts two opposing effects on country i's tax base. First, it increases the marginal product of capital and thus features a positive impact on country i's tax base due to larger investment which, in turn, implies a reduced tax sensitivity of investments (first term in the numerator of (12)). Second, an increase in p_i increases the MNE's incentive to shift profits to country j due to the higher expected tax burden in country i (second

term in the numerator of (12)).

Equation (13) states that an increase in p_j exerts a positive effect on country i's tax rate. A change in p_j has no effect on capital investment in country i, cf. (6), but it affects country i's tax rate through a change in profit shifting incentives. Specifically, a decline in country j's risk level (a rise in p_j) increases the MNE's expected tax burden in country j and thus provides incentives for shifting profits from country j to country i. This augments the tax base in country i and, in turn, country i's taxing incentives.

To highlight the interrelation between a country's level of development and its optimal tax rate setting behavior, we focus on two distinct cases. In the first case, we assume that governments have good abilities to control profit shifting, which translates into high concealment costs for MNEs. The scenario best reflects the situation of developed countries, which usually have effective administrative bodies with many well-trained employees and therefore several means to limit the outflow of paper profits. In the second case, we assume that governments have only limited abilities to prevent MNEs from shifting profits abroad. This case refers to developing countries, which usually have only little resources and only weak administrative capacities to curtail MNEs' profit shifting activities or which might prefer a lax tax enforcement. Within this framework, we analyze how asymmetries in countries' risk levels affect the tax competition game. Specifically, we evaluate how a change in the relative riskiness of countries impacts optimal corporate income tax rates.

The case of developed countries is captured in the model by applying a high value for the δ parameter in the concealment cost function. If $\delta > \hat{\delta} \equiv -\frac{[(2-\phi)t_i+(1-\phi)t_j]\hat{p}_i^3(1-t_i)^3 f''(k_i)}{(1-\hat{p}_i)[(1-\phi)(1-t_i)+2t_i]}$, we show in Appendix A.4.1 that

$$\frac{dt_i}{dp_i}|_{\delta>\hat{\delta}} > \frac{dt_i}{dp_j}|_{\delta>\hat{\delta}} > 0. \tag{14}$$

Equation (14) illustrates country i's taxing incentives if the country-risk level of country i or j changes. A decline in country i's own risk level (a rise in p_i) has, due to the positive investment effect, a positive impact on country i's taxing incentives. A decline in county j's risk level (a rise in p_j) increases the expected tax burden in country j,

which motivates the MNE to shift profits to country i, and in turn generates positive taxing incentives in country i. Although MNEs are still able to shift profits in developed countries, it is important to note that the effect resulting from a change in country i's own risk level is stronger than the one resulting from a change in country j's risk level. If profit shifting is expensive, i.e. if concealment costs are high, the MNE's profit shifting incentives are of only minor importance relative to the investment incentives.

An additional implication of equation (14) is that the country with the lower level of country risk levies a higher tax rate. The rationale behind the finding becomes evident when departing from the symmetric equilibrium in which both countries' risk levels and tax rates are identical. In the symmetric equilibrium, an increases in p_i (such that $p_i > p_j$) implies that country i will levy a higher tax rate than country j. Essentially, country i benefits from its lower country risk most because of higher investments.

In the second case, we assume that concealment costs are low. This set-up reflects the situation of developing countries best, which generally have only weak abilities to prevent MNEs' profit shifting activities. If $\delta < \tilde{\delta} \equiv -\frac{(2-\phi)t_i(\tilde{p}_i)^3(1-t_i)^3 f''(k_i)}{(1-\tilde{p}_i)[(1-\phi)(1-t_i)+2t_i]}$, we show in Appendix A.4.2 that a change in the two countries' risk levels affects the optimal tax rate in country i as follows

$$\frac{dt_i}{dp_j}|_{\delta<\tilde{\delta}} > 0 > \frac{dt_i}{dp_i}|_{\delta<\tilde{\delta}}. \tag{15}$$

Equation (15) states that a decline in country i's risk level (a rise in p_i) reduces country i's taxing incentives if the competition for paper profits is intense. The lower risk level in country i increases the MNE's expected tax payment in country i and in response the MNE shifts profits to country j. In contrast, a decline in country j's risk level (an increase in p_j) exerts positive taxing incentives for country i because the increase in the MNE's expected tax payment in country j induces the MNE to shift profits to country i. In a situation where concealment costs are low, profit shifting becomes the dominant channel, which determines the countries' tax rate setting. Investment effects play only a subordinate role.

Regarding the constellation of tax rates, equation (15) implies that the country with the lower country-risk level levies a lower tax rate. Again, the finding can be inferred when

departing from the symmetric equilibrium. Starting from a situation where $p_i = p_j$ and $t_i = t_j$, an increases in p_i (such that $p_i > p_j$) reduces (increases) country i's (country j's) tax rate. Essentially, a higher level of country risk allows the government to levy a higher tax rate because the tax elasticity of profit shifting falls with country risk (cf. (8)). We summarize our findings in:

Proposition 1 *If countries are asymmetric in their level of country risk and the costs of profit shifting are*

(i) sufficiently high, $\delta > \hat{\delta}$, the higher-risk country levies the lower tax rate,

(ii) sufficiently low, $\delta < \tilde{\delta}$, the higher-risk country levies the higher tax rate.

Proposition 1 is in line with the empirical evidence presented in Figure 1. Within the group of developed countries, which have, on average, good abilities to curb profit shifting of MNEs, countries with a lower level of country-risk levy, on average, a higher corporate income tax rate. Instead, developing countries have, on average, only weak abilities to prevent an erosion of their tax base. Accordingly, Figure 1 shows that among developing countries lower-risk countries levy, on average, a lower corporate income tax rate.

So far, we have analyzed situations of developed countries with high costs of profit shifting and developing countries where costs of profit shifting are low. However, emerging economies are characterized by intermediate abilities to prevent an erosion of their tax base, i.e. the costs of profit shifting are of intermediate size, $\tilde{\delta} < \delta < \hat{\delta}$. In emerging economies neither investment incentives nor profit shifting incentives dominate leaving the sign of $\frac{dt_i}{dp_i}$ ambiguous. Hence, the tax rate response of emerging economies due to a change in country risk is determined by a convex combination of the results for developed and developing countries, weighted by the governments' ability to curb profit shifting.

Figure 2 shows that the ability of emerging countries to curb the erosion of their corporate income tax base lies in-between those of developing and developed countries. Hence, the effect of profit shifting among emerging countries should be stronger

than among developed countries but less distinct than among developing countries. As pointed out, the direction of the change in an emerging country's tax rate due to a change in that country's risk level is ambiguous when the costs of profit shifting are of intermediate size. Therefore, it remains an empirical question whether the investment or the profit shifting effect dominates in emerging countries.

Figure 1 suggests that among emerging countries, the two effects offset each other, on average, implying a zero correlation between the corporate income tax rates and the levels of country risk. In the next section, we show that country risk still matters for the outcome of tax competition among emerging countries despite the fact that there might be no observable correlation between corporate income tax rates and country risk.

5 Implications for empirical tax competition research

In the previous section, we have analyzed how country risk and corporate income tax rates are related to each other. In doing so, the analysis focused on the relative riskiness of countries. In this section, we investigate whether absolute levels of country risk are also relevant for the incentives determining country-by-country corporate tax setting behavior. Thus, the section is informative for the empirical literature on tax competition, which considers tax competition not exclusively between developed countries but also between emerging as well as developing countries.

Proposition 1 highlights that the relationship between corporate income tax rates and country risk can be determined unambiguously if the costs of profit shifting are either sufficiently high or low. In these two polar cases, the absolute level of country risk has no impact on the qualitative outcome of the tax competition game. For sufficiently high costs of profit shifting, $\delta > \hat{\delta}$, the higher-risk country always sets a lower tax rate and this is true irrespective of the magnitude of the difference in country risk between the two countries. An analogous argument applies to countries for which the costs of

profit shifting are sufficiently low, $\delta < \tilde{\delta}$.[25]

However, the case of intermediate costs of profit shifting, $\tilde{\delta} < \delta < \hat{\delta}$, differs from the two cases analyzed above in that the absolute risk level of countries matters for whether the high-risk or the low-risk country sets the higher tax rate. The reason is that the magnitude of the investment effect, i.e. the first term in the numerator of (12), varies with country i's risk level. Hence, it depends on the actual risk level of country i, whether a change in country i's own risk level, p_i, or a change in the other country's risk level, p_j, exerts the stronger effect on country i's tax rate, t_i. As shown below, this feature critically affects tax competition between countries. In the following, we highlight the relevance of the absolute risk level of a country by distinguishing between two scenarios. In the first scenario, we assume that country j's risk level is low, i.e. $p_j > \check{p}_i$, whereas in the second scenario, country j's risk level is high, i.e. $p_j < \check{p}_i$.[26]

Regarding the first scenario with $p_j > \check{p}_i$, we show in Appendix A.4.3 that $\frac{dt_i}{dp_j} > \frac{dt_i}{dp_i}$ holds if $p_i > \check{p}_i$. Hence, whenever $p_i > p_j > \check{p}_i$, country i sets the lower tax rate. Given $p_i > \check{p}_i$, a decline in p_i implies a faster decrease in t_i than in t_j until tax rates are equalized in a symmetric equilibrium. Any further decline in p_i, such that $p_j > p_i > \check{p}_i$ implies that country i sets the higher tax rate, $t_i > t_j$, and that the difference in tax rates increases as p_i approaches $\check{p}_i$. However, once p_i falls below $\check{p}_i$, the difference between t_i and t_j starts to decrease because from this point on $\frac{dt_i}{dp_i} > \frac{dt_i}{dp_j}$ holds. The magnitude of $\frac{dt_i}{dp_i}$ increases as p_i declines further due to the growing impact of the investment effect (cf. (12)). At some point $p_i' < \check{p}_i$, the difference in tax rates becomes zero again despite the difference in the countries' risk levels.[27] Thus, if the risk level in country j is low in absolute terms, $p_j > \check{p}_i$, the higher-risk country sets the higher tax rate if country i's risk level is not too high, $p_i > p_i'$. Instead, if country i's risk level

[25]In the analysis we assume that the governments' ability to curb profit shifting, δ, and country-risk, p_i, are uncorrelated. However, Table A.1 in Appendix A.5 suggests that δ and p_i are positively correlated. This relationship does not affect our findings in Proposition 1 because only the relative riskiness of countries is relevant for our results. In the subsequent analysis, we show that countries' absolute risk levels change the outcome of the tax competition game even if δ and p_i are uncorrelated. Therefore, our results are not affected qualitatively by this simplification.

[26]We define the threshold $\check{p}_i$ in Appendix A.4.3.

[27]Using equation (11), p_i' is analytically determined when t_i^* evaluated at p_i' is equivalent to t_j^* for a given $p_j > \check{p}_i$.

becomes sufficiently high, $p_i < p_i'$, the higher-risk country sets the lower tax rate. We note that it is indeed a matter of the model's parameter constellation whether the two tax rates are equivalent for two different tuples of (p_i, p_j), i.e. whether it is actually the case that $p_i' > \underline{p}$. We therefore provide numerical simulations below to illustrate this possibility.

In the second scenario, we assume that country j's risk level is high, $p_j < \check{p}_i$. In Appendix A.4.3 we shows that for this case $\frac{dt_i}{dp_i} > \frac{dt_i}{dp_j} > 0$ holds. Thus, whenever $p_i < p_j < \check{p}_i$, country i sets a lower tax rate than country j, $t_i < t_j$. Given $p_i < \check{p}_i$, an increase in p_i implies a faster rise in t_i than in t_j until tax rates are equalized in a symmetric equilibrium. Any further increase in p_i, such that $p_j < p_i < \check{p}_i$, implies that country i sets the higher tax rate, $t_i > t_j$, and that the difference in tax rates increases as p_i approaches $\check{p}_i$. However, once p_i surpasses $\check{p}_i$, the difference between t_i and t_j starts to decrease because at that point $\frac{dt_i}{dp_j} > \frac{dt_i}{dp_i}$ holds and the magnitude of $\frac{dt_i}{dp_i}$ decreases as p_i rises further due to the abating influence of the investment effect (cf. (12)). At some point $p_i'' > \check{p}_i$, the tax rates are again equivalent despite the difference in the countries' risk levels.[28] Thus, if the risk level in country j is high in absolute terms, $p_j < \check{p}_i$, the higher-risk country sets the lower tax rate if country i's risk level is not too low, $p_i < p_i''$. Instead, if country i's risk level gets sufficiently low, $p_i > p_i''$, the higher-risk country sets the higher tax rate. Again, it is a matter of the model's parameter constellation whether the two tax rates are equivalent for two different tuples of (p_i, p_j), i.e. whether it is the case that $p_i'' < \bar{p}$.

To illustrate the findings, we run simulations for the case of intermediate costs of profit shifting. Because ϕ has no qualitative effect for our results, we simplify by setting $\phi = 0$. We specify the subsidiaries' production functions as $f(k_i) = (\alpha - k_i)k_i$, with $\alpha = 3.9$, and assume a success probability of $p_a = 0.6$ and $p_a = 0.45$ for the first and second scenario, respectively. We compute the optimal tax rates levied by country a and b for a variation in the risk level of country b, i.e. for varying p_b. In all simulations, the solid line represents the equilibrium tax rate of country a, t_a, whereas the dashed

[28] Similar to before, p_i'' is analytically determined when t_i^* evaluated at p_i'' is equivalent to t_j^* for a given $p_j < \check{p}_i$.

curve represents the equilibrium tax rate of country b, t_b.

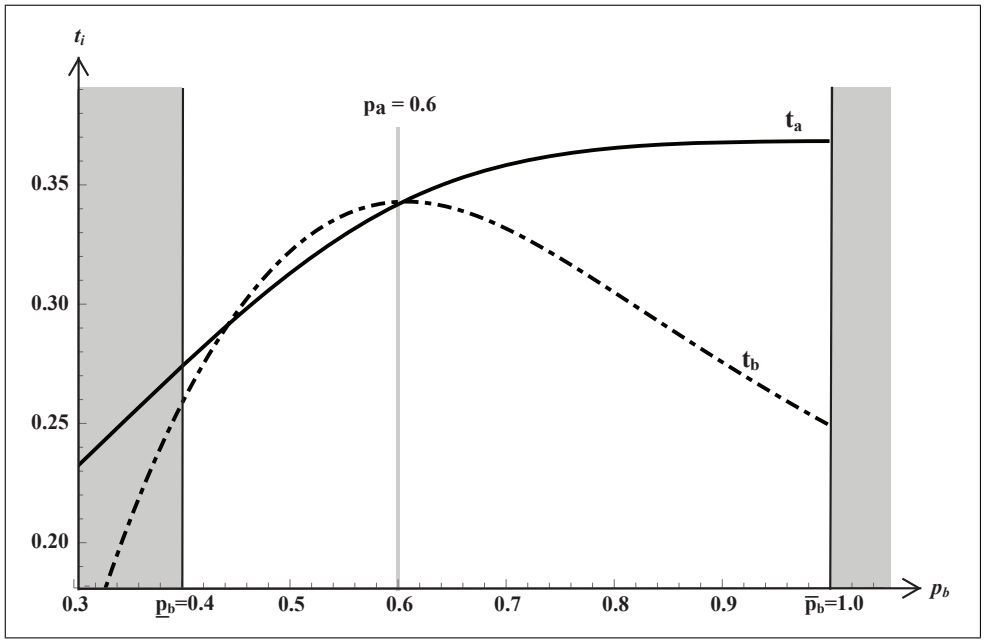


Figure 3: Optimal tax rates for $p_a = 0.6$, $p_b \in [0.40; 1.0]$, $\delta = 0.13$, $\phi = 0$.

Figure 3 illustrates the results for the case when country a is a relatively low-risk country (relatively high p_a). The simulations shows an inverted U-shaped pattern of the equilibrium tax rate in country b as its level of riskiness varies as indicated by equation (12). Starting from a situation where the risk level of country b is not too high ($p_b > 0.44$), the country with the lower risk level (higher p_i) levies the lower tax rate. However, if country b's risk level becomes sufficiently high ($p_b < 0.44$), the higher-risk country (country b) will levy the lower tax rate. The two points of intersection lie within the supported range of country risk levels of $\underline{p}_b = 0.40$ and $\overline{p}_b = 1.0$, which ensure a non-positive tax base of the subsidiary hosting an unsuccessful investment.

Figure 4 provides an illustration of the optimal tax rates if country a is a relatively high-risk country (relatively low p_a). As before the relation between country b's risk level and its optimal tax rate is inverted U-shaped. Contrary to the case where country a is a relatively low-risk country, the country with the higher risk level sets the lower tax rate if country b's risk level is not too low ($p_b < 0.62$). However, if country b's risk level becomes sufficiently low, it is optimal for the higher-risk country (country a) to levy a higher tax rate. In this situation, the range of evaluated levels of country

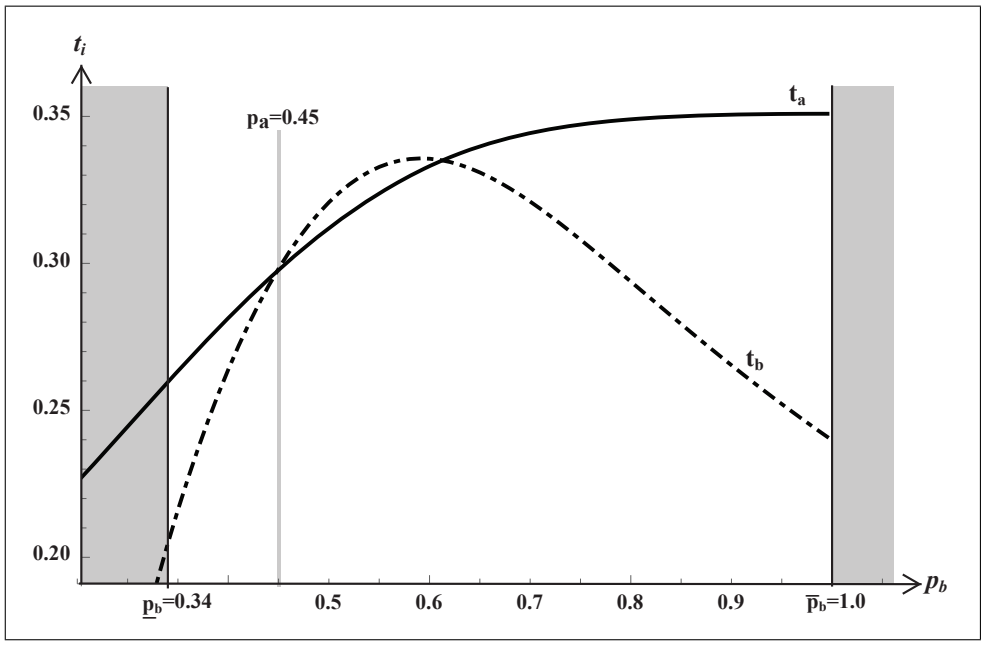


Figure 4: Optimal tax rates for $p_a = 0.45$, $p_b \in [0.34; 1.0]$, $\delta = 0.13$, $\phi = 0$.

risk cover $\underline{p}_b = 0.34$ and $\overline{p}_b = 1.0$ and ensure a non-positive tax base of the subsidiary hosting an unsuccessful investment.

We summarize our findings in:

Proposition 2 *When the costs of profit shifting are of intermediate size, $\hat{\delta} > \delta > \tilde{\delta}$, and one country's risk level is*

(i) low, $p_j > \check{p}_i$, the higher-risk country sets the higher (lower) tax rate if the other country's risk level satisfies $p_i > p_i'$ ($p_i < p_i'$),

(ii) high, $p_j < \check{p}_i$, the higher-risk country sets the lower (higher) tax rate if the other country's risk level satisfies $p_i < p_i''$ ($p_i > p_i''$).

Proposition 2 highlights that, in addition to countries' relative risk levels, also countries' absolute risk levels matter for the outcome of the tax competition game if MNEs have some leeway to engage in profit shifting. Emerging economies are arguably characterized by intermediate abilities to prevent the erosion of their corporate tax base. Ultimately, Proposition 2 shows that the optimal corporate tax policy of emerging economies does not only depend on their own but also on their competitors' risk level.

The empirical literature on foreign direct investment (FDI) highlights that corporate taxation negatively affects the location decision of multinational firms.[29] In this literature, the impact of corporate tax rates on FDI has mostly been investigated for developed countries, but several studies, e.g. Azemar and Delios (2008) or Mutti and Grubert (2004), show that the tax elasticity of FDI varies with the level of host country development. Thus, pooling developed, emerging, and developing countries in a single regression, as for instance done in earlier papers like Grubert and Mutti (1991) or Hines and Rice (1994), may produce confound estimates.

Moreover, the empirical literature on FDI emphasizes that country risk directly influences MNEs' location decision (Mody and Srinivasan, 1998; Albuquerque, 2003). Our analysis shows that country risk can also indirectly affect MNEs' location decision through governments' tax setting behavior. Against this background, Propositions 1 and 2 highlight that neglecting the interplay between country risk and corporate tax rates may cause a bias in the estimates, which obviously cannot be eliminated by just controlling for country risk. Allegedly simple remedies to capture the diverse tax setting incentives of differently developed countries are either to run separate regressions for developed, emerging, and developing countries or to include regional dummies into the regression as, for example, in Abbas and Klemm (2013) or Mutti and Grubert (2004). However, Proposition 2 also emphasizes that countries' diverse tax setting behaviors cannot be separated out by just including regional dummies or running separate regressions because the governments' taxing incentives are crucially affected by competing countries' degree of risk. One potential remedy to capture the varying taxing incentives is to add an interaction term between country risk and the corporate tax rate to capture the effect of relative country risk on tax setting behavior. In addition, the interaction term needs to be conditioned on whether competing countries have a similar or a substantially different level of country risk, i.e. countries need to be grouped according to the magnitude of their differences in country risk.

[29] See, e.g., de Mooij and Ederveen (2003) who find conducting a meta-study a mean semi-elasticity of -3.3, that is a 1%-point increase in the host-country's tax rate reduces foreign direct investment in that country by 3.3%.

6 Discussion

In this section, we review other channels which potentially could explain the observed patterns of corporate income tax rate setting across differently developed countries. In the spirit of Rincke and Mittermaier (2013), a first channel might be that countries compensate firms for country-specific risks by adjusting their tax rate. Rincke and Mittermaier (2013) show that governments compensate firms for the disadvantage of relatively high labor costs by setting lower tax rates. Resorting to the lift of the Iron Curtain as a natural experiment, they find that an increase in the (labor) cost differential by one dollar induces governments to reduce their corporate income tax rate, on average, by one percentage point. A similar argument can be made in the context of country risk. Because governments need to compensate firms for the disadvantage of higher country risk, higher-risk countries have to set lower corporate income tax rates to attract investment. Indeed, this argument can be brought forward to rationalize corporate income tax rate setting among developed countries. However, this channel in isolation is unable to explain why the relationship between corporate income tax rates and country risk becomes positive among developing countries, where it is the higher-risk countries which set, on average, the higher tax rate. Thus, the argument of compensating firms with lower tax rates in exchange for higher country risk cannot explain the broad picture of corporate tax patterns found in Figure 1.

Another channel through which country risk and corporate income tax rates might be connected is the existence of an informal sector, which is generally larger in developing than in developed countries. Auriol and Warlters (2005) argue that the informal sector is particularly large in developing countries because governments in these countries have an incentive to increases the firms' cost of entering the formal sector. Thereby, governments reduce competition and generate rents in the formal sector, which they then confiscate through entry fees and taxes. Applying the argument to the context of our model, countries with lower abilities to fight profit shifting have fewer capabilities to raise tax revenue and may therefore have a higher need for tax revenue collection. As can be inferred from the Table A.1 in Appendix A.5, countries with a more lenient

thin capitalization rule are, on average, also more risky. Against the background of our model, the argument of Auriol and Warlters would imply that higher-risk countries should, on average, have a higher need for tax revenues and thus set the higher tax rates. Indeed, corporate income tax rate setting among developing countries can be rationalized using this argument. However, it is less obvious that this argument is also relevant in the context of more developed economies. Compared to the average size of the shadow economy in developing economies, which is estimated to be 39% relative to GDP, the shadow economy in OECD countries accounts for only 16.3% (see Schneider, 2004). Even if governments in developed countries abused their tax policies to confiscate rents, this argument cannot rationalize why, among developed countries, the lower-risk countries set, on average, higher tax rates.

In contrast, our analysis provides a single mechanism, which explains the different patterns of corporate income tax rate setting behavior among countries with varying levels of development. In particular, we emphasize that the ability of MNEs to shift profits constitutes a major force in determining countries' actual corporate income tax policies.

7 Conclusion

In this paper we analyze tax competition between two asymmetric countries. The asymmetry between countries originates from country-specific risks multinational firms face and which affect both the investment and profit shifting strategies of multinational firms. We show that a country's optimal tax rate setting crucially depends on the ability of multinational firms to shift profits. Among developed countries, where governments have good abilities to restrict profit shifting, higher-risk countries set, on average, lower tax rates. The opposite is true among developing countries, where governments have only weak abilities to curb profit shifting. Our results highlight that tax competition among developing countries is characterized by an outcome where higher-risk countries set higher tax rates than lower-risk countries. The different findings of our model are in line with the actual patterns of corporate income tax rate setting observed for

developing, emerging, and developed countries. Thus, our model consistently explains the different corporate income tax rate policies of countries with different levels of development.

Finally, our results are also informative for future research in empirical tax competition. Given that country risk qualitatively affects taxing incentives, previous studies suffer from a potential bias in the tax sensitivity of FDI, which cannot be remedied by running separate analyses for developed, emerging, and developing countries or by including regional dummies.

A Appendix

A.1 Deriving the total differential of the government's first-order condition

Totally differentiating the government's first-order condition (10) yields

$$\begin{aligned}
&\left\{(2-\phi)\left[[f'(k_i)-1]\frac{\partial k_i}{\partial t_i}+\mathbb{1}\frac{\partial g}{\partial t_i}\right]+t_i\left[f''(k_i)\left(\frac{\partial k_i}{\partial t_i}\right)^2+[f'(k_i)-1]\frac{\partial^2 k_i}{\partial (t_i)^2}+\mathbb{1}\frac{\partial^2 g}{\partial (t_i)^2}\right]\right\}dt_i\\
&+\left\{(1-\phi)\left[[f'(k_i)-1]\frac{\partial k_i}{\partial t_j}+\mathbb{1}\frac{\partial g}{\partial t_j}\right]+t_i\left[f''(k_i)\frac{\partial k_i}{\partial t_j}\frac{\partial k_i}{\partial t_i}+[f'(k_i)-1]\frac{\partial^2 k_i}{\partial t_i \partial t_j}+\mathbb{1}\frac{\partial^2 g}{\partial t_i \partial t_j}\right]\right\}dt_j\\
&+\left\{(1-\phi)\left[[f'(k_i)-1]\frac{\partial k_i}{\partial p_i}+\mathbb{1}\frac{\partial g}{\partial p_i}\right]+t_i\left[f''(k_i)\frac{\partial k_i}{\partial p_i}\frac{\partial k_i}{\partial t_i}+[f'(k_i)-1]\frac{\partial^2 k_i}{\partial t_i \partial p_i}+\mathbb{1}\frac{\partial^2 g}{\partial t_i \partial p_i}\right]\right\}dp_i\\
&+\left\{(1-\phi)\left[[f'(k_i)-1]\frac{\partial k_i}{\partial p_j}+\mathbb{1}\frac{\partial g}{\partial p_j}\right]+t_i\left[f''(k_i)\frac{\partial k_i}{\partial p_j}\frac{\partial k_i}{\partial t_i}+[f'(k_i)-1]\frac{\partial^2 k_i}{\partial t_i \partial p_j}+\mathbb{1}\frac{\partial^2 g}{\partial t_i \partial p_j}\right]\right\}dp_j=0,
\end{aligned} \tag{A.1}$$

where the first line is the second-order condition of the government's maximization problem and it is assumed to be negative to obtain a maximum. For $f'''(k_i)$ positive, this is the case if $f'''(k_i)$ is not too large.

Using equations (5), (6), (8), and the simplifying assumption that the third derivatives of the concealment cost function are zero, the total differential simplifies to

$$\begin{aligned}
&\left\{\frac{(1-p_i)^2\left[(2-\phi)(1-t_i)+3t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^2(1-t_i)^4 f''(k_i)}-\frac{(2-\phi)p_i}{\delta}\right\}dt_i+\frac{(1-\phi)p_j}{\delta}dt_j\\
&-\left\{\frac{(1-p_i)\left[(1-\phi)(1-t_i)+2t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^3(1-t_i)^3 f''(k_i)}+\frac{(2-\phi)t_i}{\delta}\right\}dp_i+\frac{(1-\phi)t_j}{\delta}dp_j=0.
\end{aligned} \tag{A.2}$$

A.2 Proof of existence and uniqueness

Using equation (A.2), we obtain the tax reaction function $t_i(t_j, p_i, p_j)$ with slope

$$\frac{dt_i}{dt_j}=-\frac{\frac{(1-\phi)p_j}{\delta}}{\frac{(1-p_i)^2\left[(2-\phi)(1-t_i)+3t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^2(1-t_i)^4 f''(k_i)}-\frac{(2-\phi)p_i}{\delta}}>0. \tag{A.3}$$

Given the continuity of the production function, the tax reaction functions are also continuous in the neighbor's tax rate. Noting that $\frac{\partial W_i}{\partial t_i}|_{t_i=0} > 0$, a sufficient condition for the existence and uniqueness of the Nash equilibrium with positive tax rates is $\frac{dt_i}{dt_j} < 1$.[30] Given continuity of the best responses, the condition $\frac{dt_i}{dt_j} < 1$ ensures that the two tax reaction functions intersect only once. From equation (A.3), the condition implies

$$\frac{dt_i}{dt_j} < 1 \quad \Leftrightarrow \quad (2-\phi)p_i - (1-\phi)p_j > \frac{\delta(1-p_i)^2\left[(2-\phi)(1-t_i)+3t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^2(1-t_i)^4 f''(k_i)}. \tag{A.4}$$

As the right-hand side of (A.4) is negative by assumption, condition (A.4) is always met if country i is the low risk-country. In this case it is always true that $p_i - p_j > 0$. What remains to be determined is the requirement for which condition (A.4) also holds if country i is the high-risk country. A sufficient condition for (A.4) to hold in this case is that the left-hand side is non-negative. Because the left-hand side of (A.4) increases in p_i and decreases in p_j, a sufficient condition for the left-hand side of (A.4) to be positive is $\frac{2-\phi}{1-\phi}\underline{p} - \bar{p} > 0$. Given that $\frac{2-\phi}{1-\phi}$ increases in ϕ, a sufficient condition for a globally stable and unique Nash-equilibrium in pure strategies to exist is $2\underline{p} - \bar{p} > 0$.

A.3 Change in optimal tax rates with country risk

Using equation (A.2), the effect of a change in either country's risk level on tax rate t_i is given by

$$\frac{dt_i}{dp_i} = \frac{\frac{(1-p_i)\left[(1-\phi)(1-t_i)+2t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^3(1-t_i)^3 f''(k_i)} + \frac{(2-\phi)t_i}{\delta}}{\frac{(1-p_i)^2\left[(2-\phi)(1-t_i)+3t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^2(1-t_i)^4 f''(k_i)} - \frac{(2-\phi)p_i}{\delta}}, \tag{A.5}$$

$$\frac{dt_i}{dp_j} = -\frac{\frac{(1-\phi)t_j}{\delta}}{\frac{(1-p_i)^2\left[(2-\phi)(1-t_i)+3t_i-\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2}\right]}{(p_i)^2(1-t_i)^4 f''(k_i)} - \frac{(2-\phi)p_i}{\delta}} > 0. \tag{A.6}$$

[30] This condition also implies that the Nash equilibrium is globally stable, i.e. $\frac{dt_i}{dt_j}\frac{dt_j}{dt_i} < 1$.

If $f'''(k_i) \neq 0$, the effect of a change in country i's own country risk on its tax rate remains ambiguous because an increase in p_i increases the marginal product of capital and thus features a positive impact on country i's tax base if $f'''(k_i)$ is not too large when positive.

In the following, we study two alternative and commonly used production functions to illustrate that focusing on $f'''(k_i) = 0$ in our main analysis does not qualitatively affect our results. We analyze under which conditions the investment effect (first effect in the numerator of (A.5)) remains positive when allowing $f'''(k_i) \neq 0$.

First, we inspect a logarithmic function of the form $f(k_i) = \alpha\ ln(1 + k_i)$. After substituting the conditions for optimal investment, we get $\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2} = \frac{t_i(1-p_i)}{1-p_i t_i} < t_i$, which is always smaller than $2t_i$. Hence, the investment effect is unambiguously positive.

Second, we examine a Cobb-Douglas function of the form $f(k_i) = \alpha(k_i)^{\varepsilon}$, with $\varepsilon < 1$. After inserting optimal investment, we get $\frac{t_i(1-p_i)f'''(k_i)}{p_i(1-t_i)[f''(k_i)]^2} = \frac{(2-\varepsilon)t_i(1-p_i)}{(1-\varepsilon)(1-p_i t_i)}$. The expression decreases in p_i. Although we restrict the lowest value of p_i to be $\underline{p}$, a more restrictive condition for the investment effect to be positive, i.e. for $\left[(1-\phi)(1-t_i) + 2t_i - \frac{(2-\varepsilon)t_i(1-p_i)}{(1-\varepsilon)(1-p_i t_i)}\right] > 0$, applies when p_i approaches zero. In this case, the investment effect is positive if

$$(1-\phi)(1-t_i) + 2t_i - \frac{(2-\varepsilon)t_i}{(1-\varepsilon)} > 0 \quad \Leftrightarrow \quad \varepsilon < \frac{(1-\phi)(1-t_i)}{(1-\phi)(1-t_i) + t_i}. \tag{A.7}$$

For the Cobb-Douglas specification $\varepsilon = \frac{f'(k_i)k_i}{f(k_i)}$, the investment effect is positive if the production function is not too elastic.

Assuming a quadratic production function, the investment effect is always positive given that $f'''(k_i) = 0$. The effect of a change in a country's risk level on tax rate t_i simplifies to

$$\frac{dt_i}{dp_i} = \frac{\frac{(1-p_i)[(1-\phi)(1-t_i)+2t_i]}{(p_i)^3(1-t_i)^3 f''(k_i)} + \frac{(2-\phi)t_i}{\delta}}{\frac{(1-p_i)^2[(2-\phi)(1-t_i)+3t_i]}{(p_i)^2(1-t_i)^4 f''(k_i)} - \frac{(2-\phi)p_i}{\delta}}, \tag{A.8}$$

$$\frac{dt_i}{dp_j} = -\frac{\frac{(1-\phi)t_j}{\delta}}{\frac{(1-p_i)^2[(2-\phi)(1-t_i)+3t_i]}{(p_i)^2(1-t_i)^4 f''(k_i)} - \frac{(2-\phi)p_i}{\delta}} > 0. \tag{A.9}$$

as stated in the main text.

A.4 Tax rates and development

A.4.1 Developed countries

Starting from equations (12) and (13), we analyze under which condition a change in country i's risk level, p_i, has a positive and stronger effect on country i's tax rate, t_i, than a change in country j's risk level, p_j, on the interval $[\underline{p};\bar{p}]$, i.e.

$$\frac{dt_i}{dp_i} - \frac{dt_i}{dp_j} > 0 \quad \Leftrightarrow \quad \delta > -\frac{[(2-\phi)t_i + (1-\phi)t_j](p_i)^3(1-t_i)^3 f''(k_i)}{(1-p_i)\left[(1-\phi)(1-t_i)+2t_i\right]}. \tag{A.10}$$

The right-hand side of the second inequality in (A.10) is directly affected by p_i and indirectly via t_i and t_j. We define $\hat{p}_i \in [\underline{p};\bar{p}]$ as the risk level of country i, which maximizes the right-hand side of the second inequality in (A.10). Hence, if

$$\delta > -\frac{[(2-\phi)t_i + (1-\phi)t_j]\hat{p}_i^3(1-t_i)^3 f''(k_i)}{(1-\hat{p}_i)\left[(1-\phi)(1-t_i)+2t_i\right]} \equiv \hat{\delta}, \tag{A.11}$$

it holds that $\frac{dt_i}{dp_i} > \frac{dt_i}{dp_j} > 0$ on the interval $[\underline{p};\bar{p}]$. We assume that $\bar{\delta} > \hat{\delta}$.

A.4.2 Developing countries

Starting from equation (12), a change in country i's risk level, p_i, decreases country i's tax rate, t_i, on the interval $[\underline{p};\bar{p}]$ if the numerator is positive, i.e.

$$\frac{dt_i}{dp_i} < 0 \quad \Leftrightarrow \quad \delta < -\frac{(2-\phi)t_i(p_i)^3(1-t_i)^3 f''(k_i)}{(1-p_i)\left[(1-\phi)(1-t_i)+2t_i\right]}, \quad \forall p_i \in [\underline{p};\bar{p}]. \tag{A.12}$$

The right-hand side of the second inequality in (A.12) is affected directly by p_i and indirectly via t_i. Thus, we define $\tilde{p}_i \in [\underline{p};\bar{p}]$ as the risk level of country i, which minimizes the right-hand side of the second inequality in (A.12). If

$$\delta < -\frac{(2-\phi)t_i(\tilde{p}_i)^3(1-t_i)^3 f''(k_i)}{(1-\tilde{p}_i)\left[(1-\phi)(1-t_i)+2t_i\right]} \equiv \tilde{\delta}, \tag{A.13}$$

it follows that $\frac{dt_i}{dp_i} < 0$ on the interval $[\underline{p};\bar{p}]$. We assume that $\underline{\delta} < \tilde{\delta}$.

A.4.3 Emerging countries

From equations (12) and (13), and given $\delta \in (\tilde{\delta}; \hat{\delta})$, the impact of a change in country i's own risk level, p_i, exerts the same effect on country i's tax rate, t_i, as a change in country j's risk level, p_j, if

$$\frac{dt_i}{dp_i} = \frac{dt_i}{dp_j} \quad \Leftrightarrow \quad \frac{(1-\check{p}_i)\left[(1-\phi)(1-t_i)+2t_i\right]}{(\check{p}_i)^3(1-t_i)^3 f''(k_i)} + \frac{(2-\phi)t_i}{\delta} = -\frac{(1-\phi)t_j}{\delta}. \quad \text{(A.14)}$$

The investment effect decreases with p_i. Therefore, whenever $p_i < \check{p}_i$, a change in country i's own risk level exerts a stronger effect on its tax rate than a change in the other country's risk level, i.e. $\frac{dt_i}{dp_i} > \frac{dt_i}{dp_j}$ and vice versa.

A.5 List of country details

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

Country	Financial dev.	Country risk	Tax rate	Thin cap. rule
Denmark	187.24	10.79	25	0.20
United Kingdom	173.23	19.78	26	0.50
Japan	172.90	25.34	41	0.25
Spain	166.75	33.29	30	0.25
Portugal	156.20	38.65	25	0.33
Iceland	141.47	40.16	18	0
South Africa	139.60	40.80	28	0.25
Korea, Republic of	138.13	27.72	22	0.25
Thailand	130.65	37.00	30	0
Sweden	126.41	11.26	26.3	0
Norway	125.61	6.56	28	0
China	122.75	36.45	25	0.33
Greece	117.16	47.62	20	0.25
Netherlands	115.83	13.33	25	0
Malaysia	108.43	35.25	25	0
Vietnam	101.80	50.54	25	0
Chile	101.29	26.39	20	0.25
France	96.78	19.10	33.33	0.40
Austria	96.06	15.99	25	0
Italy	94.71	28.80	27.5	0.20
Israel	91.22	33.17	24	0
Finland	89.89	13.04	26	0
Mauritius	89.31	55.22	15	0
Germany	84.60	15.02	29	0.40
Slovenia	82.21	25.55	20	0.20
Estonia	78.07	41.21	21	0
Latvia	78.05	47.53	15	0.20
Tunisia	76.49	54.59	30	0
Ukraine	71.08	56.03	23	0
Morocco	70.45	48.72	30	0
Croatia	70.28	43.49	20	0.20

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Table A.1 – *Continued from previous page*

Country	Financial dev.	Country risk	Tax rate	Thin cap. rule
Bulgaria	65.58	46.18	10	0.25
Kuwait	60.81	29.53	15	0
Hungary	58.83	40.33	19	0.25
Brazil	58.08	36.78	34	0.33
Montenegro	55.29	62.03	9	0
Belgium	54.96	22.19	33	0.50
Poland	51.39	29.01	19	0.25
India	51.29	41.40	42.23	0
Lithuania	49.57	42.95	15	0.20
Turkey	49.42	42.93	20	0.25
Czech Republic	48.67	25.23	19	0.20
Namibia	48.57	52.35	34	0.25
Serbia	47.56	55.66	10	0.20
Honduras	46.94	53.66	25	0
Slovakia	46.66	26.58	19	0
Costa Rica	46.01	51.19	30	0
Macedonia	44.85	55.77	10	0.25
Colombia	44.72	41.28	33	0.25
Bangladesh	42.47	66.74	27.5	0
Russia	41.58	43.17	20	0.25
Oman	41.18	32.35	12	0.33
Bolivia	40.79	62.24	25	0
El Salvador	39.75	54.84	25	0
Qatar	39.75	24.47	10	0
Albania	39.46	57.23	10	0
Paraguay	38.94	59.67	10	0
Romania	38.90	50.91	16	0.25
Belarus	37.96	60.16	24	0.25
Moldova	35.90	64.54	0	0
Armenia	35.37	50.34	20	0
Georgia	35.25	52.23	15	0.25
Kazakhstan	35.14	52.09	20	0
Sri Lanka	35.01	45.14	28	0.25

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Table A.1 – *Continued from previous page*

Country	Financial dev.	Country risk	Tax rate	Thin cap. rule
Saudi Arabia	34.10	34.88	20	0
Philippines	31.87	45.54	30	0
Egypt	31.15	58.37	20	0.20
Kenya	30.57	61.29	30	0.25
Indonesia	30.08	41.73	25	0
Senegal	28.53	68.16	25	0
Cambodia	28.25	73.55	20	0
Trinidad and Tobago	28.13	62.98	25	0
Brunai Darussalam	28.12	48.19	22	0
Peru	27.14	43.30	30	0.25
Botswana	26.84	46.00	15	0
Jamaica	26.80	70.98	33.33	0
Nicaragua	26.20	70.41	30	0
Ecuador	25.34	68.59	24	0.25
Mexico	24.75	41.87	30	0.25
Suriname	23.66	66.43	36	0
Guatemala	23.57	64.28	31	0
Mozambique	23.29	61.21	32	0
Uruguay	23.06	52.21	25	0
Dominican Republic	22.93	71.67	25	0
Swaziland	22.38	79.85	30	0
Seychelles	22.25	59.73	33	0
Mauritania	21.73	89.75	25	0
Laos	20.92	90.48	35	0
Venezuela	20.47	57.53	34	0.50
Angola	20.18	65.47	35	0
Pakistan	18.13	65.06	35	0.25
Ethiopia	17.71	61.48	30	0
Azerbaijan	17.28	53.05	20	0
CÃ´te d'Ivoire	16.81	78.12	25	0
Rwanda	16.00	81.64	30	0.20
Zimbabwe	15.79	83.13	25	0.25
Uganda	15.51	64.23	30	0

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Table A.1 – *Continued from previous page*

Country	**Financial dev.**	**Country risk**	**Tax rate**	**Thin cap. rule**
Ghana	15.05	55.29	25	0.33
Argentina	14.01	56.27	35	0.33
Malawi	13.93	65.69	30	0
Algeria	13.72	60.50	19	0
Zambia	13.69	67.17	35	0
Lesotho	13.27	78.27	25	0
Cameroon	12.85	69.82	38.5	0
Tanzania	12.64	63.64	30	0
Nigeria	12.48	57.95	30	0
Madagascar	10.96	66.03	22	0
Sudan	10.82	70.67	35	n/a
Gabon	9.53	55.15	35	0
Congo, Republic of	7.77	71.11	36	0
Equatorial Guinea	7.00	91.47	35	0
Guinea	6.82	71.69	35	0
Myanmar	6.75	78.62	25	0
Iraq	5.41	69.05	15	0
Afghanistan	4.92	76.35	20	0
Chad	4.85	86.28	40	0
Congo, Dem. Rep. of	4.36	77.49	40	0

References

Abbas S.M.A. and A. Klemm, 2013. A partial race to the bottom: corporate tax developments in emerging and developing economies. International Tax and Public Finance 20, 596-617.

Albuquerque R., 2003. The composition of international capital flows: Risk sharing through foreign direct investment. Journal of International Economics 61, 353-383.

Aretz K. and P.F. Pope, 2013. Common factors in default risk across countries and industries. European Financial Management 19, 108-152.

Auriol E. and M. Warlters, 2005. Taxation base in developing countries. Journal of Public Economics 89, 625-646.

Azémar C. and A. Delios, 2008. Tax competition and FDI: The special case of developing countries. Journal of the Japanese and International Economies 22, 85-108.

Baer K., O. Benon and J. Toro, 2002. Improving large taxpayers' compliance: A review of country experience. IMF Occasional Paper No. 215, International Monetary Fund.

Becker J., C. Fuest, 2010. Taxing foreign profits with international mergers and acquisitions. International Economic Review 51, 171-186.

Bénassy-Quéré, Agnès, Fontagné, Lionel, Lahrèche-Révil, Amina, 2005. How does FDI react to corporate taxation?. International Tax Public Finance 12, 583–603.

Besley T. and T Persson, 2013. Taxation and development. Handbook of Public Economics 5, 51-110.

Bucovetsky S., 1991. Asymmetric tax competition. Journal of Urban Economics 30, 167-181.

Crivelli E., R. De Mooij and M. Keen, 2016. Base erosion, profit shifting and developing countries. FinanzArchiv/Public Finance Analysis 72, 268-301.

Davies R.B., J. Martin, M. Parenti, and F. Toubal, 2018. Knocking on tax haven's door: Multinational firms and transfer pricing. Review of Economics and Statistics 100, 120-134.

Davies R.B. and K.C. Vadlamannati, 2013. A race to the bottom in labor standards? An empirical investigation. Journal of Development Economics 103, 1-14.

de Mooij R.A. and S. Ederveen, 2003. Taxation and foreign direct investment: A synthesis of empirical research. International Tax and Public Finance 10, 673-693.

Desai M.A., C.F. Foley and J.R. Hines, 2004. A multinational perspective on capital structure choice and internal capital markets. Journal of Finance 59, 2451-2488.

Desai M.A., C.F. Foley and J.R. Hines, 2008. Capital structure with risky foreign investment. Journal of Financial Economics 88, 534-553.

Devereux M.P., B. Lockwood and M. Redoano, 2008. Do countries compete over corporate tax rates? Journal of Public Economics 92, 1210-1235.

Duffie D., L. Saita and K. Wang, 2007. Multi-period corporate default prediction with stochastic covariates. Journal of Financial Economics 83, 635-665.

Emran M.S. and J.E. Stiglitz, 2005. On selective indirect tax reform in developing countries. Journal of Public Economics 89, 599-623.

Figlewski S., H. Frydman and W. Liang, 2012. Modeling the effect of macroeconomic factors on corporate default and credit rating transitions. International Review of Economics and Finance 21, 87-105.

Fuest C., S. Hebous and N. Riedel, 2011. International debt shifting and multinational firms in developing economies. Economics letters 13, 135-138.

Fuest C., B. Huber and J. Mintz, 2005. Capital mobility and tax competition, Foundations and Trends in Microeconomics 1, 1-62.

Fuest C. and N. Riedel, 2012. Tax evasion and tax avoidance in developing countries: The role of international profit shifting. In: Reuter P. (editor): Draining development? The sources, consequences and control of flows of illicit funds from developing countries, The World Bank.

Giavazzi F. T. Jappelli and M. Pagano, 2000. Searching for non-linear effects of fiscal policy: Evidence from industrial and developing countries. European Economic Review 44, 1259-1289.

Gordon R. and W. Li, 2009. Tax structures in developing countries: Many puzzles and a possible explanation. Journal of Public Economics 93, 855-866.

Gresik T.A., D. Schindler and G. Schjelderup, 2015.The effect of tax havens on host country welfare. CESifo Working Paper No. 5314.

Grubert H. and J. Mutti, 1991. Taxes, tariffs and transfer pricing in multinational corporate decision making. Review of Economics and Statistics 73, 283-285.

Haufler A. and F. Stähler, 2013. Tax competition in a simple model with heterogeneous firms: How larger markets reduce profit taxes. International Economic Review 54, 665-692.

Hines J.R. and E. Rice, 1994. Fiscal paradise: Foreign tax havens and American business. Quarterly Journal of Economics 109, 149-182.

Hines J.R., 2005. Do tax havens flourish? in: Poterba J.M. (ed.), Tax policy and the economy 19, Cambridge: MIT Press.

IMF, 2011. Revenue mobilization in developing countries. The International Monetary Fund, Washington D.C..

Janeba, E., 2002. Attracting FDI in a politically risky world. International Economic Review 43, 1127-1155.

Johannesen N., T. Tørsløv and L. Wier, 2017. Are less developed countries more exposed to multinational tax avoidance? Method and evidence from micro-data. WIDER Working Paper 2016/10, Helsinki.

Julio B. and Y. Yook, 2016. Policy uncertainty, irreversibility, and cross-border flows of capital. Journal of International Economics 103, 13-26.

Kang W., K. Lee and R.A. Ratti, 2014. Economic policy uncertainty and firm-level investment. Journal of Macroeconomics 39, 42-53.

Keen M., 2008. VAT, tariffs, and withholding: Border taxes and informality in developing countries. Journal of Public Economics 92, 1892-1906.

Keen M., 2012. Taxation and development – again. IMF Working Paper WP/12/220.

Keen M. and B. Lockwood, 2010. The value added tax: Its causes and consequences. Journal of Development Economics 92, 138-151.

Keen M. and M. Mansour, 2010. Revenue mobilisation in Sub-Saharan Africa: Challenges from globalisation II - Corporate taxation. Development Policy Review 28, 573-596.

Kesternich I. and M. Schnitzer, 2010. Who is afraid of political risk? Multinational firms and their choice of capital structure. Journal of International Economics 82, 208-218.

Lucas R.E., 1990. Why doesn't capital flow from rich to poor countries? American Economic Review 80, 92-96.

Mardan M., 2017. Why countries differ in thin capitalization rules: The role of financial development. European Economic Review 91, 1-14.

Mody A. and K. Srinivasan, 1998. Japanese and US firms as foreign investors: do they march to the same tune? Canadian Journal of Economics 31, 778-799.

Mutti J. and H. Grubert, 2004. Empirical asymmetries in foreign direct investment and taxation. Journal of International Economics 62, 337-358.

Raff H. and K. Srinivasan, 1997. Tax incentives for import-substituting foreign investment: Does signaling play a role? Journal of Public Economics 67, 167-193.

Rincke J. and F. Mittermaier, 2013. Do countries compensate firms for international wage differentials? Journal of Public Economics 102, 23-36.

Rocha R., G. Ulyssea and L. Rachter, 2018. Do lower taxes reduce informality? Evidence from Brazil. Journal of Development Economics 134, 28-49.

Sanjo Y., 2012. Country risk, country size, and tax competition for foreign direct investment. International Review of Economics and Finance 21, 292-301.

Schneider F.G., 2004. The size of the shadow economies of 145 countries all over the world: First results over the period 1999 to 2003. IZA Discussion paper series No. 1431.

Tang, D.Y. and Yan, H., (2010). Market conditions, default risk and credit spreads. Journal of Banking and Finance 34, 743-753.

Tanzi V. and H.H. Zee, 2000. Tax policy for emerging markets: Developing countries. National Tax Journal 53, 299-322.

Wei S.-J., 2000. How taxing is corruption on international investors? The Review of economics and statistics 82, 1-11.

Wilson J.D., 1991. Tax competition with interregional differences in factor endowments. Regional Science and Urban Economics 21, 423-451.

Wilson J.D., 1999. Theories of tax competition. National Tax Journal 52, 269-304.