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WORKING PAPER

Why Lower Tax Rates May be Ineffective to Encourage Investment: The Role of The Investment Climate

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Why Lower Tax Rates May be Ineffective to Encourage Investment: The Role of The Investment Climate

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Abstract:

In this paper we first analyze theoretically how the investment climate can affect the impact of corporate taxation on investment in a simple tax competition model where the corporate tax revenues are used to improve the investment climate. We find that an improvement of the investment climate increases the sensitivity of capital to the tax rate if the investment climate is very effective at enhancing the productivity of capital or if the investment climate enhances the productivity of capital much more when the initial investment climate is unattractive than when the initial investment climate is already attractive. As a result, the model calls for the estimation of an investment equation where the tax variable is moderated by an investment climate variable.

We estimate such an investment equation using a unique panel dataset of effective corporate tax rates of 80 countries, including countries with an unattractive and countries with an attractive investment climate, for the period 2005-2008. We find two important results. First, a better investment climate increases the sensitivity of FDI to the tax rate. Second, in the worst investment climate countries, FDI reacts not negatively to a rise in the tax rate.

These results have important policy implications. For bad investment climate countries it is ineffective to lower the tax rate to compensate for the bad investment climate. Instead, these countries should focus on improving the basic investment climate.

Keywords: tax competition, investment climate, developing countries, Foreign Direct Investment, corporate tax

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1. Introduction

The neoclassical investment theory, pioneered by Jorgenson (1963) predicts that lowering the tax burden - through a drop in the user cost of capital - increases investment. This prediction has been tested many times[1]. The results of the empirical research on the relationship between investment and taxation are mixed, depending on how the data are defined, which periods and regions are covered, the methodology used, etc (Devereux 2006). In their Meta analysis De Mooij and Ederveen (2003) find a median tax rate elasticity of foreign capital of -3.3. Their Meta analysis offers interesting insights in how conceptual issues explain the heterogeneity of evidence. However, in this paper we investigate how differences in the investment climate between countries can moderate the relationship between investment and taxation. More precisely we focus on that part of the investment climate that can be directly affected by government policy, and that is crucial for the productivity of capital. Concretely, we examine the impact of public goods such as the regulatory quality, the rule of law, basic infrastructure, etc. on the effect of corporate taxation on investment.

We want to provide policy makers and policy advisers with better insights on the extent to which the investment climate moderates the relationship between investment and tax. Two quotes from policy notes of the OECD and the World Bank demonstrate that this is a relevant topic:

"There is a broad agreement that a low host country tax burden cannot compensate for a generally weak or unattractive FDI environment… Tax is but one element and cannot compensate for weak non-tax conditions" (OECD 2007).

"…tax incentives are a poor instrument for compensating for negative factors in a country's investment climate" (World Bank, Morisset 2003).

The rationale behind this is that lower the tax rates are effective in attracting investment if the investment climate is attractive, but not if the investment climate is unattractive. These statements are more based on anecdotic evidence and surveys than on theory and empirical

[1] For excellent overviews see Devereux (2006), Feld and Heckmayer (2009), Hines (1999), and OECD (2007).

evidence. Common to the empirical papers is that the theoretical framework underlying the interaction between investment climate variables and tax are rather weak. Bénassy-Quéré et al. (2007) present a theoretical model but they do not completely analyze the behavior of the interaction between capital taxation and the investment climate.

In this paper we start with providing a simple theoretical framework, based on the tax competition model of Zodrow and Mieszkowski (1986), in which public goods enhance the productivity of capital and in which the public good is financed by the corporate tax. The model explains that capital can react positively or negatively to a rise in the corporate tax rate depending on how effective the public good is at enhancing capital's productivity. We find that this relationship crucially depends on whether a higher corporate tax rate increases the tax revenue, i.e. on whether a country is on the rising or falling side of the Laffer curve. Next, the model explains that the investment climate can have a positive or negative impact on the relationship between capital and the tax rate depending on: (i) how complementary the public good is to capital, (ii) whether a higher corporate tax rate leads to higher or lower tax revenues and (iii) the rate at which the effectiveness of the public good at enhancing the productivity decreases as the level of the public good increases.

The model implies that one should take account of the moderating impact of the investment climate on the relationship between investment and corporate taxation when estimating investment equations across countries. We do so using a unique dataset of marginal effective tax rates (METRs) from Chen and Mintz (2009) of 80 countries, including low and highly developed countries, for the period 2005-2008. Further, we impose two important restrictions to our data selection. First, we select investment climate variables that correspond to two assumptions of the theoretical model: they are complementary to investment, and their outcome can improve if the government disposes of higher tax revenues. Second, we select a sample of countries ranging from countries with very low (unattractive) levels of the investment climate to countries with very high (attractive) levels, allowing for variations in the

complementarity of the investment climate variables. We use FDI inflows as a percentage of GDP as the dependent variable.

We find that in countries with a very poor basic investment climate, capital does not react negatively on a rise of the tax rate. The reaction gets more negative as the investment climate improves. As a result, if the basic investment climate is poor, governments should focus on improving the investment climate and not on lowering the tax burden which is ineffective in such a situation. Moreover, higher tax revenues help to improve the investment climate.

Section 2 reviews the literature. Section 3 sets out the theoretical model. Section 4 describes the data and the methodology. Section 5 presents the results, which are further discussed in section 6. Section 7 concludes.

2. Literature review

The little empirical evidence on the impact of the investment climate on the effect of corporate taxes on investment consists of two kinds: (i) studies that split samples in better and worse investment climate countries and that estimate separate elasticities of capital to taxation for each sample, and (ii) studies that explicitly interact investment climate variables with the tax variable in investment equations[2]. Table 1 gives an overview of both kinds of studies that consider the moderating impact of the investment climate or of other development related variables.

Demekas et al. (2007) study FDI flows to 16 South, Central and Eastern European countries and find that FDI is more sensitive to taxation in high GDP per capita countries than in low GDP per capita countries. At the same time, FDI is more sensitive to infrastructure in low GDP per capita

[2] A third option could be to look at separate studies focusing on good IC countries and bad IC countries. However, comparing results of studies that use good IC countries versus studies that use bad IC countries would be dangerous because of differences in data definitions, estimation methodology, etc. A few studies of which we know that only focus on poor investment climate countries, assuming for a second that developing countries are poor IC countries, are Gastanaga et al. (1998), Klemm and Van Parys (2009), and Van Parys and James (2010).

countries. In a study of FDI flows to 18 EU countries, Bénassy-Quéré et al. (2007) find that FDI is more sensitive in the sample of low public capital countries than in the sample with high public capital countries. Given the selection of EU host countries, it is likely that the variance in public capital is rather low and that all sample countries provide the most vital investment climate needs for investors. Therefore, their results should be interpreted as results within a group of countries with a generally good investment climate. Turning to studies using interaction variables, we note that Mutti and Grubert (2004) for US firms and Azemar and Delios (2008) for Japanese firms, find that the location decision of multinationals to developed and developing countries is more sensitive to tax when GDP is lower, GDP per capita is lower, host countries are less developed, have less public goods or a worse quality of public governance. Bellak et al. (2007) find that the FDI flow to 8 CEEC countries is more sensitive to taxation if the infrastructure is poorer, but the coefficient of their interaction term is not significant. Gorg et al. (2009), on the other hand, study 18 OECD countries and find a higher sensitivity of FDI flows to taxation if social expenditures (as a share of GDP) are higher. A final empirical study that contributes to the discussion, be it from a different angle, is a study of Hines (2009) who finds that tax havens are typically countries with high-quality governance institutions. According to him tax havens are likely to be unsuccessful in the absence of high-quality governance.

These apparently mixed results force us to be very careful interpreting them before drawing policy implications about the impact of the investment climate on the effectiveness of lowering the tax burden. The results depend on a number of important conceptual settings. The results depend on the kind of investment climate or development variable that is used and on the level of variance of this variable across the sample countries. For example, in studies with only developed countries, with a generally good investment climate, a worse investment climate does not mean a bad investment climate. Furthermore, some investment climate or development variables are more crucial or complementary to investment than others.

Table 1: Literature overview.

Author	**Period-Countries**	**Dep var**	**Sample split/**	**Results**

			Interaction	
Demekas et al. (2007)	1995-2003 FDI from 24 (EU 15 +9) to 16 South, Central and Eastern European countries	FDI flow	Sample split: GDPpc > $ 5887 GDPpc < $ 5887	- FDI more sensitive to STR in high GDPpc countries - FDI more sensitive to infrastructure in low GDPpc countries
Bénassy-Quéré et al. (2007)	1994-2003 US FDI to 18 EU countries	FDI flow	Sample split: high and low public capital countries	FDI more sensitive to tax in low public capital countries
Mutti and Gubert (2004)	1982/1989/1994 US MNCs to 47 (for activity) or 60 [a] (for location) countries	Activity (GPO), and location decision	Interaction: AETR*GDP AETR*GDPpc	Activity and location more sensitive to tax when: - GDP higher - GDPpc higher
Azemar and Delios (2008)	1990-2000 Japanese firms to 66 developed and developing countries	Location decision	Interaction: STR*(L)DC [b] STR*GDPpc STR*public goods STR*quality of public governance	Location decision more sensitive to STR in: - less developed countries - low GDPpc countries - low public good countries - low quality of public governance countries
Bellak et al. (2009)	1995-2004 FDI from 7 western countries to 8 CEEC countries	Bilateral FDI flow	Interaction: BEATR*infra	Higher sensitivity of FDI to tax if infrastructure low, but not significant
Gorg et al. (2009)	1984-1998 18 OECD countries	FDI flow	Interaction: EMTR*soc exp (% GDP)	Higher sensitivity of FDI to tax if higher social expenditures

[a]: Only countries with >= 5 inv projects selected

[b]: dummy for less developed and developed countries

3. Theoretical analysis

The review of the empirical literature showed that there are important differences of the sensitivity of capital to the tax rate across countries and over time. Moreover, also the impact of the investment climate on the sensitivity of investment to taxation is ambiguous. In this section we present a theoretical framework to explain the impact of the investment climate on the derivative of capital to the corporate tax rate. Throughout this section we talk about public goods rather than the investment climate. An investment climate variable satisfies the definition of a public good in the sense of the model if it is non rival and non excludable, under control of the government, and if higher tax revenues can improve the investment climate outcome. We interpret this definition rather broadly by considering variables such as the regulatory quality, the rule of law, security of property rights, etc. as public good variables.

3.1 The basic tax competition model

The analysis is based on the basic tax competition model of Zodrow and Mieszkowski (1986), henceforth Z-M. In the model citizens play the role of consumer and producer. Together, the N citizens of a jurisdiction possess the amount of capital $\overline{K}$. The producer behaves competitively and takes government policies as given. He maximizes profits by choosing the appropriate level of capital *K*. Next to capital, also the public good *G* is a useful production factor. The production function for producing the private numéraire good is denoted by $F(K,G)$. The production function is characterized by:

- decreasing marginal productivity: $F_K > 0, F_{KK} < 0$
- complementarity of capital and the public good: $F_{KG} > 0$
- decreasing complementarity of capital and the public good with rising *G* and *K*: $F_{KGG} < 0$, $F_{KKG} < 0$

Capital is perfectly mobile between jurisdictions and it follows from international arbitrage that the single world price for capital is *r*. Next to the world price of capital, the firm also faces a

capital tax rate *t* on capital. The firm maximizes profits when marginal costs equal marginal revenue:

$$F_K = t + r \qquad (1)$$

As a consumer the citizen draws utility from consumption of the private good. The output available for consumption of the private good by citizens is given by the consumers' budget constraint:

$$C = F(K,G) - (r+t)K + r(\overline{K}/N) \qquad (2)$$

Citizens receive the profits from the firm, and the revenue from their endowment of capital.
The government's revenue is determined by the tax rate and the jurisdiction's tax base capital, since *t* is a destination based tax rate. The government produces public goods according to the budget constraint:

$$G = tK \qquad (3)$$

The government chooses the optimal tax rate to maximize the utility U(C, G) of the representative citizen under the constraint of equations (1), (2) and (3).
One can derive the change in capital demand within a jurisdiction due to a change in the tax rate, by differentiating equations (1) and (3) and find:

$$\frac{dK}{dt} = \frac{1 - F_{KG}K}{tF_{KG} + F_{KK}} \qquad (4)$$

3.2 The interpretation of *dK/dt*

The denominator of (4) can be called the overall marginal productivity of capital (See Dhillon et al. (2007)). When capital goes up, this affects the productivity of capital F_K in two ways. First, it decreases the productivity of capital because of the decreasing marginal productivity ($F_{KK}<0$). Second, a rise in capital also causes the public good to rise, by a factor t (according to equation (3)). Now, a rise in the public good increases the productivity of capital because they are complementary ($F_{KG}>0$). As a result, there are two opposite forces on the productivity of capital. Z-M assume that the overall marginal productivity of capital is negative. This assumption rules out the possibility of ever increasing demand for capital since the overall productivity rises due to the provision of public goods[3].

Given the negative denominator, the overall sign of *dK/dt* depends on the sign of the numerator. Z-M assume that the numerator is always positive, irrespective of the level of public goods[4]. However, we follow the argument of Dhillon et al. (2007) and Sinn (2003) that this assumption should be relaxed to allow the numerator to be negative. The sign of the numerator depends on the magnitude of F_{KG}, i.e. the extent to which the public good enhances the marginal productivity of capital or the extent to which the public good is complementary to capital. It is possible that the marginal value of the public good – through productivity enhancement -, i.e. $F_{KG}K$, is higher than the marginal cost of the tax rate, which is by assumption equal to one. This would mean a negative denominator and a positive overall *dK/dt*[5]. The basic intuition is that, the more public goods contribute to the productivity of capital, the less capital is *opposed*[6] to a rise in the tax rate.

However, to know the complete impact of the complementarity of the public good and capital, one may not solely rely on the analysis of the numerator. F_{KG} also appears in the denominator. When taking the total derivative of *dK/dt* to F_{KG}, we find that a higher complementarity of the

[3] This is equivalent to saying that the marginal product of capital exhibits decreasing returns to scale as a function of capital and the public good (Bénassy-Quéré et al. 2007).
[4] As a result, *dK/dt* is always negative: raising the tax rate leads to capital flight. From this result follows a race to the bottom with countries undercutting each other's tax rate, resulting in under-provision of the public good.
[5] This would then lead to a race to the top with overprovision of public goods.
[6] We prefer to use the term 'opposed' here rather than 'sensitive' because we allow dK/dT to be positive. If dK/dT is positive, 'more opposed' still means a lower dK/dT, while 'more sensitive' would mean a higher dK/dT.

public good and capital only leads to a lower *opposition* of capital to a rise in the tax rate under a certain condition. Formally,

$$(\frac{dK}{dt}) / dF_{KG} = \frac{-KF_{KK} - t}{(tF_{KG} + F_{KK})^2} \qquad (5)$$

is only positive if $(-KF_{KK} - t)$ is positive. We show in the appendix A1 that $(-KF_{KK} - t)$ is only positive if an increase in the tax rate – through a rise of the tax revenue - leads to an increase in the public good (*dG/dt>0*). This is not the case if a rise in the tax rate does not make up for the fall of the tax base due to the rise of the tax rate (*dG/dt<0*)[7] [8]. Thus,

$$(\frac{dK}{dt}) / dF_{KG} \quad \begin{cases} > 0 \Leftrightarrow dG/dt > 0 \\ < 0 \Leftrightarrow dG/dt > 0 \end{cases}$$

This outcome is illustrated graphically in appendix B1.

Proposition 1a: Capital is less *opposed* to a rise in the tax rate if the complementarity of the public good and capital is higher, conditional on the fact that the rise in the tax rate leads to more public goods.

Next to the complementarity of the public good and capital (F_{KG}), we also study the importance for *dK/dt* of the rate at which the productivity of capital diminishes, i.e. F_{KK}. We will need this result in section 3.3. The derivative of *dK/dt* to F_{KK} is:

$$(\frac{dK}{dt}) / dF_{KK} = \frac{(1 - KF_{KG})}{(tF_{KG} + F_{KK})^2} \qquad (6)$$

[7] *dG=Kdt+tdK*, this is negative if *Kdt<tdK*.

[8] Note that the reason of this more nuanced result is that F_{KG} not only occurs in the numerator of *dK/dt* but also in the denominator. For example Dhillon et al. (2007) and Bénessy-Quéré et al. (2007) only analyze the numerator when it comes to the complementarity of public goods and capital.

This expression is positive if $(1 - KF_{KG})$ is positive, i.e. if *dK/dt* is negative. Thus,

$$(\frac{dK}{dt}) / dF_{KK} \quad \begin{cases} > 0 \Leftrightarrow dK/dt < 0 \\ > 0 \Leftrightarrow dK/dt > 0 \end{cases}$$

Intuitively, a higher rate of decreasing productivity of capital decreases the sensitivity of capital to the tax rate: if the productivity of capital rises less with the amount of capital, the demand of capital is less sensitive to changes in the user cost of capital, including the tax rate. As a result, the change in capital (*dK*) gets lower. For *dK/dt*, it means that a higher rate of decreasing productivity of capital brings *dK/dt* closer to zero: if *dK/dt* is positive it lowers *dK/dt*, if *dK/dt* is negative it increases *dK/dt*.

Propostion 1b: capital is less *sensitive* to a rise in the tax rate, if the rate at which the productivity of capital decreases is higher. As a result, capital is more (less) *opposed* to a rise in the tax rate, as the productivity of capital decreases at a higher rate, if *dK/dt* is positive (negative).

This outcome is illustrated graphically in appendix B2.

3.3 The interpretation of *(dK/dt)/dG*

The above analysis shows that the sensitivity of capital to taxation depends on the level of public goods. We analyze the total impact of the level of the public good G on *dK/dt*, by analyzing the impact of the level of the public good (i) on the complementarity of the public good and capital and (ii) on the rate at which the productivity of capital decreases.

Concerning the complementarity of the public good and capital, the basic tax competition model assumes that the complementarity decreases when the level of the public good goes up

($F_{KGG}<0$). The more public goods, the less an extra unit of the public good enhances the productivity of capital. Combining this with propostion 1a – higher complementarity of public good and capital lead to higher opposition of capital to a higher tax rate - one could prematurely conclude that capital always gets *more opposed* to a rise in the tax rate (*dK/dt* gets lower) if the level of public goods is higher, because an extra public good becomes less productivity enhancing. This is where the analysis of Dhillon et al. (2007) and Bénassy-Quéré et al. (2007) stops. Again, we find that this is only valid if a higher tax rate – though higher tax revenues – leads to more public goods, i.e. that a country is on the rising side of the Laffer curve.

But, an increase in the level of public good provision also has an impact on the rate at which the productivity of capital decreases. The tax competition model assumes that the productivity of capital decreases faster at higher levels of the public good ($F_{KKG}<0$). Combining this with propostion 1b – faster decreasing returns lead to lower sensitivity of capital to the tax rate - we get that capital becomes less sensitive to a rise in the tax rate at higher levels of the public good (*dK* gets closer to zero). If *dK/dt* is positive, less sensitive means *more opposed* to a rise in the tax rate (*dK/dt* gets lower), while if *dK/dt* is negative, less sensitive means *less opposed* (*dK/dt* gets higher).

Therefore, if a country is on the rising side of the Laffer curve ($dG/dt>0$), three possibilities with respect to the impact of the level of public goods on the derivative of capital to the tax rate arise. If *dK/dt* is positive, both forces work in the same direction: a higher level of the public good always makes capital more opposed to a rise in the tax rate (*dK/dt* gets lower). Formally, the total derivate of *dK/dt* to the level of public goods can be written as follows:

$$(\frac{dK}{dt}) / dG = \frac{F_{KGG}(-KF_{KK} - t) - F_{KKG}(1 - F_{KG}K)}{(tF_{KG} + F_{KK})^2} \qquad (7)$$

Indeed, this is negative when $(-KF_{KK} - t)$ is positive (rising side of Laffer curve) and $(1 - F_{KG}K)$ is negative (initial *dK/dt* is positive). Note that the initial *dK/dt* can only be positive if the public good is very effective at enhancing the productivity of capital. Graphically, this result is illustrated in appendix B3.

If *dK/dt* is negative, both forces work in opposite directions. Then, the overall effect depends on the relative magnitude of F_{KGG} versus F_{KKG}. Only if the rate at which more public goods reduce the complementarity of public goods is high relative to the rate at which more public goods enhance the decreasing productivity of capital, will capital become more opposed to a rise in the tax rate at higher levels of the public good. In appendix A2, we show that the probability of getting a negative *(dK/dt)/dG* indeed decreases with F_{KGG} and increases with F_{KKG}. Graphically, this result is illustrated in appendix B4.

Formally, table 2 illustrates these possibilities in the first three lines. The last three lines illustrate the three possibilities when countries are at the decreasing end of the Laffer curve.

Table 2: The sign of (dK/dt)/dG

$1) dG/dt > 0$	$a) dK/dt > 0$		$\Rightarrow (dK/dt)/dG < 0$
	$b) dK/dt < 0$	$i) F_{KGG}(-KF_{KK} - t) - F_{KKG}(1 - F_{KG}K) < 0$	$\Rightarrow (dK/dt)/dG < 0$
		$ii) F_{KGG}(-KF_{KK} - t) - F_{KKG}(1 - F_{KG}K) > 0$	$\Rightarrow (dK/dt)/dG > 0$
$2) dG/dt < 0$	$a) dK/dt < 0$		$\Rightarrow (dK/dt)/dG > 0$
	$b) dK/dt > 0$	$i) F_{KGG}(-KF_{KK} - t) - F_{KKG}(1 - F_{KG}K) < 0$	$\Rightarrow (dK/dt)/dG < 0$
		$ii) F_{KGG}(-KF_{KK} - t) - F_{KKG}(1 - F_{KG}K) > 0$	$\Rightarrow (dK/dt)/dG > 0$

In short, based on our theoretical model we can formulate the following propositions:

Proposition 2a: if higher tax rates lead to more (less) public goods, and if *dK/dt* is positive (negative), capital always becomes more (less) opposed to a rise in the tax rate as the level of public goods increases.

Proposition 2b: if higher tax rates lead to more (less) public goods, and if *dK/dt* is negative (positive), capital is more (less) likely to become more opposed to a rise in the tax rate as the level of public goods increases:

- **as the rate at which the level of public goods diminishes the complementarity of public goods and capital is higher, i.e. F_{KGG} more negative.**
- **as the rate at which the level of public goods enhances the decreasing productivity of capital, is lower, i.e. F_{KKG} less negative.**

4. Empirical analysis

4.1. From theory to empery

The theoretical framework shows that the relationship between capital and corporate taxation can be negative or positive. It demonstrates how the sensitivity of capital to taxation depends on the level of public goods. As a result, it calls for the inclusion of an interaction term between the tax rate and the level of public goods when investigating the relationship between capital taxation and investment. The model gives possible interpretations for the sign of the interaction term. The sign depends on how complementary the public good is, how the complementarity changes with the level of the public good, and on the position of the country on the Laffer curve. For the rest of the empirical analysis we will use the term 'investment climate', interpreted as the public goods for investors, instead of 'public goods'.

Following the model we add the interaction term between the corporate tax and the investment climate variable to the investment specification, which gives:

$$INV = \alpha + \beta TAX + \gamma IC + \delta TAX.IC + \rho X + u \quad (6)$$

Where *INV* is investment, *TAX* denotes the capital tax rate, *IC* is the investment climate variable, *X* a vector of control variables and *u* the residual term. This kind of ad hoc investment equation has proven useful in assessing the impact of taxation on investment when the only available data are aggregate investment. This is the case in this study since we want to include countries with good and bad investment climates.

In order to stick to the mechanisms of the theoretical framework, we are careful in selecting the variables of interest: investment, the corporate tax rate and the investment climate. According to the model investment must be very mobile. We use FDI because it is very footloose and largely available. Next, we want the investment climate variable to satisfy the definition of the public good in the model as good as possible. This means that it must be productivity enhancing or complementary to capital ($F_{KG}>0$), and that the outcome of the public

good variable must improve if the tax revenue increases ($G=tK$). Further, when selecting the observations, we want a large variance in the investment climate variable in order to establish its impact on the relation of capital to the tax rate. We need observations where the investment climate is bad and observations where the investment climate is good, so that additional public goods can be more complementary in some than in other observations ($F_{KGG}<0$). The variance of the investment climate within countries over time is limited. Moreover accurate data on effective corporate tax rates and the investment climate - in the sense of the public good in the model - are not available for long periods of time. This constrains us to exploit rather cross country variance over a relatively short period of time. Specifically, the unique dataset of marginal effective tax rates of Mintz and Chen (2009) demarcates our dataset to 80 countries for the period 2005-2008. The econometric issues for the analysis of this kind of panel are discussed in section 4.3..

The vector of control variables allows taking account of factors outside the model that also affect investment and that are correlated with the corporate tax rate and the investment climate variable, which could cause identification issues. It also allows to partially correct for certain assumptions of the model that are very restrictive, but useful to focus the analysis on the relationship of interest. One restrictive assumption is that the model neglects labor taxation despite the widespread use of it. We include labor taxation as a control variable to level the playing field. Another strong assumption is that governments are benevolent and use tax revenues to improve the investment climate. We add a measure of corruption to partially correct for the presence of less benevolent governments.
The detailed definitions of these and other control variables and the variables of interest are presented in the next data section.

4.2. Data

As the *investment* variable we use FDI inflows as a percent of GDP (*FDI*). The FDI inflow data come from the World Bank's World Development Indicators. The most recent available FDI data

are for 2008. We divide the FDI inflows by GDP to make them more comparable across countries. FDI inflow data are the best available investment data that are also available for countries with a poor investment climate. We believe that FDI is a good investment measure in the context of this paper because it is very footloose. As a result it fits well into our theoretical model.

As the *capital tax rate* variable we use the unique set of marginal effective tax rates (*METR*) on capital for 80 developed and developing countries over the period 2005-2008, calculated by Chen and Mintz (2009). The dataset is exceptional because it calculates METRs for a selection of countries that, more than any other tax dataset includes countries with a very poor investment climate. There has been much discussion in the literature about which tax rate should be used in empirical analysis (e.g. Devereux and Griffith (1998), Devereux (2006), and de Mooij and Ederveen (2008)). Although every tax measure has its strengths and weaknesses, incremental investment decisions should depend on the marginal effective tax rate. Moreover the *METR* is a forward looking measure which should be generally preferred to backward looking measures. The advantage of a forward looking measure is that it is not based on data on realized profits and tax payments, which could introduce an important endogeneity bias (Devereux (2006)). In our theoretical model the average and marginal tax rate are the same. However, *METR* is the right measure since the model considers marginal investment decisions (see equation (1)). The *METR* is a summary measure of the amount of tax paid as a percentage of the pre-tax return on investments that are marginal, i.e. just sufficient to cover financing and tax costs. Next to corporate income taxes, the *METR* that we use also includes sales and excise taxes on capital purchases and capital-related taxes[9] (Chen and Mintz 2009). We will also use the statutory corporate income tax rate (*STR*) from Chen and Mintz (2009) to see whether the results are sensitive for the tax measure.

The *investment climate* (*IC*) variables, in order to fit the theoretical model, need to enhance the productivity of capital and be financed by tax revenues. The 2005 World Development Report

[9] For a more detailed description of the calculation of the METR by Chen and Mintz see appendix C.

(World Bank 2005) reports the major investment climate constraints for investors based on investment climate surveys in 53 countries. From their list, we filter those variables that are purely public and of which we believe that their outcome can improve as the tax revenue increases. This reduced list consists of: regulations and tax administration, courts and legal systems, and - to a lesser extent because often (semi-) privately provided- electricity, transportation and telecommunications.

The ideal variable would summarize the variables of this list. We define six *IC* variables that cover at least part of the load. We choose outcome variables rather than expenditure variables because of more widespread availability and because the public good outcomes are what count for the investors. The detailed definitions and sources are presented in table 3. The variables that best meet the requirements are the 'regulatory quality' (*REGQUA*) and the 'rule of law' (*RULAW*) indicators from the Kaufmann, Kraay and Mastruzzi (2009) governance indicators. From the Economic Freedom of the World index we take the sub-component 'legal structure and security of property rights' (*LEGPROP*), which is assembled from the International Country Risk Guide, the Global Competitiveness report and the World Bank's Doing Business project. A less strict interpretation of our investment climate variables is given for the The Heritage Foundation's 'investment freedom' indicator (*INVFREE*), which scrutinizes each country's policies towards the free flow of investment capital. Next, we use the World Bank's Doing Business (DB) indicators, which provide ten quantitative measures of regulations[10]. Because not all 10 sub-indicators equally satisfy our definition of public good, we construct the variable *DB6*, which is a score calculated on 6 DB sub-indicators[11]. We leave out three sub-indicators that are related to market regulations (see definition table 3) of which we believe the outcome depends less on tax revenues, and the 'paying taxes' sub-indicator because it overlaps with our tax variable. Finally, as an infrastructure variable, we use the 'basic requirements' indicator

[10] starting a business, dealing with construction permits, employing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts and closing a business.

[11] We prefer to calculate a score to the DB ranking because an ordinal variable is less accurate to reflect the variance across countries. The calculation of the score is based on the scores of six sub-indicators that together constitute the World Bank DB rank. In the calculation of the score of every of the six DB sub-indicators gets an equal weight and within every sub-indicator every sub-sub-indicator gets an equal weight. This methodology corresponds to the methodology of calculating the Doing Business ranking (see www.doingbusiness.org) but using the indicator scores instead of the ranks. The correlation between our DB score and the DB rank is -.91. The correlation between the rank based on our score and the World Bank DB score is .96.

(*BASREQ*) from the Global Competitiveness Report. This variable is broader than the definition of the public good that we intend, incorporating also the quality of private institutions and infrastructure and macroeconomic stability, which we will have to keep in mind when interpreting the results[12]. But we consider it a useful robustness check.

For the first four investment climate variables we have data for the period 2004-2007. For the DB6 and BASREQ we only have data for one year, 2007 for DB6 and 2006 for BASREQ[13]. In spite of this we find them interesting enough to use as checks for the robustness of the IC variables. To be able to use them, we expand the DB6 and BASREQ variable over the period 2004-2007, considering them as stable.

For ease of interpretation, all *IC* variables are defined such that a higher value means a better *IC*. For ease of comparison, we standardize the *IC* variables. This will help us interpreting the results of the interaction variable across different regressions with different *IC* variables. Note that several *IC* variables might overlap, summarizing indicators from common sources. This is apparent from table 4 that shows the correlations between the 6 variables. Still, most indicators also seem to partly cover different loads. Also METR is included in the table. The correlation between the investment climate variables and our tax measure is small.

With the investment, tax and investment climate variables at hand we can perform a first descriptive analysis of the interplay between them. Table 5 lists the countries with their *REGQUA* rank. In figure 1 we set out the data points of the year 2008 for *FDI* and *METR* of these countries in a scatter plot. We divide the sample in two groups: the top half *REGQUA* and the bottom half *REGQUA* countries[14]. This simple scatter discloses an interesting pattern. *FDI* in the lower *REGQUA* countries seems to be less responsive to differences in the *METR* than *FDI* in the

[12] We would have liked to also cover the critical investment variable 'transportation'. But no data are available. The WDI provides data on the share of roads paved, but only 47 of our sample countries are covered.

[13] Of the DB indicators not all data on the separate DB sub-indicators are available for earlier years. The global competitiveness index in its current form only exists since 2006.

[14] We exclude Luxemburg because it is an outlier in terms of FDI as a percentage of GDP.

higher *REGQUA* countries[15]. This suggests that a worse investment climate reduces the sensitivity of capital to changes in the tax rate.

To properly test the relationship between investment and the tax rate we will account for a large number of *control variables*. Particularly since our panel dataset is too short to estimate within countries it is important to control for many factors that might be correlated with our variables of interest (tax and the IC) and cause spurious relations if omitted. The definitions and sources of the control variables are detailed in table 6. For the selection of control variables we follow among others Djankov et al. (2008) and Azemar and Delios (2008). We first define a group of basic control variables that will be used in all regressions if they turn out significant. GDP per capita (*GDPPC*) controls for agglomeration effects since average income is higher in countries in agglomerated regions. But it can also point to the productivity level, wages, or the potential for future growth. Population (*POP*) points to the size of the country[16]. Inflation might influence investment through its impact on the cost of capital (Auerbach and Jorgenson 1980). We use the average inflation over the past five years (*INFL*). *OPEN* measures the extent to which the country's economic activity is export oriented. The basic control variables also include a set of regional dummies: Africa (*AFR*), Latin America and the Caribbean (*LAC*), *Asia*, Europe (*EUR*), and Oceania (*OCE*). Finally, for the reasons explained in 4.4. we complete this basic set with a measure for labor taxation (*LABTAX*). *LABTAX* is the percentage of profits taken by labor taxation and social contributions. Next, we define groups of variables that we add to the basic control variables. First, we add corruption (*CORRUP*). *CORRUP* measures the corruption within the political system that reduces the efficiency of government. Second, as an alternative for *OPEN* we also use *TRADE*, an 'Economic Freedom of the World' index that measures how free countries are from tariff and non tariff barriers to trade. Third, we take account of some geographical characteristics of the countries. The geography variables capture how isolated a country is. We use the distance (*DIST*) of a country's capital to the closest of three economic agglomerations (New York, Tokyo and Amsterdam) and we control for the fact

[15] The same patterns appears when leaving out the highest and lowest *FDI* countries.
[16] Since FDI is already divided by GDP, we do not control for the level of GDP anymore. We tried out all regressions below including GDP, but it was never significant.

that a country is landlocked (*LANDLOCK*) and not European. Both variables come from Gallup et al. (1999). Forth, we check additionally for the degree of market liberalization, using a measure that proxies the labor market freedom (*LABMAR*) and the credit market freedom (*CREDMAR*). Further, we also control for political stability of countries using a measure for political stability and the absence of violence (*POLSTAB*) and the degree of democracy and freedom of speech (*VOICE*). Finally, we also control for the presence of natural resources using the discovered oil reserves of a country (*OIL*) and for the extent to which a country is less prone to risk of internal or external conflicts (*CONFLICT*).

Table 7 shows the descriptive statistics of all the variables. Note that the normalized *IC* variables result in zero means and standard deviations equal to one. Luxemburg is left out of the sample because it is an outlier in terms of FDI as a percentage of GDP.

4.3. Econometric specification

Given the panel structure of our data we transform equation (6) to estimate the following investment specification:

$$FDI_{i,t} = \alpha + \lambda FDI_{i,t-1} + \beta TAX_{i,t-1} + \gamma IC_{i,t-1} + \delta TAX_{i,t-1}.IC_{i,t-1} + \rho X_{i,t-1} + \mu_t + u_{i,t}$$
$$u_{i,t} = \eta_i + \varepsilon_{i,t} \qquad (7)$$

where *i* denotes the country and *t* the year. μ_t are fixed year effects, η_i are fixed country effects in the error term. We are primarily interested in the total derivative of investment to the tax rate, $\beta + \delta IC$, and the impact of the *IC* variable on the derivative of investment to the tax rate, i.e. the sign and magnitude of interaction coefficient δ. The interpretation of β is made straightforward because we normalized the *IC* variables. Since the mean of *IC* is zero, β is the derivative of *FDI* to the tax rate when the *IC* of a country is equal to the sample's average *IC*.

We lag the explanatory variables by one year because the investment decision is likely to be based on information available in the year before the investment takes place. It also reduces possible reverse causality. Lagging with one year reduces the length of our panel data set to three years.

We include many additional control variables in *X* to reduce possible unobserved heterogeneity across countries that could cause endogenous relationships between investment, the tax rate and the investment climate.

We adopt the lagged dependent variable $FDI_{i,t-1}$ to reduce serial correlation in the residuals and to allow for persistence of investment. We use the system GMM estimator of Blundell and Bond (1998) that is based on a set of first-differenced and level moment conditions to correct for the bias due to correlation between the lagged dependent variable and the fixed country effects in the error. The data are transformed using forward orthogonal deviations (see Arellano and Bover 1995). Thanks to the robust option the standard errors are consistent with panel-specific autocorrelation and heteroskedasticity in the one step estimation. System GMM is designed for situations with small T (number of time periods) and large N (number of countries) as is the case in this study. The overall validity of the moment conditions is checked by the Hansen test of overidentifying restrictions. The assumption of no serial correlation in the level residuals is tested by the Arellano-Bond m1 and m2 statistic that tests for first and higher order autocorrelation of the first-differenced residuals (see Arellano and Bond 1991)[17]. The second order correlation test m2 cannot be calculated because our time period is limited to three years. However, when performing the regression with four years (not lagging the explanatory variables), the second order correlation tests are satisfactory.

We start testing specification (7) without the interaction term as a benchmark. Then we add the interaction term. Next, we perform the robustness checks. We also use the *STR* instead of the *METR* as the tax variable to see whether the results still hold. Finally, we split the sample in

[17] Therefore, to check for first order correlation in levels, one should look for m2 in differences as the right check.

below and above median *IC* countries, as an alternative to find out the impact of the investment climate on the relationship between corporate taxation and investment.

5. Results

5.1 Basic results

Table 8 presents the results of the estimation of specification (7) without the interaction and with the basic control variables. We repeat the estimation for the six *IC* variables that are mentioned on top of each column. We find that the lagged dependent variable is informative about the current levels, with coefficients around .45 and significant at the 5% level. The Hansen J test of overidentifying restrictions does not reject the chosen instrument set. The second order correlation test cannot be calculated for the reason mentioned above[18]. We observe that the *METR* has a significantly negative impact on FDI as a percentage of GDP at least at the 10% level. On average a 10 percent point lower *METR* results in a 0.95 to 1.10 percent point higher *FDI* rate. The *IC* variables have the expected positive impact on *FDI*, except when using the basic requirements indicator (*BASREQ*), but the coefficients are (just) not significant. Note that *BASREQ* incorporates macroeconomic stability that is also captures by other control variables.

Concerning the basic control variables, the labor tax rate (*LABTAX*) shows a significantly positive impact on FDI as a share of GDP. This result confirms the importance of controlling for labor taxation when investigating the impact of corporate taxation on investment. Investors may appreciate high taxes on labor because they alleviate the tax burden on capital. GDP per capita (*GDPPC)* is significantly negative at least at the 5% level, except when the IC variable is BASREQ. However, the economic significance is rather small with *GDPPC* expressed in thousands of dollars. An increase of the GDP per capita with thousand leads to a decrease of FDI with around

[18] When performing the regression with four years (not lagging the explanatory variables), the second order correlation tests are satisfactory, and the results are qualitatively the same.

.10 percent points of GDP. The negative relationship between GDPPC and FDI can be interpreted as the negative impact of low wages (Globerman and Shapiro 2002), or as the impact of a low return to capital in capital abundant countries (Asiedu 2002). The impact of population is negative but only significant at the 10% level in most columns. Bigger countries have a lower share of FDI to GDP because their investment depends less on foreigners. Inflation (*INFL)* is not significant at all. *OPEN* is significant in almost all equations with the expected positive sign: more trade oriented economies attract a higher share of FDI on GDP. The region dummies point to lower investment in Africa (AFR), Latin America and the Caribbean (LAC) as compared to the benchmark North American countries, although the effect is not always significant.

Table 8 basically serves as a benchmark to analyze the results with interaction terms in table 9, the true focus of this paper. From the comparison of the two tables we can learn how important it is to let the relationship between capital and corporate taxation depend on the investment climate. In table 9 we add the variable *METR*IC*, which again differs over the six columns along with the chosen *IC* variable.

The impact of the lagged dependent variable remains approximately the same. Focusing on the coefficients on *METR* we observe that the coefficients grow in significance compared to table 8. These coefficients must be interpreted as the total derivative of *FDI* to the *METR* when the *IC* is equal to zero, i.e. at the sample average investment climate. Turning to the coefficients on the *IC* variables, we observe that the *IC* now has a significant positive impact on the *FDI* rate at least at the 5% level, except for the broadly defined *IC* variable 'basic requirements'. Apart from BASREQ, a one standard deviation improvement of the investment climate increases the *FDI* rate with between 2.46 percent points in case of 'legal structure and security of property rights' (*LEGPRPOP*) and 3.72 percent points in case of regulatory quality (*REGQUA)*.

To get the full picture of the impact of the METR on FDI, we need to take account of the moderating impact of the *IC* variable on this relationship. The interaction term's coefficient is highly significantly negative for all *IC* variables. This demonstrates that the relationship between corporate taxation and investment much depends on the quality of a country's investment

climate. According to the model and assuming that higher tax rates yield higher tax revenues, the negative sign is due to the high complementarity of the *IC* with capital or to a much higher complementarity of the IC at low levels of the *IC* than at high levels of the *IC*, or both.

With the coefficient on the interaction, we can now calculate the total derivative of *FDI* to *METR*: $\beta + \delta IC$. The minimum and maximum values of the total derivative depend on the sample maximum and minimum level of the *IC* variable. We find that the *FDI* rate reacts very differently to a rise in the *METR* rate in the worst *IC* countries than in the best *IC* countries. If Uzbekistan, the country with the least attractive regulatory quality, would have the regulatory quality of Hong Kong, the country with the most attractive regulatory quality, a drop of the METR with 10 percent points would increase FDI as a share of GDP with 4.3 percent points more than in its current state. If the enforcement of the rule of law in Chad would be as effective as in Iceland, a fall of the METR with 10 percent points would increase the FDI share with 3.3 percent points more. Analogously, if Iran would be characterized by the freedom to invest of the Netherlands, Ireland, Hong Kong, Germany or Belgium, Iran would see its share of investment to GDP rise with 3.5 percent points more following a 10 percent points decrease of the METR. Figure 2 shows how the total derivative (vertical axis) changes with the *IC* (horizontal axis) for the first four *IC* variables[19]. It shows that, at low levels of *IC*, the derivative can be positive and turns negative when a certain level of *IC* is reached. Finding positive derivatives for low levels of *IC* does not mean yet that they are significantly positive. We cannot conclude that the derivative of capital to the corporate tax rate is significantly positive for the worst investment climate countries. However, we can say that the derivative becomes nonnegative. This is quite different from the message of table 8 – without the interaction term - of an overall negative impact of the corporate tax rate on *FDI*[20].

5.2 Adding other covariates

[19] The other two *IC* variables are left out for clearness of the figure.

[20] To avoid concerns of outliers driving the results, we repeat the analysis of table 9 leaving out observations for which FDI as a share of GDP is higher than 20% or lower than -10%. The results are qualitatively similar and therefore not presented. The results are available from the authors upon request.

The first set of robustness checks focuses on adding other control variables to reduce possible unobserved heterogeneity, and reject as much as possible spurious correlations between *METR* or *IC* and *FDI* due to omitted variables. We leave out the basic control variables INFL, ASIA, EUR and OCE that were not significant at all in tables 8 and 9. To save space, table 10 only displays the results using REGQUA as the investment climate variable. We did the same exercise with the other IC variables and obtained qualitatively similar results[21]. In the first column no new controls are added.

In column 2 we add the variable *CORRUP*, which partially corrects for the presence of malevolent governments. Despite the expected positive sign – CORRUP is inversely proportional to the level of corruption – the variable's coefficient is not significant. Next, we adopt *TRADE*, which includes more regulatory measures of trade freedom than the variable OPEN[22]. Because it is a more comprehensive measure TRADE comes in significantly positive at the expense of OPEN. Compared to column 1, the coefficient on *METR* is lower, but still significant at the 10% level. The coefficient on the *IC* variable drops but remains significant. The interaction coefficient is very similar and still very significant at the 1% level. As a result the dampening impact of a bad investment climate on the relationship between the METR and the FDI share remains.

In column 4 we check whether it is the geographical location of the sample countries rather than the tax rate and the investment climate that drives *FDI* by adding two geographical variables. The air distance (*AIRDIST*) to one of three of the world's biggest economic agglomerations enters not significantly, although the negative sign gives support to the gravity model of international investment. Also the fact of being landlocked and outside Europe (*LANDLOCK*) apparently plays no role for the *FDI* rate or is already captured by the combination of other controls. Consequently, controlling additionally for the geographical location has no qualitative impact on our three variables of interest, METR, IC and METR*IC.

Column 5 shows whether the liberal character of the credit and the labor market interferes with the relationship between tax and the investment climate and *FDI*. As expected, easier

[21] The results can be obtained from the authors.

[22] The correlation between them is 0.61

access to the credit market stimulates investment significantly at the 5% level. Also less rigid labor markets encourage FDI, even at the 1% level of significance. Compared to the first column, controlling for market regulations makes the METR coefficient drop but it is still significant. The coefficient on *IC* remains approximately the same, while the coefficient on the interaction term drops a bit to -0.079.

In column 6 we add political variables. As expected political stability (*POLSTAB*) is important for *FDI*. It pops up positively and almost significantly. Note that this variable is highly correlated with any of the *IC* variables[23]. Still, the coefficients on IC and the interaction terms remain significantly positive. The voice and accountability index (*VOICE*) does not enter significantly.

Finally in column 7, we account for the presence of oil reserves in a country, because certainly in less developed countries natural resources may constitute a big share of foreign investment. The variable 'oil reserves' (*OIL*) enters positively but not significant. Also the variable *CONFLICT*, which gives a higher value to countries that run less the risk of internal of external conflicts, enters positive but not significant. Since not significant, both variables have not impact on the *METR* and *IC* variables. In short, despite some small changes in the coefficient levels, the sign and significance of the variables of interest's coefficients are robust to the inclusion of many variables that remove (part of) the heterogeneity across countries.

5.3 Using the Statutory Tax Rate

The second robustness check verifies whether the results are also robust for the tax rate measure. We are convinced that the *METR* is a better measure because it is the effective rate (taking account of the many aspects of the tax code for investment) and because it is the marginal rate that best fits our theoretical model, but it is interesting to check whether the results still hold when using the simple statutory corporate tax rate (*STR*). Table 11 provides the answer. As in table 9, we present the results for several investment climate measures, while including the same basic control variables.

[23] Between 0.60 and 0.84

The coefficients on the *STR* are significantly negative, at least at the 5% level, as with the METR in table 9, and a bit higher in absolute values. Regarding the *IC* variable and the interaction variable *IC*STR*, the result depend on the investment climate variable used. Regulatory quality (*REGQUA*) and the rule of law (*RULAW*) still have a significantly positive impact on FDI as a share of GDP, while the interaction term's coefficient is still significantly negative. The coefficient's values are even slightly more pronounced. However, when using legal structure and security of property rights (*LEGPROP*) and Investment Freedom (*INVFREE*) as IC variables, both the direct and the interaction coefficient become insignificant. We have no clear explanation why including the statutory tax rate takes away part of the explanatory power of these two investment climate variables. Turning to the doing business variable (*DB6*), we find again a significant positive impact on investment, while the interaction coefficient is just not significant. Finally, the basic requirements variable (*BASREQ*) is again not significant, and now also the interaction effect is not significant anymore.

Although *LEGPROP*, *INVFREE* and *BASREQ* loose significance, the signs of their coefficients – including the interaction terms – remain the same. Their lower significance could point out that they are less productivity enhancing or less tax revenue dependent in the sense of the theoretical framework.

5.4. Splitting the sample

As mentioned in the literature section, next to moderating the impact of taxation on investment by the investment climate, another clarifying exercise is to split the sample in bad and good investment climate countries. We perform this analysis splitting the sample into countries with an investment climate below or equal to the median *IC* and countries above the median *IC*. Table 12 shows the results. To save space only the coefficients for *METR* and the *IC* variable are presented[24]. First, we observe that the lagged dependent variable's coefficients are lower in the above median investment climate subset. Concerning the relationship between

[24] If the number of observations below or equal to the *IC* is different from the number of observation above the *IC*, several countries have the median *IC* value. If the sum of the number of countries is higher than the total number of countries (79), some countries are below the median in one year and above in the other year.

METR and FDI, the results confirm that there is an important difference between low and high *IC* countries. A lower *METR* is effective in attracting *FDI* for the countries with an above median investment climate, whatever *IC* measure we use. However, reducing the *METR* has no significantly negative impact on *FDI* in the low *IC* countries. Turning to the impact of the *IC* variables, we find that a better regulatory quality, rule of law or good doing business score is significantly effective in attracting investment in countries where the investment climate is bad, i.e. below median. This is not the case in countries where the investment climate is good, i.e. above median, apart from the slight significance for rule of law. The other investment climate variables are not significant within the split samples but clearly play their role in making the METR more or less effective over the whole sample.

6. Discussion and conclusion

We confirm the general finding that on average lowering the corporate tax rate is effective in attracting investment, irrespective of the corporate tax measure we use. However, we find that the sensitivity of investment to corporate taxation in a country very much depends on the investment climate in that country. The result that reducing the marginal effective tax rate is more effective in countries with a good investment climate than in countries with a bad investment climate is robust. The result is confirmed using various measures of the investment climate, adding several covariates and splitting the sample along the investment climate's median. Lowering the marginal effective tax rate is even ineffective in the worst investment climate countries. Also the statutory corporate tax rate is a more effective policy tool in countries with a better regulatory quality, rule of law or Doing Business indicators. Moreover we find that improving the same three investment climate variables themselves is more effective in countries that are below the median level of the investment climate than in countries above the median.

In the light of our theoretical framework we can interpret these results as follows. Assuming that most countries are at the increasing left hand side of the Laffer curve, a more attractive investment climate increases the sensitivity of investment to the corporate tax rate only when the investment climate is very effective at enhancing the productivity of capital or when the effectiveness of the investment climate at enhancing the productivity is much higher at low (unattractive) levels of the than at high (attractive) levels. The nonnegative relationship between the corporate tax rate and investment can only be the case when there is a high complementarity of the investment climate to capital.

The fact that results with the investment climate variables regulatory quality, rule of law and the Doing Business indicators are the most pronounced could point to the fact that these investment climate variables are the most productivity enhancing when their initial levels are low.

It is useful to consider the specific empirical setting in which the results are obtained. More than in the previous studies - mentioned in the literature review - the empirical setting is based on a theoretical framework. We opted to include a wide range of countries including industrial and developing countries. This gives a large variance in the investment climate with countries with little and much room for improvement. We could only do this because we use a unique dataset of marginal effective tax rates for a broad range of countries. The choice for a wide panel, which comes at the expense of its length, is accounted for by the fact that within countries the investment climate and tax policies only change gradually. The econometric issues from not estimating within countries are mitigated by checking for many control variables including institutional, geographical, and regional country characteristics. Moreover, the use of system GMM allows bringing dynamics to the estimated specification.
The theoretical framework also guided our choice of investment climate variables in the direction of pure public goods.

Our theoretical framework has the merit to clearly explain the empirical results although we recognize that the framework is based on strong assumptions. Further research is needed to find out whether the same mechanisms work when some of these assumptions, like the absence of labor taxation and the benevolence of governments, are relaxed. On the other hand, we cannot exclude the existence of other mechanisms that would explain the same empirical results.

The results have important policy implications. The nonnegative reaction of investment to a rise in the tax rate in the worst investment climate countries means that these countries should focus on improving the investment climate, rather than decreasing the tax rate to compensate for the poor investment climate. Decreasing the tax rate does not attract capital. This supports the view of policy advisers that “a low host country tax burden cannot compensate for a generally weak or unattractive FDI environment”. A general policy advice based on the results neglecting the interaction term would say that any country can attract investment by lowering its tax rate. In contrast, based on the results with interaction terms, the policy advice on

corporate taxation should depend on the level of the investment climate in a country. In addition, this paper munitions the policy advice that improving the investment climate is of significant importance to attract investment in bad investment climate countries. Put more strongly, the worst investment climate better try to raise their tax revenues in order to improve the basic investment requirements for investors.

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Table 3: Definitions of *IC* variables.

Variable	Definition	Source
REGQUA	Regulatory quality. Captures the perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Kaufmann et al. (2009)
RULAW	Rule of law. Captures the perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Kaufmann et al. (2009)
LEGPROP	Legal structure and security of property rights. Captures judicial independence, presence of impartial courts, protection of property rights, military interference in rule of law and the political process, integrity of the legal system, legal enforcement of contracts, and regulatory restrictions on the sale of real property	Economic Freedom of the World
INVFREE	Investment freedom. Measures whether there is a foreign investment code that defines the country's investment laws and procedures; whether the government encourages foreign investment through fair and equitable treatment of investors; whether there are restrictions on access to foreign exchange; whether foreign firms are treated the same as domestic firms under the law; whether the government imposes restrictions on payments, transfers, and capital transactions; and whether specific industries are closed to foreign investment.	Heritage Foundation
DB6	Doing Business score 6. This is a score calculated like DB10 but excluding 4 DB sub-indicators: employing workers, getting credit, paying taxes and trading across borders.	DB indicators - World Bank- authors' calculation
BASREQ	Basic requirements. Measures the quality of institutions, infrastructure, macroeconomic stability, and the quality of health and primary education	Global Com-petitiveness Report

Table 4: Correlations of *IC* variables and METR.

	METR	REGQUA	RULAW	LEGPROP	INVFREE	DB6	BASREQ
METR	1						
REGQUA	-0.10	1					
RULAW	0.00	0.94	1				
LEGPROP	0.01	0.88	0.92	1			
INVFREE	-0.13	0.73	0.66	0.58	1		
DB6	-0.10	0.72	0.71	0.67	0.52	1	
BASREQ	0.03	0.87	0.91	0.87	0.54	0.72	1

Table 5: List of 80 countries with their 'regulatory quality' *(REGQUA)* rank and METR for 2007.

REGQUA rank	METR	Country	REGQUA rank	METR	Country	REGQUA rank	METR	Country
1	19.1	Luxembourg	28	17	Czech republic	55	24.1	Georgia
2	4.7	Hong Kong	29	33.4	Italy	56	26.9	Indonesia
3	30.3	United Kingdom	30	11.9	Greece	57	1.8	Kenya
4	13.2	Ireland	31	14.8	Trinidad and Tobago	58	45.3	China
5	18.6	Denmark	32	37.1	Korea	59	22.2	Tanzania
6	8	Singapore	33	14	Poland	60	-6	Serbia
7	20.1	Finland	34	15.1	South Africa	61	19.2	Fiji
8	20.1	New Zealand	35	12.2	Mauritius	62	28.9	Pakistan
9	16.6	Netherlands	36	4.1	Bulgaria	63	10.4	Egypt
10	29.3	Australia	37	19.3	Malaysia	64	8.7	Ukraine
11	12.8	Iceland	38	23.3	Botswana	65	20.4	Kazakhstan
12	26.4	Austria	39	9.4	Romania	66	13.8	Rwanda
13	31.9	Canada	40	27.9	Costa rica	67	26.5	Lesotho
14	36	United States	41	20	Jordan	68	37	Russian Federation
15	21.1	Sweden	42	9.6	Croatia	69	16.3	Vietnam
16	35.1	Germany	43	15.4	Mexico	70	20.6	Zambia
17	17.2	Switzerland	44	16.2	Jamaica	71	46	Argentina
18	14	Chile	45	19	Thailand	72	17.8	Bangladesh
19	-3.4	Belgium	46	9.2	Turkey	73	21.9	Ethiopia
20	24.5	Norway	47	23.1	Tunisia	74	21.9	Bolivia
21	35	Japan	48	24.7	Peru	75	3.1	Nigeria
22	13.5	Hungary	49	14.8	Ghana	76	13.7	Ecuador
23	35.9	France	50	39.1	Brazil	77	21.9	Sierra Leone
24	28.7	Spain	51	17.8	Morocco	78	40.1	Chad
25	12.6	Slovakia	52	16.4	Uganda	79	26.5	Iran
26	4.2	Latvia	53	37.6	India	80	20.1	Uzbekistan
27	19	Portugal	54	21.8	Madagascar			

Table 6: Definitions of control variables.

Variable	Definition	Source
Basic:		
GDPPC	GDP per capita (thousands of current USD).	WDI-World Bank
POP	Population (millions).	WDI-World Bank
INFL	Inflation. Average percentage inflation in period 2002-2006.	WDI-World Bank
OPEN	Openness. A measure that combines trade intensity and the relative importance of a country's trade level to total world trade[a]. This measure is proposed by Squalli and Wilson (2006).	WDI-World Bank and authors' calculations
LABTAX	Amount of taxes and mandatory contributions on labor paid by the business as a percentage of commercial profits. This amount include mandatory social security contributions paid by the employer both to public and private entities, as well as other taxes or contributions related to employing workers.	Doing Business - World Bank
CORRUP	Measures corruption within the political system, which distorts the economic and financial environment, reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introduces an inherently instability in the political system.	Political Risk Services
Trade freedom:		
TRADE	Freedom to international trade. Index that measures taxes on international trade, regulatory trade barriers, size of trade sector relative to expected, black market exchange rates, and international capital market control.	Economic Freedom of the World
Geography:		
AIRDIST	Closest air distance to New York, Tokyo or Amsterdam (thousand of km).	Gallup et al. (1999)
LANDLOCK	Landlocked dummy. Dummy equal to one if country is landlocked and not in Europe.	Gallup et al. (1999)
Market liberalization:		
CREDMAR	Credit market regulations. Index accounting for the ownership of banks, foreign bank competition, private sector credit and interest rate controls.	Economic Freedom of the World
LABMAR	Labor market regulations. Index accounting for minimum wages, hiring and firing regulations, centralized collective bargaining, mandated cost	Economic Freedom of the World

	of hiring, mandated cost of worker dismissal, and conscription.	
Political stability:		
POLSTAB	Political stability and absence of violence. Captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism.	Kaufmann et al. (2009)
VOICE	Voice and accountability. Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and free media.	Kaufmann et al. (2009)
Oil Reserves and conflict:		
OIL	The level of proved oil reserves per country in billions of barrels	US Energy Information Administration
CONFLICT	The sum of the two Political Risk indicators 'Internal Conflict' and 'External Conflict'. 'Internal conflict', ranging from 0 to 12 assesses the political violence in the country and its actual or potential impact on governance. The lowest rating is given to a country embroiled in an on-going civil war. 'External conflict' assesses the risk to the incumbent government from foreign action, ranging from non-violent external pressure to violent external pressure. The highest score (12) indicates the least risk for an external conflict.	Political Risk Services

[a]: The measure is defined as: $\frac{n(X+M)_i^2}{GDP_i \sum_{j=1}^{n}(X+M)_j}$, where *X* and *M* are exports and imports of country *i*, and *n* is the number of countries in the world.

Table 7: Descriptive statistics of all variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI (% of GDP)	314	5.59	6.56	-15.04	52.13
METR	316	20.40	10.58	-6.00	46.00
STR	316	27.13	7.08	10.00	45.00
REGQUA	316	0	1	-2.22	1.63
RULAW	316	0	1	-1.77	1.78
LEGPROP	304	0	1	-2.23	1.82
INVFREE	312	0	1	-2.34	1.73
DB6	316	0	1	-2.03	2.64
BASREQ	296	0	1	-2.17	1.76
LABTAX	316	20	13	0.00	58.90
GDPPC	316	14.54	17.45	0.14	82.48
POP	316	69.90	191.95	0.29	1318.31
INFL	298	0.05	0.03	-0.01	0.14
OPEN	316	1.98	3.64	0.00	20.20
CORRUP	286	2.97	1.27	0.5	6.0
TRADE	304	7.03	0.91	4.12	9.65
AIRDIST	308	3.72	2.80	0.14	9.59
LANDLOCK	308	0.13	0.34	0	1
CREDMAR	304	7.95	1.29	4.45	9.98
LABMAR	296	5.72	1.37	2.46	8.85
POLSTAB	316	0.08	0.89	-2.39	1.65
VOICE	316	0.30	0.96	-1.91	1.83
OIL	314	6.74	25.70	0.00	179.21
CONFLICT	286	19.94	2.28	12.50	23.50

Table 8: Estimation results with basic control variables and no interaction variable.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	FDI	FDI	FDI	FDI	FDI	FDI
IC variable:	REGQUA	RULAW	LEGPROP	INVFREE	DB6	BASREQ
FDI_{t-1}	0.450**	0.440**	0.477**	0.452**	0.448**	0.459**
	(2.27)	(2.20)	(2.39)	(2.23)	(2.22)	(2.18)
$METR_{t-1}$	-0.099*	-0.110**	-0.110**	-0.110**	-0.100**	-0.110**
	(-1.96)	(-2.19)	(-2.19)	(-2.22)	(-2.01)	(-2.26)
IC_{t-1}	1.427	1.367	0.506	0.704	1.033*	-0.654
	(1.55)	(1.51)	(0.80)	(1.44)	(1.93)	(-1.04)
$LABTAX_{t-1}$	0.081**	0.077**	0.076**	0.073**	0.080**	0.073**
	(2.36)	(2.33)	(2.25)	(2.25)	(2.36)	(2.22)
$GDPPC_{t-1}$	-0.113**	-0.128**	-0.091**	-0.090**	-0.109***	-0.056
	(-2.59)	(-2.62)	(-2.24)	(-2.61)	(-2.94)	(-1.61)
POP_{t-1}	-0.004*	-0.004**	-0.004*	-0.004*	-0.003	-0.005**
	(-1.96)	(-2.09)	(-1.94)	(-1.91)	(-1.27)	(-2.06)
$INFL_{t-1}$	7.659	3.819	-1.301	-2.464	-5.613	-6.977
	(0.42)	(0.21)	(-0.08)	(-0.17)	(-0.41)	(-0.46)
$OPEN_{t-1}$	0.337*	0.378*	0.370**	0.333*	0.346*	0.434**
	(1.71)	(1.96)	(2.03)	(1.67)	(1.73)	(2.37)
AFR	-1.917	-2.295	-2.510	-2.705	-1.660	-2.815*
	(-1.04)	(-1.27)	(-1.43)	(-1.58)	(-0.97)	(-1.69)
LAC	-2.915	-2.620	-2.870	-3.535**	-2.159	-3.202*
	(-1.66)	(-1.45)	(-1.66)	(-2.06)	(-1.24)	(-1.87)
ASIA	-1.372	-1.727	-1.985	-1.787	-1.545	-1.718
	(-0.71)	(-0.93)	(-1.17)	(-1.01)	(-0.90)	(-1.05)
EUR	-2.252	-1.998	-2.195	-2.276	-1.138	-2.215
	(-1.14)	(-0.96)	(-1.09)	(-1.14)	(-0.54)	(-1.12)
OCE	-0.130	-0.263	-0.018	-0.081	-0.102	0.572
	(-0.08)	(-0.16)	(-0.01)	(-0.05)	(-0.06)	(0.30)
Cst	5.810*	6.568**	6.086*	6.682**	5.819*	5.915*
	(1.72)	(2.03)	(1.92)	(2.09)	(1.76)	(1.85)
Observations	226	226	215	223	226	213
Number of countries	79	79	78	78	79	74
Hansen J test (P value)	0.252	0.265	0.294	0.222	0.159	0.236
AR(1)[a] (P value)	0.0428	0.0447	0.0429	0.0462	0.0456	0.0485
t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1						

[a]: AR(i) is the Arellano-Bond test for autocorrelation, applied to the differenced residuals. AR(1) is expected in first-differences, because D.e_(it) = e_(it) - e_(i,t-1) should correlate with D.e_(i,t-1) = e_(i,t-1) - e_(i,t-2). To check for AR(1) in levels, one should look for AR(2) in differences, on the idea that this will detect the relationship between the e_(i,t-1) in D.e_(it) and the e_(i,t-2) in D.e_(i,t-2). When performing the regression with four years (not lagging the explanatory variables), the AR(2) tests are satisfactory, and the results are qualitatively the same.

Table 9: Estimation results with basic control variables and with interaction variable.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	FDI	FDI	FDI	FDI	FDI	FDI
IC variable:	REGQUA	RULAW	LEGPROP	INVFREE	DB6	BASREQ
FDI_{t-1}	0.434**	0.426**	0.458**	0.436**	0.434**	0.444**
	(2.23)	(2.15)	(2.27)	(2.17)	(2.13)	(2.08)
$METR_{t-1}$	-0.104**	-0.118***	-0.124***	-0.081**	-0.108**	-0.112***
	(-2.49)	(-2.86)	(-2.80)	(-2.18)	(-2.38)	(-2.84)
IC_{t-1}	3.720***	3.424***	2.456**	2.949***	2.790***	2.232
	(3.61)	(3.59)	(2.45)	(3.47)	(3.17)	(1.60)
$METR_{t-1}*IC_{t-1}$	-0.113***	-0.099***	-0.086**	-0.116***	-0.089**	-0.104**
	(-3.09)	(-2.97)	(-2.25)	(-2.87)	(-2.05)	(-2.29)
$LABTAX_{t-1}$	0.069**	0.063**	0.062**	0.050*	0.071**	0.063**
	(2.31)	(2.19)	(2.02)	(1.76)	(2.30)	(2.22)
$GDPPC_{t-1}$	-0.101**	-0.123**	-0.096**	-0.098***	-0.102***	-0.071**
	(-2.30)	(-2.47)	(-2.35)	(-2.99)	(-2.72)	(-2.19)
POP_{t-1}	-0.004**	-0.004**	-0.003*	-0.005**	-0.004**	-0.004**
	(-2.23)	(-2.05)	(-1.71)	(-2.15)	(-2.02)	(-2.33)
$INFL_{t-1}$	13.412	9.376	1.681	-0.056	-5.874	6.584
	(0.87)	(0.62)	(0.13)	(-0.00)	(-0.48)	(0.44)
$OPEN_{t-1}$	0.296*	0.352**	0.363**	0.301*	0.295*	0.362***
	(1.82)	(2.14)	(2.27)	(1.85)	(1.76)	(2.65)
AFR	-2.768	-3.090	-3.026	-3.069*	-2.784	-3.153*
	(-1.43)	(-1.61)	(-1.64)	(-1.95)	(-1.29)	(-1.83)
LAC	-4.142**	-3.691*	-3.627*	-3.947**	-3.561	-4.113**
	(-2.11)	(-1.85)	(-1.92)	(-2.48)	(-1.56)	(-2.14)
ASIA	-2.531	-2.719	-2.789	-2.449	-2.794	-2.570
	(-1.22)	(-1.34)	(-1.49)	(-1.44)	(-1.27)	(-1.38)
EUR	-2.967	-2.491	-2.466	-1.798	-2.070	-2.372
	(-1.43)	(-1.14)	(-1.16)	(-1.02)	(-0.82)	(-1.15)
OCE	-0.657	-0.719	-0.351	-0.102	-1.052	0.053
	(-0.35)	(-0.37)	(-0.19)	(-0.06)	(-0.48)	(0.02)
Cst	6.588*	7.471**	7.113**	6.765**	7.229*	6.423*
	(1.94)	(2.25)	(2.10)	(2.21)	(1.91)	(1.98)
Observations	226	226	215	223	226	213
Number of countries	79	79	78	78	79	74
Hansen J test (P value)	0.258	0.276	0.298	0.305	0.243	0.294
AR(1)[a] (P value)	0.0417	0.0442	0.0439	0.0460	0.0466	0.0513
t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1						

[a]: AR(i) is the Arellano-Bond test for autocorrelation, applied to the differenced residuals. AR(1) is expected in first-differences, because D.e_(it) = e_(it) - e_(i,t-1) should correlate with D.e_(i,t-1) = e_(i,t-1) - e_(i,t-2). To check for AR(1) in levels, one should look for AR(2) in differences, on the idea that this will detect the relationship between the e_(i,t-1) in D.e_(it) and the e_(i,t-2) in D.e_(i,t-2). When performing the regression with four years (not lagging the explanatory variables), the AR(2) tests are satisfactory, and the results are qualitatively the same.

Table 10: Estimation results as adding more control variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)
IC variable:	Regulatory quality (REGQUA)	Regulatory quality (REGQUA)	Regulatory quality (REGQUA)	Regulatory quality (REGQUA)	Regulatory quality (REGQUA)	Regulatory quality (REGQUA)	Regulatory quality (REGQUA)
FDI (% of GDP)$_{t-1}$	0.437**	0.442**	0.447**	0.518***	0.452**	0.441**	0.446**
	(2.24)	(2.17)	(2.37)	(2.70)	(2.44)	(2.27)	(2.22)
METR$_{t-1}$	-0.091**	-0.108**	-0.070*	-0.082**	-0.069**	-0.092**	-0.103**
	(-2.47)	(-2.55)	(-1.86)	(-2.45)	(-2.10)	(-2.43)	(-2.47)
IC$_{t-1}$	3.308***	3.185***	2.494**	3.116***	2.731***	2.488**	3.592***
	(3.44)	(3.06)	(2.58)	(3.00)	(2.99)	(2.19)	(3.05)
METR$_{t-1}$*IC$_{t-1}$	-0.097***	-0.088***	-0.099***	-0.079**	-0.111***	-0.094***	-0.091***
	(-2.84)	(-2.85)	(-2.93)	(-2.32)	(-3.49)	(-2.68)	(-3.03)
Labor tax$_{t-1}$	0.049*	0.060**	0.045	0.053*	0.101***	0.044	0.052
	(1.76)	(2.23)	(1.57)	(1.98)	(2.72)	(1.57)	(1.58)
GDP pc (1000 USD)$_{t-1}$	-0.115***	-0.135***	-0.091**	-0.115**	-0.097**	-0.120***	-0.118***
	(-2.83)	(-3.11)	(-2.10)	(-2.48)	(-2.39)	(-2.75)	(-2.83)
Population$_{t-1}$	-0.004**	-0.003**	-0.004**	-0.003**	-0.004**	-0.004**	-0.003*
	(-2.61)	(-2.07)	(-2.60)	(-2.03)	(-2.07)	(-2.54)	(-1.91)
Openness$_{t-1}$	0.264	0.258	0.151	0.240	0.269*	0.295*	0.249
	(1.66)	(1.52)	(0.88)	(1.48)	(1.81)	(1.94)	(1.47)
Africa	-0.697	-0.148	-0.248	-0.585	0.220	-0.805	0.073
	(-0.84)	(-0.18)	(-0.29)	(-0.80)	(0.26)	(-0.98)	(0.09)
Latin America and Caribbean	-1.932**	-1.399	-2.203**	-1.551*	-1.167	-2.020**	-1.365
	(-2.23)	(-1.57)	(-2.45)	(-1.96)	(-1.39)	(-2.15)	(-1.56)
Corruption$_{t-1}$		0.574					
		(1.26)					
Trade freedom$_{t-1}$			1.205**				
			(2.33)				
Air distance				0.006			
				(0.04)			
Landlocked				0.928			
				(1.12)			
Credit market regulations$_{t-1}$					0.723**		
					(2.46)		
Labor market regulations$_{t-1}$					0.667***		
					(2.70)		
Political stability$_{t-1}$						0.614	
						(1.28)	
Voice and accountability$_{t-1}$						0.383	
						(0.54)	
Oil reserves$_{t-1}$							0.012
							(1.30)
Conflict$_{t-1}$							0.053
							(0.29)
Cst	5.398***	3.343	-3.653	4.096*	-6.868**	5.365***	3.628
	(2.76)	(1.55)	(-0.87)	(1.77)	(-2.20)	(2.68)	(1.07)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	235	213	228	229	224	235	213
Number of countries	79	72	78	77	78	79	72
Hansen J test (P value)	0.138	0.343	0.147	0.340	0.349	0.171	0.295
AR(1) (P value)	0.0423	0.0441	0.0423	0.0569	0.0381	0.0412	0.0427
t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1							

Table 11: Estimation results with *STR* as the tax variable.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)	FDI (% of GDP)
IC variable:	Regulatory quality (REGQUA)	Rule of law (RULAW)	Legal structure (LEGPROP)	Investment freedom (INVFREE)	Doing business (DB6)	Basic requirements (BASREQ)
$FDI\ (\%\ of\ GDP)_{t-1}$	0.418**	0.416**	0.448**	0.420**	0.434**	0.441**
	(2.23)	(2.17)	(2.28)	(2.22)	(2.25)	(2.16)
STR_{t-1}	-0.149***	-0.152**	-0.187***	-0.148**	-0.128**	-0.180**
	(-2.75)	(-2.55)	(-2.80)	(-2.48)	(-2.14)	(-2.61)
IC_{t-1}	4.638***	4.221**	2.194	3.335	3.377**	1.322
	(2.87)	(2.51)	(1.17)	(1.53)	(2.10)	(0.55)
$STR_{t-1}*IC_{t-1}$	-0.126**	-0.111**	-0.062	-0.093	-0.087	-0.071
	(-2.40)	(-2.13)	(-1.06)	(-1.27)	(-1.53)	(-1.07)
$Labor\ tax_{t-1}$	0.095**	0.086**	0.086**	0.088**	0.078*	0.085**
	(2.31)	(2.14)	(2.04)	(2.16)	(1.92)	(2.07)
$GDP\ pc\ (1000\ USD)_{t-1}$	-0.107**	-0.132**	-0.096**	-0.097**	-0.113***	-0.057
	(-2.40)	(-2.53)	(-2.12)	(-2.60)	(-2.98)	(-1.28)
$Population_{t-1}$	-0.006**	-0.006**	-0.006*	-0.005**	-0.005*	-0.006**
	(-2.19)	(-2.20)	(-1.97)	(-2.12)	(-1.72)	(-2.14)
$Inflation_{t-1}$	10.611	6.058	-1.830	-0.505	-4.212	-4.675
	(0.71)	(0.40)	(-0.12)	(-0.04)	(-0.34)	(-0.28)
$Openness_{t-1}$	0.380*	0.434**	0.417**	0.366*	0.364*	0.458**
	(1.97)	(2.22)	(2.18)	(1.90)	(1.86)	(2.57)
Africa	-2.296	-2.526	-1.905	-2.088	-1.434	-2.333
	(-1.25)	(-1.38)	(-1.10)	(-1.41)	(-0.84)	(-1.42)
Latin America and Caribbean	-3.832**	-3.632*	-3.331*	-3.772**	-2.522	-3.685**
	(-2.06)	(-1.91)	(-1.86)	(-2.33)	(-1.47)	(-2.08)
Asia	-2.163	-2.493	-2.291	-2.137	-1.878	-2.002
	(-1.11)	(-1.27)	(-1.20)	(-1.25)	(-1.06)	(-1.07)
Europe	-3.090	-2.489	-2.628	-2.436	-1.234	-2.543
	(-1.66)	(-1.30)	(-1.40)	(-1.46)	(-0.69)	(-1.48)
Oceania	0.323	0.391	0.642	0.565	0.736	1.141
	(0.22)	(0.27)	(0.45)	(0.43)	(0.57)	(0.68)
Cst	7.987**	8.777**	9.065**	8.334***	7.366**	8.411**
	(2.40)	(2.56)	(2.57)	(2.68)	(2.31)	(2.50)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	226	226	215	223	226	213
Number of countries	79	79	78	78	79	74
Hansen J test (P value)	0.254	0.266	0.311	0.260	0.237	0.265
AR(1) (P value)	0.0373	0.0391	0.0399	0.0407	0.0413	0.0444
t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1						

Table 12: Estimation results with sample split according to the median *IC* value.

IC variable:	Regulatory quality (REGQUA)		Rule of law (RULAW)		Legal structure (LEGPROP)	
	IC<=median	IC>median	IC<=median	IC>median	IC<=median	IC>median
FDI (% of GDP)$_{t-1}$	0.480***	0.424*	0.720***	0.383	0.808***	0.395
	(3.08)	(1.92)	(6.24)	(1.55)	(7.18)	(1.54)
METR$_{t-1}$	0.041	-0.239***	0.028	-0.249***	0.018	-0.252***
	(1.32)	(-3.47)	(1.53)	(-3.17)	(0.69)	(-3.05)
IC$_{t-1}$	1.957**	2.790	2.058**	3.377*	0.116	2.459
	(2.63)	(0.88)	(2.26)	(1.95)	(0.17)	(1.64)
Observations	110	116	110	116	100	115
Number of countries	42	41	40	40	43	44
IC variable:	Investment freedom (INVFREE)		Doing business (DB6)		Basic requirements (BASREQ)	
	IC<=median	IC>median	IC<=median	IC>median	IC<=median	IC>median
FDI (% of GDP)$_{t-1}$	0.531***	0.500**	0.311*	0.466*	0.729***	0.407
	(3.77)	(2.71)	(2.01)	(2.01)	(6.35)	(1.64)
METR$_{t-1}$	0.041	-0.274***	0.019	-0.183**	0.029	-0.232**
	(1.33)	(-3.58)	(0.54)	(-2.18)	(1.45)	(-2.27)
IC$_{t-1}$	-0.336	-1.183	1.141*	-0.402	0.366	0.206
	(-0.54)	(-0.92)	(1.72)	(-0.34)	(0.55)	(0.11)
Observations	122	101	112	114	105	108
Number of countries	49	39	40	39	37	37
t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1						

Figure 1: *FDI* and *METR* for low and high regulatory quality (*REGQUA*) countries.

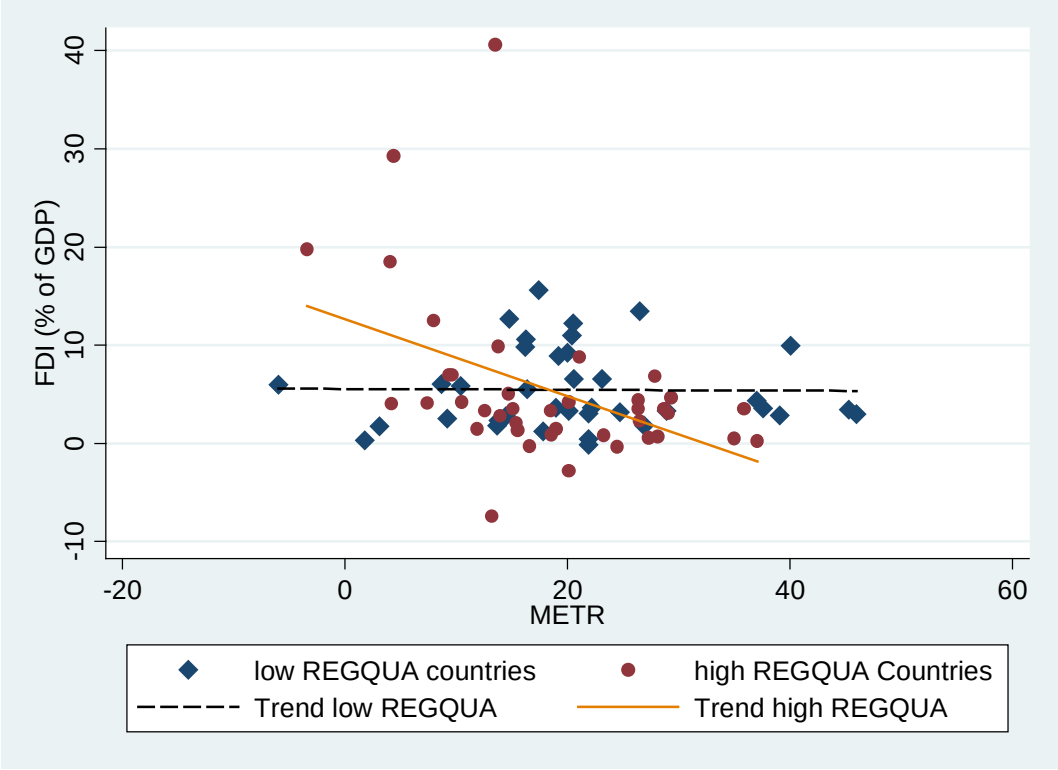
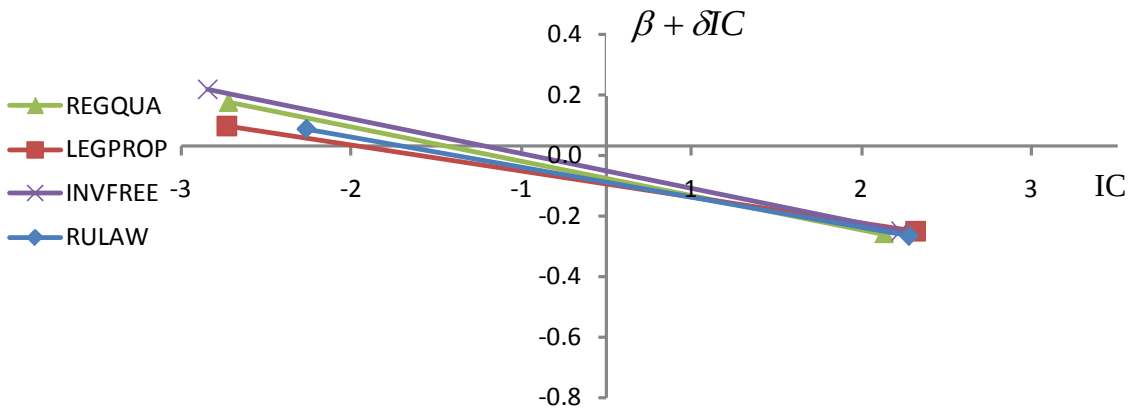


Figure 2: The evolution of the total derivative of *FDI* to *METR* ($\beta + \delta IC$) between the sample minimum and the sample maximum of the investment climate (*IC*) variable.



Appendix

A1:

$$-KF_{KK} - t > 0$$
$$\Leftrightarrow -K\frac{dF_K}{dK} - t > 0 \text{ and } dF_K = d(t+r) = dt$$
$$\Leftrightarrow -Kdt - tdK < 0 \text{ if } dK < 0$$
$$\Leftrightarrow -dG < 0$$
$$\Leftrightarrow dG > 0$$

A2:

$$\frac{d(\frac{dK}{dt})/dG}{dF_{KGG}} = -KF_{KK} - t \ > 0 \text{ if } dG > 0$$

$$\frac{d(\frac{dK}{dt})/dG}{dF_{KKG}} = -(1 - F_{KG}K) < 0 \text{ if } dK/dt < 0$$

B1: The impact of F_{KG} on dK/dt (F_{KK} constant)

Rise in tax rate (dt):

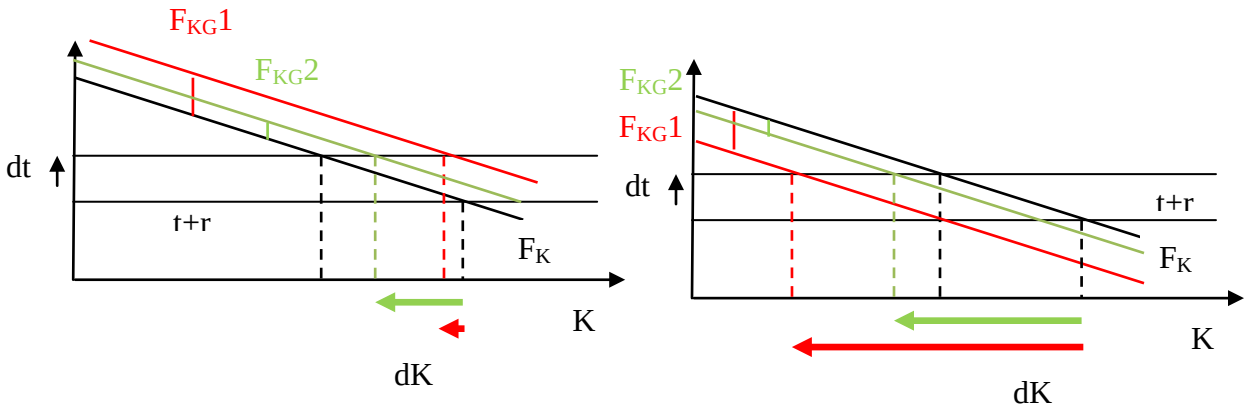
=> ($t+r$) shifts up

=> F_K shifts up when $dG/dt>0$ (left panel), F_K shifts down when $dG/dt<0$ (right panel)

Left graph: $dG/dt>0$; green case: low F_{KG}, red case: high F_{KG}

Right graph: $dG/dt<0$; green case: low F_{KG}, red case: high F_{KG}

=> higher F_{KG}, higher (lower) dK/dt if $dG/dt>0$ ($dG/dt<0$).



B2: The impact of F_{KK} on dK/dt (F_{KG} constant)

Rise in tax rate (dt):

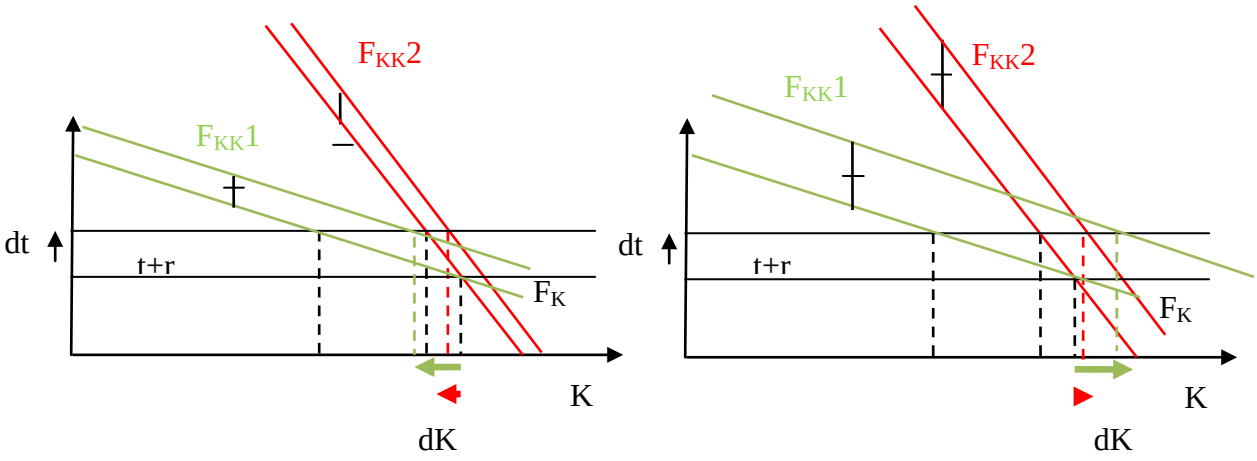
=> ($t+r$) shifts up

=> F_K shifts up (assuming $dG/dt>0$)

=> F_K steeper (assuming $dG/dt>0$), depending on F_{KK}

Left graph: dK/dt <0; green case: high F_{KK}, red case: low F_{KK}

Right graph: dK/dt >0; green case: high F_{KK}, red case: low F_{KK}


FKK2
FKK1
dt
t+r
FK
K
dK
FKK2
FKK1
dt
t+r
FK
K
dK

B3: *(dK/dt)/dG* <0 (if *dK/dt*>0, and if higher tax means more *G*)

Rise in tax rate (*dt*):

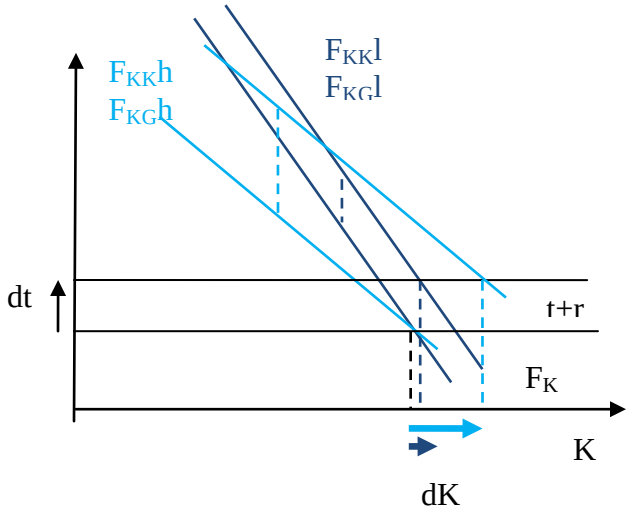
=> (*t+r*) shifts up

=> F_K shifts up

=> F_K steeper

Light blue case: low *G* (high F_{KG}, high F_{KK}); dark blue case: high *G* (low F_{KG}, low F_{KK})

=> higher *G*, lower *dK/dt*: *(dK/dt)/dG*<0



B4: *(dK/dt)/dG* not determined (if *dK/dt*<0, and if higher tax means more *G*)

Rise in tax rate (*dt*):

=> (*t+r*) shifts up

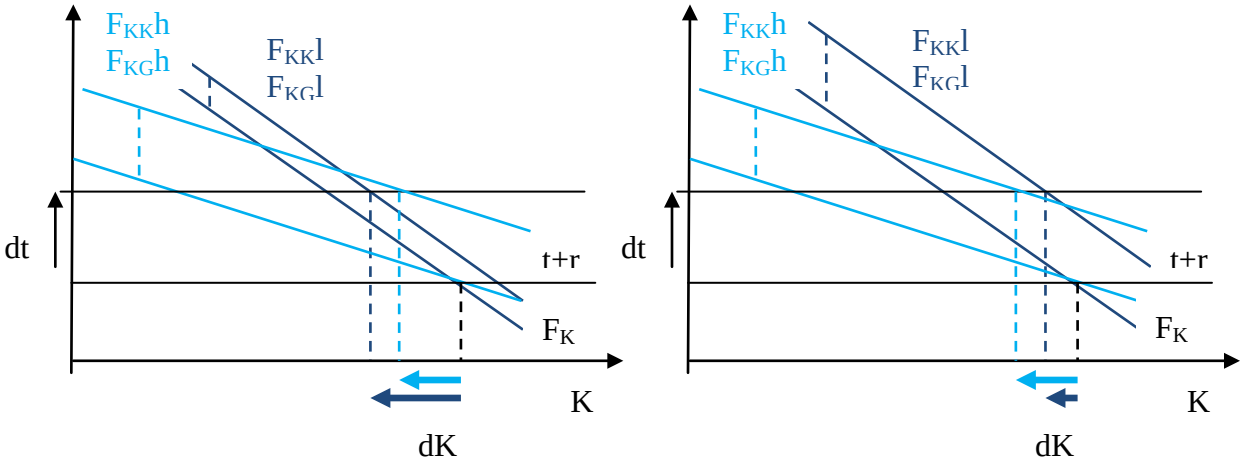
=> F_K shifts up

=> F_K steeper

Left graph: low F_{KGG}; light blue case: low *G*, dark blue case: high *G*

Right graph: high F_{KGG} (almost zero); light blue case: low *G*, dark blue case: high *G*

=> lower F_{KGG} (compared to F_{KKG}), more likely negative *(dK/dt)/dG*



C:

The calculation of Marginal Effective Tax Rates by Chen and Mintz (2009) (based on Chen and Mintz 2009).

The marginal effective tax rate analysis takes into account corporate income taxes, sales and excise taxes on capital purchases and capital-related taxes (such as asset-based taxes). It is a summary measure of the amount of tax paid as a percentage of the pre-tax return for investments that are "marginal" – they earn a risk-adjusted rate of return on capital just sufficient to cover financing and tax costs. For example, suppose the pre-tax risk-adjusted rate of return on capital is equal to 10 percent, and after payment of taxes at a 40 percent rate, the after-tax rate of return on capital earned by the project is 6 percent. A business will undertake the investment if the return on the project is just sufficient to cover the minimum rate of return on capital. If 6 percent is the minimum rate of return that is needed to attract capital from financial markets, then a business will undertake any "marginal" project that just earns this minimum rate of return on capital.

The model is based on a multinational company seeking to maximize its value for projects around the world, raising equity and debt financing from international markets. The multinational minimizes its cost of finance by choosing its optimal debt and dividend policy, taking into tax and non-tax factors that influencing financial decisions (independent of the investment decision). The cost of equity and debt is determined by international markets and independent of the availability of a domestic savings in a small open economy. To calculate the METR, similar investment projects in manufacturing and service industries are assumed to take place in each country. The same capital structure for eight industries (manufacturing, construction, utilities, communications, transport, wholesale trade, retail trade and other services that are aggregated into manufacturing and service industries) is assumed across countries, using data developed by Finance Canada for capital stock weights. The Statistics

Canada's recently estimated economic depreciation rates are used to reflect changes in service lives and obsolescence, and apply them across all countries.

Tax systems are very complex with many specific provisions including credits, exemptions, deductions and limitations that make any analysis complex to apply. Given that Chen and Mintz (2009) model most taxes and their provisions affecting capital decisions except for property taxes (that are impossible to assess empirically across jurisdictions in terms of effective tax rates), they believe that they have captured the most important provisions affecting capital decisions in each country.

They do not include conditional tax incentives in their international assessment.