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Taxation, infrastructure, and firm performance in developing countries

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Abstract: This paper investigates the relationship between taxation and firm performance in developing countries. Taking firm-level data from the World Bank Enterprise Surveys (WBES) and tax data from the Government Revenue Dataset (ICTD/UNU-WIDER), our results suggest that tax revenue benefits to firm growth in developing countries, especially in low-income countries and lower-middle income countries. These findings are robust to the inclusion of alternative covariates and specifications, and do not appear to be sample dependent. We also provide evidence that the positive effect of taxation on firm growth falls significantly when corruption is too pervasive, and when the origin of tax revenue origin reduces government accountability. Lastly, our paper finds that the positive effect of domestic revenue on firm performance could channel through the financing of public infrastructures vital to firms operating in lower-income countries.

Keywords: taxation, firm growth, infrastructure, corruption

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1 Introduction

Since the early 1960s, there has been growing tendency to see the domestic resource mobilization as a stepping stone for economic development. The impressive work undertaken in recent decades to understand the determinants of taxation and its impact on economic activity has helped policymakers design tax policies in both advanced and developing economies. Yet although the need for further analysis of taxation and development has never let up, interest in these issues (by policymakers and scholars) has fluctuated considerably. Although the improvement of taxation in LICs was among the commitments signed by the international community at the Monterrey Conference in 2002, the contribution of taxation to financing the Millennium Development Goals was overshadowed by the strong emphasis on the critical role that foreign aid had to play. In addition, the aid effectiveness dispute of the 2000s and the growing attention to remittances detracted from debates on domestic revenue mobilization. All this has dramatically changed over the past few years. The public finance crisis in advanced economies and the need for greater autonomy in financing for development have placed taxation issues firmly on the development agenda. The June 2015 International Conference on Financing for Development in Addis Ababa brought the question of taxation back to centre stage: it reasserted the decisive role of domestic revenue in helping developing countries to grow, and highlighted the need to raise the level of taxes collected given the ambitious sustainable development goals for 2030 and the budgetary constraints faced by traditional donors.

This call from the international community to improve domestic resource mobilization was accompanied by renewed interest from academics and policymakers in improving their understanding of how taxation can affect economic development, especially in countries with substantial financing needs. Our paper investigates the effects of tax revenue on economic growth in developing countries taking a micro approach and focus on their firms' performance. In this, the article sets out to contribute to the literature on taxation and firm growth, as yet very thin on the ground when it comes to developing countries.

As recently shown in paper by Aghion et al. (2016), the effect of taxation on firm performance can be twofold. On the one hand, taxes can be seen as a disincentive to innovate or invest since one additional dollar of tax is one dollar that is not used for a production activity. This first view is put forward by the large body of theory that builds on neo-classical models of investment (Jorgenson, 1963; Tobin, 1969; Hayashi, 1982) and posits that taxation is harmful for firm and industry development since it tends to negatively alter firm investment decisions (Hall and Jorgenson, 1967; Summers et al., 1981; Auerbach et al., 1983). Empirical analyses testing these theoretical predictions in advanced economies find that taxation does indeed depress capital accumulation (Cummins et al., 1996), the firm growth rate (Carroll et al., 2000) and entrepreneurship when tax progressiveness is too high (Gentry and Hubbard, 2000).

Yet on the other hand, tax resources are essential in financing the public infrastructures key to corporate activity. Aghion et al. (2016) argue that the overall effect of taxation on firm performance depends on the relative weight of these two effects, which can be very different depending on the kind of country studied. This condition was initially stated by Barro (1988), who argues that the effect of government spending (and hence taxes since he considers that public finances are balanced) on economic growth depends on the size of the government and especially on the marginal returns of public spending. According to him, a tax increase lowers the growth rate of the economy while the resulting government spending raises it. Yet this second effect dominates only when the government's size is small (i.e. when the ratio of public finance to the GDP is low). If the government is large, then the marginal returns of public spending decrease and the negative tax effect dominates, slowing down GDP growth. Furthermore, as pointed up by both Aghion et al. (2016) and Goyette (2015), the sound use of taxes in financing infrastructure is a necessary condition for the existence of such a positive effect, which depends heavily on the incidence of corruption within the country, and on the government's political accountability and willingness to invest domestic resources in promising projects for corporate activity.

If most studies to date have found that taxation is bad for corporate activity, it may be because they focus on advanced economies where the level of public infrastructures is already satisfactory and the marginal effect of taxation therefore only represents a direct cost for corporates. In keeping with the idea put forward by Aghion et al. (2016), in these countries, the first negative effect hence outweighs the second positive effect. Yet looking at the impact of taxation on firm activity in developing countries can produce different conclusions since the lack of infrastructure in these countries really does hamper business development. A number of studies find that infrastructure needs are a major impediment to economic growth in developing countries, especially LICs (Collier and Gunning, 1999; Bigsten and Söderbom, 2006; Dollar et al., 2005; Aterido et al., 2011; Harrison et al., 2014). Figure A.1 in the Appendix illustrates the relationship between economic development and infrastructure and clearly shows that infrastructure is considered as greater obstacle in poorer countries than in advanced economies. This suggests that taxes in lower income countries could have a large positive effect on firm activity by means of financing public infrastructure, subject to the condition that public revenue is indeed used for such purposes and not diverted into corruption.

To our knowledge, the only studies that set out to observe the impact of taxation on economic activity in developing countries are Easterly and Rebelo (1993), Djankov et al. (2008), Fisman and Svensson (2007), and Goyette (2015). However since the first two remain at the country-level, and the third considers the specific case of Uganda, the study by Goyette (2015) is the only one that focuses on the average effect of taxation on firm performance in LICs. Although this paper argues that, on average, taxation positively affects firm growth, the author uses firm-level data on sales declared for tax purposes as a proxy for the effective tax rate and does not look specifically at the channels through which taxation benefits firm activity. The purpose of our paper is to use country-level tax variables to see how domestic revenue mobilization taken as a whole (not just considering tax revenue on corporate profits) affects individual firm performance, and what are the transmission channels for these effects.

We therefore examine the ability of taxes to affect firm growth and attempt to control for the way these domestic resources are used. We use micro data on formal firm performance from the World Bank Enterprise Surveys (WBES) (World Bank, 2015) on more than 102 countries (including 89 developing countries) covering the period from 2006 to 2015.[1] These surveys have been standardized over time and across all countries, allowing for repeated cross-sectional analysis. We combine data on firm growth with tax data from the Government Revenue Dataset (GRD - ICTD/UNU-WIDER), which provides the most reliable data on taxes to date with its impressive coverage (across countries and over time) and level of disaggregation for domestic revenue (Prichard et al., 2014).

Estimation of the impact of taxation on economic performance can be subject to a number of estimation biases. The first source of bias is due to omitted variables: unobservable country characteristics may explain variations in both firm growth and tax ratio. We thus include numerous control variables in our estimations, both at the country and the firm- level, as well as country and sector-year fixed effects in order to reduce the omitted variable bias. The second source of bias is reverse causality. In well-performing countries with significant annual GDP growth, an increase in GDP and consequently in the tax base is likely to improve the amount of taxes collected. Yet although reverse causality is indisputable at the macro level, one firm's performance is hardly likely to affect the tax-to-GDP ratio at the country level, however large the firm may be. Nonetheless, our empirical strategy leaves the possibility open for other sources of endogeneity to bias the estimates. In our model, time-varying unobservable heterogeneity is only accounted for at the industry level and not at the country level. Moreover, we may be estimating an average country-level relationship between firm performance and taxation, in which case reverse-causality may still be an issue. We therefore provide two-stage least squares estimates in which the tax variable is instrumented by the level of taxation and rent from natural resources in neighboring countries.

Across our global sample of 102 countries (including both developed and developing countries), our results find no significant linear effect of the overall tax burden on firm growth. However the relationship

[1] The WBES cover more than 130 countries. Since our IV strategy does not allow for the inclusion of small islands in our sample, we remove them permanently from all the other tests. Their inclusion does not alter the results. We also drop Angola and Kazakhstan, which are outliers. Including them tends to overestimate the impact of taxation on firm growth.

between taxation and firm growth appears to be non-linear and conditioned by several factors, particularly by the level of development. We observe significant non-linearity between taxation and firm growth with respect to the level of per capita GDP. While the marginal effect of taxation is positive and quite large for lower levels of development, explicable by the need for public infrastructures, it is negative and significant for firms operating in countries with higher levels of income. In addition, the positive effect of taxation on firm growth in LICs appears to be influenced by the level of corruption. Our results show that when the incidence of corruption is high, the positive impact of taxation on firm growth is largely reduced, confirming the findings of Aghion et al. (2016) and Goyette (2015). This indirectly suggests that the positive contribution of taxation to corporate activity channels through the provision of public goods and that, where there is a high level of corruption, taxes collected are not redirected to infrastructure financing and hence merely represent an additional cost for firms. The Government Revenue Dataset (GRD) differentiates natural resource taxes from non-natural resource taxes. We assume that non-resource taxes are more likely to increase government accountability towards the general public than resource taxes, which can be considered as a rent and therefore do not automatically imply public good counterparts. Our results find that the positive effect of taxation on firm performance is indeed driven by non-resource taxes.

Lastly, we use an empirical specification similar to Rajan and Zingales (1998) to examine the channels through which taxation positively affects firm growth in developing countries. This specification includes interaction terms between taxation and an exogenous measure of infrastructure intensity at the sector level. We find that the positive effect of taxes on firm growth is greater for firms in industries that disproportionately depend on public utilities such as transport, electricity and water supply. This last result hence points up public infrastructure as one of the potential channels through which taxation benefits firm activity.

The rest of this paper proceeds as follows: Section 2 presents our empirical strategy and the data used. Section 3 presents the baseline results and some robustness checks. Section 4 examines how corruption alters the impact of taxation on firm performance. Using sector-specific intensity measures, Section 5 then investigates the infrastructure channels through which domestic resource mobilization potentially benefits firm growth. Section 6 concludes.

2 Model and Data

We use World Bank Enterprise Survey (WBES) repeated cross-section data on formal firm performance over the 2006-2015 period to examine the impact of taxation on firm growth.[2] The WBESs cover a representative sample of firms in the manufacturing and service sectors for each country, and are comparable across countries and years. Table A.1 in the Appendix presents the entire sample of countries, the number of firms interviewed per country, and the year of the surveys. We use these data, to estimate the following general model:

$$GROWTH_{i,k,j,(t,t-2)} = \alpha + \beta TAX_{j,(t,t-2)} + \lambda X_{i,k,j,t} + \gamma Y_{j,(t,t-2)} + \mu_j + \tau_{k,t} + \varepsilon_{i,k,j,t} \qquad (1)$$

where $GROWTH_{i,k,j,(t,t-2)}$ is the annual average growth rate in sales for firm i in industry k in country j over the period (t, t-2).[3] The sales in local currencies are deflated using the GDP deflator (with the same base year of 2005 for every country) and then converted into US dollars.[4] Our main variable of interest is $TAX_{j,(t,t-2)}$, which is the share of total taxes, excluding social contributions, in GDP. It is measured at the country level and on average over the period for which sales growth is computed (t, t-2). We use the Government Revenue Dataset (ICTD/UNU-WIDER) to measure total taxes. The GRD covers information on tax revenue collected by both central and general government. Central government data are more widely available, but as noted by Prichard et al. (2014), could be misleading for federal states with more local taxes. Our rule of thumb is therefore to use general government taxes for a given country whenever the number of observations is as high as for central government taxes. This is the case with half of the countries included in the full sample. Otherwise, central level data are used. In all regressions the country fixed effects, μ_j, account for whether general or central government data are used.[5]

Our model controls for $X_{i,k,j,t}$, a set of firm-level characteristics. We include lagged sales, $SALES_{i,k,j,t-2}$ in order to account for catching-up effects. This variable captures the fact that the smaller the past growth rate, the greater the prospects of higher growth in the future. In keeping with Harrison et al. (2014), we control for the size of the firm, $SIZE_{i,k,j,t}$, which takes the value one if the firm employs less than 20 persons, two if the firm employs between 20 and 100 persons, and three for the largest firms (more than 100 employees). We also include two variables accounting for the firm's ownership structure: $STATE_{i,k,j,t}$ which is equal to one if the state owns part (or all) of the firm, and $FOREIGN_{i,k,j,t}$ which is equal to one if a foreign entity owns part (or all) of the firm. We also control for $EXPORT_{i,k,j,t}$, which is equal to

[2] Version of November 11^{th} 2015.

[3] In each survey, firm sales are measured in t, which is the last fiscal year before the year the survey was conducted, and in t-2 which is three fiscal years before the survey was conducted.

[4] Data for the GDP deflator and the exchange rate come from the World Development Indicators database.

[5] A dummy variable that is equal to one when general government data are used ($GENGOV_j$) cannot be estimated given that it does not vary over time.

one if the firm is outward-looking, *i.e.* if part of its production is exported directly or indirectly (supplied to exporting firm). Lastly, the firm-level set of control variables includes $WEBSITE_{i,k,j,t}$, which is equal to one if the firm has a website. This variable is a proxy for the firm's access to a telecommunications infrastructure and has been shown by Harrison et al. (2014) as key in explaining firm growth, especially in Africa.

At the country level, $Y_{j,(t,t-2)}$ includes the size of the country, $POPULATION_{j,(t,t-2)}$, in logarithm and on average over the period (t, t-2). We also account for the countries' level of development using the logarithm of per capita income in constant 2005 US dollars, $INCOME_{j,(t-3,t-5)}$. To avoid endogeneity issues, this variable is lagged by one period, and thus averaged over the (t-3, t-5). We also control for a corruption indicator to capture the quality of institutions at the country level. The WBES provides information on how pervasive corruption is perceived by firms. This variable ranges on a scale from 0 (corruption is not perceived as an obstacle to current operations) to 4 (corruption is perceived as a very severe obstacle to current operations). $CORRUPTION_{j,t}$ is the re-aggregation at the country-level of the firm-level perception of corruption. We use the firm probability weights provided by the WBES to compute the mean value of corruption at the country- level.

Table 1 shows the summary statistics for the sample of developing countries and LICs and LMICs. The annual average sales growth of formal firms is around 10% for the sample of developing countries, and slightly less for LICs/LMICs, at approximately 8%. In these countries, some 18% of the firms are outward-looking, *i.e.* exporting part of their production either directly or indirectly. This proportion is slightly higher for the sample of developing countries (around 22%). The firms operating in LICs/LMICs tend to have less access to the Internet as proxied by $WEBSITE_{i,k,j,t}$. In the other arears (state or foreign ownership, initial sales and size), the two samples of firms are fairly similar.

At the country level, Table 1 suggests that corruption is pervasive with an average value of around 1.8 on a scale from 0 to 4. The country-level variation is quite high, however, since some countries return a maximum value of 3.3 (corruption is perceived as a major obstacle at the country- level), and others a minimum value of 0.2 (corruption is not perceived as an obstacle at all). Lastly, the share of taxes in GDP is quite low in our sample of developing countries (14.7%) and even lower for LICs/LMICs (12.8%).

Table 1: Summary statistics.

Variables		mean	sd	min	max	mean	sd	min	max
		Firm characteristics							
		ALL DCs (N = 62,482)				LICs/LMICs (N = 39,458)			
$\mathrm{GROWTH}_{i,k,j,(t,t-2)}$	%	9.941	64.573	-100	915.085	7.731	66.612	-100	915.085
$\mathrm{SALES}_{i,k,j,t-2}$	logarithm	12.864	2.512	2.056	28.622	12.383	2.612	2.623	27.279
$\mathrm{STATE}_{i,k,j,t}$	dummy	0.014	0.117	0	1	0.012	0.112	0	1
$\mathrm{FOREIGN}_{i,k,j,t}$	dummy	0.093	0.291	0	1	0.086	0.281	0	1
$\mathrm{EXPORTS}_{i,k,j,t}$	dummy	0.225	0.417	0	1	0.180	0.384	0	1
$\mathrm{SIZE}_{i,k,j,t}$		1.718	0.796	0	3	1.663	0.780	0	3
$\mathrm{WEBSITE}_{i,k,j,t}$	dummy	0.439	0.496	0	1	0.352	0.477	0	1
		Country characteristics[a]							
		ALL DCs (N = 138)				LICs/LMICs (N = 90)			
$\mathrm{INCOME}_{j,(t-3,t-5)}$	logarithm	7.228	0.995	5.013	8.971	6.605	0.621	5.013	7.944
$\mathrm{POPULATION}_{j,(t,t-2)}$	logarithm	17.619	2.005	12.589	21.014	17.846	2.040	13.428	20.935
$\mathrm{CORRUPTION}_{j,t}$		1.800	0.712	0.189	3.273	1.849	0.662	0.189	3.273
$\mathrm{TAX}_{j,(t,t-2)}$	%GDP	14.748	5.830	1.102	56.933	12.841	5.315	4.807	56.933
$\mathrm{TAX\_NEIGHB}_{j,(t,t-2)}$	%GDP	15.047	4.165	6.607	27.366	13.543	3.485	6.607	25.565
$\mathrm{NRR\_NEIGHB}_{j,(t,t-2)}$	%GDP	11.427	7.794	0.338	43.694	11.267	7.723	1.996	43.694

[a] Number of observations at the country level.
Source: Firm-level variables are from the World Bank Enterprise Surveys (various years). Data at the country level are from the World Development Indicators, except for CORRUPTION (weighted mean of the WBES at the country level) and TAX (GRD - UNU-WIDER/ICTD). Authors' computation.

3 Baseline results

We first estimate Equation 1 for the full sample of countries, including all 102 developing and developed countries. Equation 1 is estimated using the OLS estimator. In keeping with Moulton (1990) and Froot (1989), the standard errors are clustered at the country-year level (which is the level for our variable of interest, $TAX_{j,(t,t-2)}$). Column (I) of Table 2 presents the results. Across the full sample, we find evidence of a catching-up effect both at the firm and country levels, as suggested by the significantly negative coefficients of $INCOME_{j,(t-3,t-5)}$ and $SALES_{i,k,j,t-2}$. Firms in less developed countries and with lower past performance tend to have higher growth prospects. Results also suggest that foreign ownership is correlated with higher growth, as well as outward-looking operations. Larger firms and firms with good telecommunications access also tend to grow faster. As regards the effect of taxation on firm growth, regression (I) in Table 2 displays a positive coefficient for $TAX_{j,(t,t-2)}$, although this is not statistically significant.

This absence of linear relationship between taxation and firm growth for our overall sample of 102 countries may be due to the large country heterogeneity within the sample. Indeed, the impact of taxes on firm performance has to be compared to the marginal effectiveness of taxes to provide the economic environment conducive to growth. In that sense, the marginal effect of taxes on firm growth may be greater when the scope for public goods provision is extremely high, which is the case when the level of development is low (see Figure A.1 in the Appendix). In highly developed countries with fair public goods provision, the marginal effect of taxation may be lower and tax might represent a burden weighing on firms' profitability and performance. In order to examine the heterogeneity of the tax impact depending on the country's level of development we include, in regression (II) of Table 2, an interaction term for $TAX_{j,(t,t-2)}$ with $INCOME_{j,(t-3,t-5)}$.

The interaction term is significantly negative, in line with the idea of a marginal decreasing impact of taxation with the level of development. The turning point in $INCOME_{j,(t-3,t-5)}$, for which taxation shows negative returns is around 5,000 USD per capita, which is the level of development of a country such as Costa Rica or Brazil in our sample. Of the 102 countries in the full sample, 33 (corresponding to 30,718 firms) display higher levels of income per capita. This result is in line with the findings of Aghion et al. (2016) and the theoretical predictions of Barro (1988) since above a certain level of development/or government's size, the negative effect of taxation on firm's incentive to innovate and invest outweighs the benefits of public goods provision.

Columns (III) and (IV) of Table 2 confirm this result. The share of taxes in GDP appears to be negatively correlated with firm growth in developed economies, while positively correlated with firm growth in developing countries in which the prospects for improvements in public goods provision are greater. Among the developing countries, however, the effect of $TAX_{j,(t,t-2)}$ appears to be driven mostly by the low income and LMICs, as shown in regressions (V) and (VI) of Table 2.

When estimating the impact of taxation on growth outcomes, there are two main sources of endogeneity bias: (1) reverse causality, which stems from the fact that the creation of wealth in an economy influences the amount of taxes that can be raised; and (2) omitted variables, due to the fact that growth performance and taxes can both be determined by the countries' unobservable structural, historical and institutional characteristics. In the following, we try to provide solutions to minimize these potential estimation biases.

Table 2: Baseline estimations of the impact of tax on firm growth.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Dependent variable:	$GROWTH_{i,k,j,(t,t-2)}$					
Sample:	**All countries**		**Non-DCs**	**DCs**		
Sub-samples:				*All*	*LICs/LMICs*	*UMICs*
Taxation var.						
$TAX_{j,(t,t-2)}$	1.440	14.695***	-2.864**	4.482***	3.266**	2.422
	(1.263)	(2.797)	(-2.125)	(4.102)	(2.370)	(1.339)
$TAX * INCOME_{j,(t,t-2)}$		-1.729***				
		(-2.727)				
Country-level control var.						
$CORRUPTION_{j,t}$	-2.646	-4.943	0.876	-7.628	8.167	-10.257*
	(-0.549)	(-1.018)	(0.191)	(-1.316)	(0.793)	(-1.793)
$INCOME_{j,(t-3,t-5)}$	-101.216***	-63.719**	-81.651**	-99.701***	-21.866	-56.423***
	(-3.968)	(-2.193)	(-2.772)	(-3.122)	(-0.508)	(-6.216)
$POPULATION_{j,(t,t-2)}$	68.774*	54.138	116.560	94.267*	-32.593	565.556***
	(1.729)	(1.438)	(1.018)	(1.725)	(-0.498)	(9.050)
Firm-level control var.						
$SALES_{i,k,j,t-2}$	-14.865***	-14.866***	-20.037***	-14.114***	-12.201***	-14.442***
	(-6.617)	(-6.616)	(-5.148)	(-5.722)	(-4.701)	(-4.186)
$STATE_{i,k,j,t}$	-6.080*	-6.074*	-7.411	-5.837*	-1.772	-6.994**
	(-1.918)	(-1.913)	(-0.731)	(-1.810)	(-0.214)	(-2.571)
$FOREIGN_{i,k,j,t}$	7.538**	7.580***	15.207*	5.691**	6.230**	4.094
	(2.595)	(2.607)	(1.952)	(2.535)	(2.544)	(1.628)
$EXPORT_{i,k,j,t}$	7.387***	7.392***	6.711	8.251***	7.585***	8.511***
	(3.999)	(4.000)	(1.446)	(3.685)	(3.310)	(2.841)
$SIZE_{i,k,j,t}$	19.881***	19.870***	28.622***	18.050***	16.377***	18.489***
	(6.272)	(6.271)	(4.397)	(5.788)	(3.460)	(4.344)
$WEBSITE_{i,k,j,t}$	11.286***	11.335***	15.633***	10.203***	7.271***	11.362***
	(6.264)	(6.262)	(3.674)	(5.435)	(7.709)	(4.115)
Constant	-406.123	-387.700	-748.525	-853.072	829.134	-8,591.2***
	(-0.552)	(-0.554)	(-0.402)	(-0.829)	(0.673)	(-8.338)
Observations	71,608	71,608	9,126	62,482	39,458	23,024
R-squared	0.239	0.240	0.212	0.256	0.180	0.332
Number of countries	102	102	13	89	59	30
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. DCs stands for "Developing Countries" and includes aid recipients only. OLS estimations using firm probability weights. Robust t-statistics in parentheses, based on standard-errors clustered at the country-year level. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

3.1 Endogeneity concerns

So far, our identification strategy has been based mainly on the introduction of country and industry-year fixed effects and on the different levels of aggregation of the variable of outcome, $GROWTH_{i,k,j,(t,t-2)}$, and of interest, $TAX_{j,(t,t-2)}$. The fact that $TAX_{j,(t,t-2)}$ is measured at the country level, while $GROWTH_{i,k,j,(t,t-2)}$ is measured at the firm level, largely allays reverse-causality concerns. It is highly unlikely that the growth performance of one firm, even a large one, would determine how much tax is raised in a country. However, it might still be argued that we are looking at the relationship between taxation and the average firm growth rate at the country level. So the firm growth rate will be positively correlated with the country's GDP growth rate, which determines the level of taxes collected. Reverse causality would be hence be important in this context. Moreover, the introduction of country and industry-year fixed effects does not fully preclude an omitted variable bias.

Regression (IV) in Table 2 on the sample of developing countries is our baseline result. In the following, we provide robustness checks of this baseline estimation that address both confounding factors and reverse-causality issues. First, we examine the robustness of the baseline result to additional covariates. Given that $TAX_{j,(t,t-2)}$ is measured at the country level, the primary source of omitted variable bias is likely to be at the country level. Panel A of Table 3 includes country characteristics that may be correlated with both the tax ratio and firm performance. In keeping with the existing literature on taxation in developing countries, we include in turn the share of trade (imports plus exports) in GDP, $TRADE_{j,(t,t-2)}$, natural resource rent in GDP, $NRR_{j,(t,t-2)}$, and a measure of institutional quality, $POLITY_{j,(t,t-2)}$, which have been shown as being major determinants of the domestic revenue mobilization (Agbeyegbe et al., 2006; Crivelli and Gupta, 2014; Teera and Hudson, 2004; Bornhorst et al., 2009), and which may also be correlated with firm growth. All these variables are downloaded from the World Development Indicators (World Bank, 2016). Column (I) in Panel A of Table 3 replicates the baseline estimate for the sample of developing countries. Columns (II) to (IV) in Panel A of Table 3 show that when the macroeconomic covariates are sequentially introduced in the baseline OLS estimations, none of them is significant and $TAX_{j,(t,t-2)}$ remains significantly positive and in similar ranges (the coefficient ranges from 4.5 to 5). Lastly, in column (V) of Table 3, we include the tax share squared in order to capture any non-linearity in the tax ratio rather than in development level as we did in Table 2. This additional variable is not significant, and $TAX_{j,(t,t-2)}$ becomes marginally significant (p = 0.100).

Our second approach to dealing with endogeneity concerns consists in estimating Equation 1 with the two-stage least squares estimator. We use two instrumental variables, both relying on the assumption that the tax ratio in country j is linked, through tax competition, to the tax ratio of its neighboring countries n. Indeed, Lee and Gordon (2005) have shown that tax rates between nearby countries are highly correlated, as illustrated in Figure A.2 in the Appendix. However, it is fairly unlikely that the private sector activity of a given country affects the taxation of its neighboring countries, which therefore makes the average tax ratio of the neighbors a good instrument for this study. In addition, we consider the average natural resource rents of neighboring countries as an instrument since variation in resource rent is induced mostly by price fluctuations on international markets, and can directly affect the tax rate of the country (as has been shown by Bornhorst et al. (2009), Thomas and Treviño (2013), and Crivelli and Gupta (2014)), and can consequently impact the tax rate of its neighbors under the tax competition argument. So we define the first instrument as the average of the neighbors' tax ratios (as a share of GDP), $TAX\_NEIGHB_{j,(t,t-2)}$, and the second one as the average of the neighbors' natural resource rents (as a share of GDP), $NRR\_NEIGHB_{j,(t,t-2)}$. They are both obtained from:

$$TAX\_NEIGHB_{j,(t,t-2)} = \Sigma_{n=1}^{N} TAX_{n,(t,t-2)} \times NEIGHBOR_{j,n}$$

$$NRR\_NEIGHB_{j,(t,t-2)} = \Sigma_{n=1}^{N} NRR_{n,(t,t-2)} \times NEIGHBOR_{j,n}$$

where $NEIGHBOR_{j,n}$ is a dummy variable equal to 1 if country n shares a land border with country j. Column (I) of Panel B of Table 3 displays the results. In this regression we use the same specification as in column (IV) of Table 2 with no additional covariates. The TSLS estimate is close to the OLS estimate in Panel A, with a slightly higher coefficient for $TAX_{j,(t,t-2)}$.[6] The first-step estimate is satisfactory, with both instruments being significantly correlated with $TAX_{j,(t,t-2)}$ and displaying the expected sign. The Sargan test for over-identification and Kleibergen-Paap F-Stat also suggest that the instruments are valid.

One key condition for $TAX\_NEIGHB_{j,(t,t-2)}$ and $NRR\_NEIGHB_{j,(t,t-2)}$ to be valid instruments is that they affect firm growth, $GROWTH_{i,k,j,(t,t-2)}$, solely through their impact on $TAX_{j,(t,t-2)}$. This exclusion restriction may, however, be violated if the instruments affect firm growth through other macroeconomic covariates, such as trade, for example. One way to investigate the validity of the instruments and check for the exclusion restriction is to include in the TSLS estimations the other potential channels through which the instruments may affect firm growth. This test is performed in Panel B, regressions (II) to (IV) of Table 3. The results suggest that the TSLS estimate of the coefficient of $TAX_{j,(t,t-2)}$ is unaltered by the introduction of additional macroeconomic covariates ($TRADE_{j,(t,t-2)}$, $NRR_{j,(t,t-2)}$, and $POLITY_{j,(t,t-2)}$). The first-step results remain largely unchanged, as do the Sargan and Kleibergen-Paap F-Stat. In the last column, we also instrument tax rate squared, with no additional instrument, since our specification is overidentified.[7] The instruments now perform very poorly, as illustrated by the Sargan and Kleibergen-Paap F-Stat, which explains why both $TAX_{j,(t,t-2)}$ and its square are not significant.

Table 3 thus suggests that when country-level confounding factors and reverse causality are accounted

[6] Although the OLS coefficient is not significantly different to the one obtained with the IV estimate since their confidence intervals overlap.

[7] The results are very similar when we add the squared terms of the two instruments.

for, the baseline results remain largely unchanged. In the following, we also examine firm-level endogeneity concerns.

Table 3: Additional macroeconomic covariates and TSLS estimations.

Sample: **DCs** Dep.: $\text{GROWTH}_{i,k,j,(t,t-2)}$	(I)	(II)	(III)	(IV)	(V)
$\text{VARIABLE}_{j,(t,t-2)}$:		TRADE	NRR	POLITY	TAX^2
Panel A			**OLS**		
$\text{TAX}_{j,(t,t-2)}$	4.482***	5.136***	4.941***	5.048***	6.724
	(4.102)	(4.247)	(4.172)	(4.636)	(1.656)
$\text{VARIABLE}_{j,(t,t-2)}$		-0.377	-0.909	0.767	-0.057
		(-1.084)	(-1.051)	(0.706)	(-0.595)
Panel B			**TSLS**		
$\text{TAX}_{j,(t,t-2)}$	7.201**	6.963**	7.711**	8.042***	20.607**
	(2.178)	(2.203)	(2.232)	(2.906)	(2.561)
$\text{VARIABLE}_{j,(t,t-2)}$		-0.498	-1.252	1.047	-0.373*
		(-1.406)	(-1.139)	(0.983)	(-1.915)
First-step					
$\text{TAX\_NEIGHB}_{j,(t,t-2)}$	0.311***	0.314***	0.249**	0.297***	-0.970
	(3.30)	(3.36)	(2.38)	(0.000)	(-0.08)
$\text{NRR\_NEIGHB}_{j,(t,t-2)}$	-0.165**	-0.179***	-0.194***	-0.227***	-0.688
	(-2.48)	(-2.75)	(-2.92)	(0.001)	(-0.11)
Kleibergen-Paap F-Stat	15.437	17.231	13.597	21.777	3.767
Hansen J-Stat	0.191	0.141	0.000	0.017	3.831
p-value	0.661	0.707	0.983	0.897	0.147
Observations	62,482	61,935	62,482	60,919	62,482
Nb. of countries	89	89	89	85	89
Country-level var.	Yes	Yes	Yes	Yes	Yes
Firm-level var.	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. Panel A: OLS estimations using firm probability weights. Panel B: TSLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$.

Source: authors.

First, we check whether the specification omits any firm-level variable that may be correlated with both firm performance and the tax ratio. Thus, we investigate the robustness of the baseline result to the inclusion of additional firm-level covariates. The results are presented in Panel A of Table 4.

Table 4: Additional firm covariates and TSLS estimations.

Sample: **DCs** Dep.: $\text{GROWTH}_{i,k,j,(t,t-2)}$	(I)	(II)	(III)	(IV)	(V)	(VI)
$\text{VARIABLE}_{i,k,j,t}$:		FEMALE	ELECTRY.	TRANSPT.	OUTAGE	CELL
Panel A				**OLS**		
$\text{TAX}_{j,(t,t-2)}$	4.482***	5.522***	4.423***	4.110***	4.603***	4.362***
	(4.102)	(5.976)	(3.981)	(3.737)	(4.203)	(3.745)
$\text{VARIABLE}_{i,k,j,t}$		-0.175	1.230	0.113	1.828	
		(-0.097)	(1.535)	(0.261)	(0.651)	
$\text{SALES}_{cell,j,t-3}$						-14.507***
						(-3.205)
$\text{STATE}_{cell,j,t}$						-7.658*
						(-1.740)
$\text{FOREIGN}_{cell,j,t}$						8.468
						(1.562)
$\text{EXPORT}_{cell,j,t}$						5.983***
						(3.235)
$\text{SIZE}_{cell,j,t}$						14.911***
						(4.366)
$\text{WEBSITE}_{cell,j,t}$						15.061***
						(2.841)
Panel B				**TSLS**		
$\text{TAX}_{j,(t,t-2)}$	7.201**	8.446**	6.962**	5.876*	7.325**	6.771**
	(2.178)	(2.532)	(2.110)	(1.826)	(2.199)	(1.974)
$\text{VARIABLE}_{i,k,j,t}$		-0.167	1.225	0.116	1.861	
		(-0.093)	(1.538)	(0.269)	(0.335)	
First-step						
$\text{TAX\_NEIGHB}_{j,(t,t-2)}$	0.311***	0.319***	0.311***	0.310***	0.310***	0.311***
	(3.30)	(3.30)	(3.30)	(3.32)	(3.30)	(3.30)
$\text{NRR\_NEIGHB}_{j,(t,t-2)}$	-0.165**	-0.168**	-0.165**	-0.167**	-0.166**	-0.166**
	(-2.48)	(-2.46)	(-2.48)	(-2.51)	(-2.49)	(-2.49)
Kleibergen-Paap F-Stat	15.437	14.287	15.428	15.602	15.444	15.460
Hansen J-Stat	0.191	0.192	0.174	0.431	0.175	0.221
(p-value)	0.661	0.661	0.676	0.511	0.675	0.638
Observations	62,482	59,109	62,329	61,943	62,205	62,482
Nb. of countries	89	82	89	89	89	89
Country-level var.	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level var.	Yes	Yes	Yes	Yes	Yes	No

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. $_{cell}$ indicates that the variable has been averaged on industry-region cells. Firm-level aggregated at the $_{cell}$ level are not exposed in the second step of the TSLS estimates in order to save space but are statistically significant and have the same sign as in the OLS estimate. Panel A: OLS estimations using firm probability weights. Panel B: TSLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

Again, column (I) replicates the baseline result. In column (II), we control for whether the firm's CEO is a female, using a dummy variable, as well as whether the firm faces strong infrastructure obstacles, either electricity (column (III)) or transport obstacles (column (IV)).[8]

Lastly, in column (V) we also add a dummy variable indicating whether the firm has experienced power outages in the last tax year. Table 4 shows that the coefficient of $TAX_{j,(t,t-2)}$ is unaltered by the introduction of these additional firm-level covariates.

Second, we examine whether the potential endogeneity of firm-level controls affects the estimated coefficient of $TAX_{j,(t,t-2)}$. One simple way to deal with firm-level control endogeneity is to aggregate all the firm-level controls on cells at the sector-region level (Harrison et al., 2014). Column (VI) of Panel A of Table 4 displays the results when firm-level controls are aggregated on these cells: the coefficient of $TAX_{j,(t,t-2)}$ is virtually unchanged. Lastly, we perform the same test sets (including additional firm-level covariates and aggregating all the firm-level controls) using the TSLS estimator. The results are displayed in Panel B of Table 4. Including additional firm covariates and aggregating the controls alter neither the TSLS estimate of the coefficient of $TAX_{j,(t,t-2)}$ nor the validity of the instruments.

3.2 Further robustness checks

In a supplementary Appendix (Tables presented in Appendix B), we provide further robustness checks on the baseline results. The first set of robustness checks consists in examining whether the results are altered by the choice of the fixed effects introduced in Equation 1. Panel A of Table B.1 in the supplementary Appendix presents the coefficient for $TAX_{j,(t,t-2)}$ when the sector-year dummies are replaced by sector and year dummies. The coefficients are very similar to those in Table 2, with the exception that the average positive effect of taxation on firm performance for the overall sample is now statistically significant at the 10% level. Panel B then re-estimates the same specification as in the baseline (with sector-year dummies), but this time we change the level of clustering. Instead of clustering the standard errors at the country-year level, we cluster them at the country level. The significance of the coefficient of $TAX_{j,(t,t-2)}$ in column (IV) for the sample of developing countries, is unaffected. Only the result for the full sample (column (I)) loses significance. Lastly, in Panel C, we examine robustness to a change in both the fixed effect and the level of clustering. As in Panel A, the results are unchanged, except that the negative effect of taxation on firm growth in advanced economies is now marginally significant (around the 10% level). Table B.1 thus suggests that the estimated coefficient of $TAX_{j,(t,t-2)}$ is robust to the kind of clustering and fixed-effects introduced, especially for the sample of developing countries in column (IV).

[8]Both electricity and transport variables range from 0 (low obstacle) to 4 (severe obstacle).

The last set of robustness checks examines the issue of sample dependence, as well as potential bias due to outliers. First, regression (IV) of Table 2 is re-estimated with each regional sub-sample excluded (one at a time) in order to check that the baseline results are not driven by one specific region. Table B.2 in the supplementary Appendix shows that the coefficient of $TAX_{j,(t,t-2)}$ is again unaltered by these sample changes. Second, Table B.3 in the supplementary Appendix re-estimates the baseline regression (IV) for Table 2 dropping one country at a time. They both provide evidence that the coefficient of $TAX_{j,(t,t-2)}$ is unaffected when the developing countries in the sample are excluded one at a time, suggesting that the results are not driven by one specific country, or potential outliers. In the same vein, we alternately drop sub-samples of firms belonging to each of the 21 sectors in our sample in order to see whether results are driven by sector specific characteristics (although we control for sector fixed effects and sector-year fixed effects in Table B.1). The results are presented in Table B.4 and highlight that, as with the previous robustness checks, the positive effect of taxation on firm growth remains statistically significant and is not driven by a sub-sample of firms operating in a more buoyant sector than the others.

Third, although we control for firm time-varying characteristics via the inclusion of firm-level covariates, our benchmark result for the developing countries could potentially be driven by a small cluster of firms presenting specific features. We consequently run estimate (IV) on Table 2, this time dropping sub-samples of firms based on a given feature. For instance, Panel B in Table B.5 in the supplementary Appendix presents the results for our benchmark specification when state-owned firms are dropped from the sample. Panel F does the same, excluding this time small-size firms (with less than 20 employees). The results in Table B.5 show that the positive effect of taxation on firm performance remains significant across all these different panels, and is not driven by a specific type of firm.

Lastly, as illustrated by Table A.1 the number of firms surveyed in each country varies quite a lot depending notably on the level of development. Because our variable of interest is measured at the country level, the unbalanced number of firms for the different countries implies that some countries are over-represented in the sample of firms. To account for this problem, we randomly draw, for each survey, sub-samples of firms (100 firms, 200 firms, and 300 firms), re-run the baseline estimation on these sub-samples (replicating the random draw 500 times), and compute the average coefficient for $TAX_{j,(t,t-2)}$, as well as the proportion of regressions in which the coefficient is not statistically significant. Table B.6 in the supplementary Appendix presents the results. We observe that starting from a draw of 200 firms, the coefficient of $TAX_{j,(t,t-2)}$ is almost always statistically significant over the entire replication and stands, on average, at around 3.4.

Overall, Tables B.1 to B.6 all suggest that the positive effect of the share of taxes in GDP on firm growth in developing countries is robust to sub-sample estimations as well as to changes in the specification of the fixed effects and in the level of clustering.

4 Taxation and Corruption Nexus

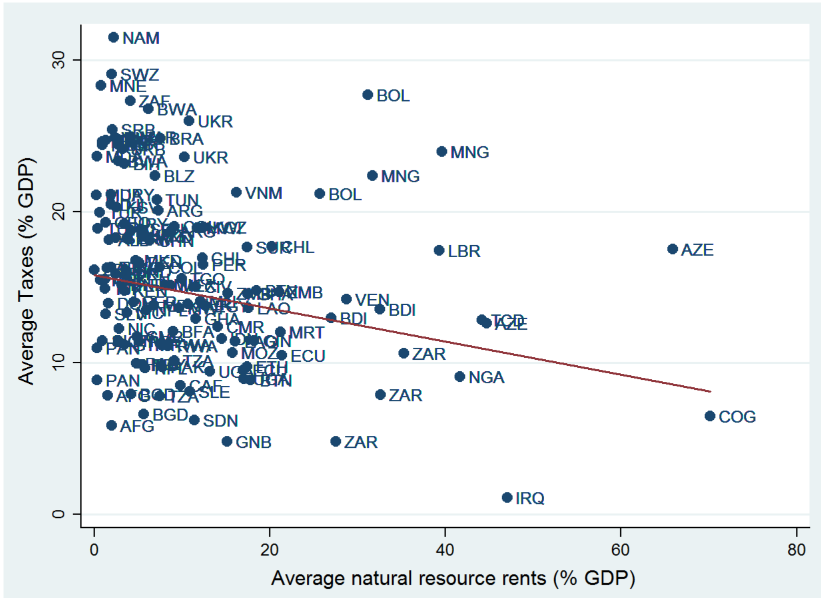
The main mechanism explaining how taxation can positively affect firm growth is that it is used to provide public goods that are conducive to growth. These public goods are infrastructure (electricity and transportation in the main), as well as education and health facilities conducive to the effectiveness and social well-being of the labor force and ultimately capital accumulation.

In this section we provide indirect evidence that the positive effect of taxation disappears when the conditions are not met for it to transform into public goods provision. We examine two mechanisms that can prevent taxation from contributing to the provision of public goods: (1) lack of government accountability; and (2) embezzlement by the political elite.

Government accountability is closely linked to its reliance on the taxation of citizens. Without taxation, any democracy would fail: taxation is what makes governments accountable to the population. It has been shown in the literature that windfall finance tends to reduce the accountability of governments to the citizens (Tsui, 2011). It has also been emphasized that the impact of windfall finance, such as natural resource rents, on growth outcomes is more adverse when institutions are weak (Mehlum et al., 2006). Lastly, natural resources also tend to adversely impact the demand for accountability through the decrease in taxation that they induce (Bornhorst et al., 2009; McGuirk, 2013; Crivelli and Gupta, 2014). The data in our sample appear to support this crowding-out effect of natural resources windfall on non-resource taxes. Indeed, looking at Figure 1 below, it can be observed that average taxation, excluding natural resource taxes, is much lower on average in countries that are significantly endowed with natural resources.

In the following, we examine whether all forms of taxation produce the accountability effect that is required for taxation to transform into public goods provision. The ICTD/UNU-WIDER Government Revenue Dataset provides information on whether taxation is raised from non-resource sectors, $NRTAX_{j,(t,t-2)}$, or from the extraction of natural resources $RTAX_{j,(t,t-2)}$. In line with the GRD glossary, resource taxes do not include royalties and other revenue from exploitation rights. Resource taxes thus cover direct taxes on corporations operating in the resource sector, and indirect resource taxes (such as excise duty on refined products for instance). We therefore examine whether the positive effect of taxation holds when taxation stems from the resource sector, which we assume does not discipline the government into providing public goods to the population.

Figure 1: Government accountability and natural resource rents.



Notes: Natural resource rents and taxes (excluding social contribution and resource taxes) are averaged over the period on which sales growth is computed (t, t-2). Lesotho has been removed from the graph in order to obtain a more legible scatter. Since taxes for Lesotho amount to 56% of GDP, it tends to squash the scatter for countries with tax-to-GDP ratio lower than 20%. However, including Lesotho into the graph leads to the same fitted line (though little bit more steep) since the average natural resource rents for Lesotho corresponding to its tax ratio is around 5%.
Source: authors.

Table 5 provides summary statistics on disaggregated taxes. The number of country-year observations falls from 138 on the full sample of developing countries to 133 (for 88 countries instead of 89 for the baseline). Despite being a small part of all taxes, $RTAX_{j,(t,t-2)}$ in some countries represents more than 10% of GDP. Yet Table 5 shows that, on average, resource taxes remain a minor source of revenue for the countries in our sample.

Table 5: Summary statistics on disaggregated taxes.

Variable	**mean**	**sd**	**min**	**max**
	ALL DCs (N = 133)			
$\text{NRTAX}_{j,(t,t-2)}$	13.923	6.040	0.936	56.933
$\text{RTAX}_{j,(t,t-2)}$	0.864	1.890	0	14.518

Source: Authors' computation based on data from the GRD (UNU-WIDER/ICTD) Dataset

Table 6 presents the results when the $TAX_{j,(t,t-2)}$ variable we have used so far is divided into non-resource taxes, $NRTAX_{j,(t,t-2)}$, and resource taxes, $RTAX_{j,(t,t-2)}$. The first column of Table 6 reproduces our baseline result in column (IV) of Table 2. Column (II) then estimates the same regression on the sample of countries for which we have information on the resource and non-resource components of taxation. The $TAX_{j,(t,t-2)}$ coefficient remains positive, statistically significant, and in the same magnitude as the benchmark coefficient.

In column (III), we disaggregate between resource and non-resource taxation. The results suggest that only the non-resource taxes display a positive correlation with firm growth. Taxes raised from the resource sector are not significantly associated with firm outcome. These results hence suggest that when taxation is not associated with some form of government accountability to the citizens, as is likely to be the case when taxation stems from natural resources, then the positive effect of taxation disappears. This finding is in line with the idea that the positive impact of taxation on firm growth stems from the public goods provision that it entails.

Table 6: Impact on growth of resource and non-resources taxes.

Sample: **DCs**	(I)	(II)	(III)
Dependent variable:	$\text{GROWTH}_{i,k,j,(t,t-2)}$		
$\text{TAX}_{j,(t,t-2)}$	4.482***	4.336***	
	(4.102)	(3.515)	
$\text{NRTAX}_{j,(t,t-2)}$			3.810***
			(3.388)
$\text{RTAX}_{j,(t,t-2)}$			-2.008
			(-0.658)
Observations	62,482	61,365	61,365
R-squared	0.256	0.256	0.257
Nb. of countries	89	88	88
Country-level var	Yes	Yes	Yes
Firm-level var	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$.

Source: authors.

The second mechanism that we examine is embezzlement by the political elite. This mechanism has already been evidenced by Aghion et al. (2016) using US data and by Goyette (2015) for a small sample of developing countries. Corruption generally diverts public resources from their purpose, namely the provision of public goods. If taxation has a positive impact on firm growth that stems from the provision of public goods, then this requires that corruption is not too pervasive. In Table 8 we examine the relationship between taxation, corruption, and growth by introducing an interaction term between the taxation variable and the corruption variable. We use two measures of corruption, both re-aggregating at the country-level information provided in the WBES.[9] The first measure is the perception of corruption as an obstacle to firm activity, $CORRUPTION_{j,t}$ averaged at the country level, which is the measure of corruption used so far as one of our country-level control variables.

The second measure, $BRIBE_{j,t}$, provides information on whether the firm had to pay an informal payment over the past year (as well as two years before). This is also averaged at the country level. Consequently, when re-aggregated at the national level, this variable represents the share of resident firms that have had to pay a bribe over the past year. These two measures of corruption have advantages and disadvantages. The first is a perception indicator and suffers from the respondent's subjectivity, implying that it may well be endogenous to firm performance (even though this may be a minor issue at the country level). The second measure is a more objective measure of corruption, but may be plagued by the reluctance of firm managers to declare informal payments. This under-declaration bias is also likely to be correlated with other firm characteristics. We therefore use both measures, bearing in mind their limitations.

In Table 8, we augment the baseline specification with an interaction term between the tax variables and the corruption variables. In Panel A, we use the full sample of developing countries. The first column reproduces our baseline regression (IV) in Table 2. Then in column (II), we interact $CORRUPTION_{j,t}$ with $TAX_{j,(t,t-2)}$. In column (III), we interact $BRIBE_{j,t}$ with $TAX_{j,(t,t-2)}$. In columns (IV) and (V), we replace total taxes with non-resource taxes, which have been shown to display a positive impact on firm growth, and whose impact should be most affected by corruption. In all columns (II) to (IV) of Panel A the interaction terms between taxes and corruption is not significant, suggesting no substitution effect between the two.

Yet in order to deepen our understanding of the mechanisms we further reduce the sample to the LICs and LMICs. This sample reduction makes sense since, as shown in Table 1, LICs/LMICs face a higher level of corruption compared with the entire sample of developing countries. In addition, looking at Table 7 on summary statistics by income group across the entire sample of developing countries, it can be observed

[9]The country averages are computed using firms' weights.

that the prevalence of corruption, based on both $CORRUPTION_{j,t}$ and $BRIBE_{j,t}$ measures, is indeed significantly higher in LICs/LMICs than in UMICs.

Furthermore, Table 7 displays a lower level of tax revenues for LICs/LMICs than for UMICs. This is also supported by Figure 2, which plots tax revenue with the perception of corruption for our sample of developing countries, but differentiates between LICs/LMICs and UMICs.

Table 7: Prevalence of Corruption by Income Group[a]

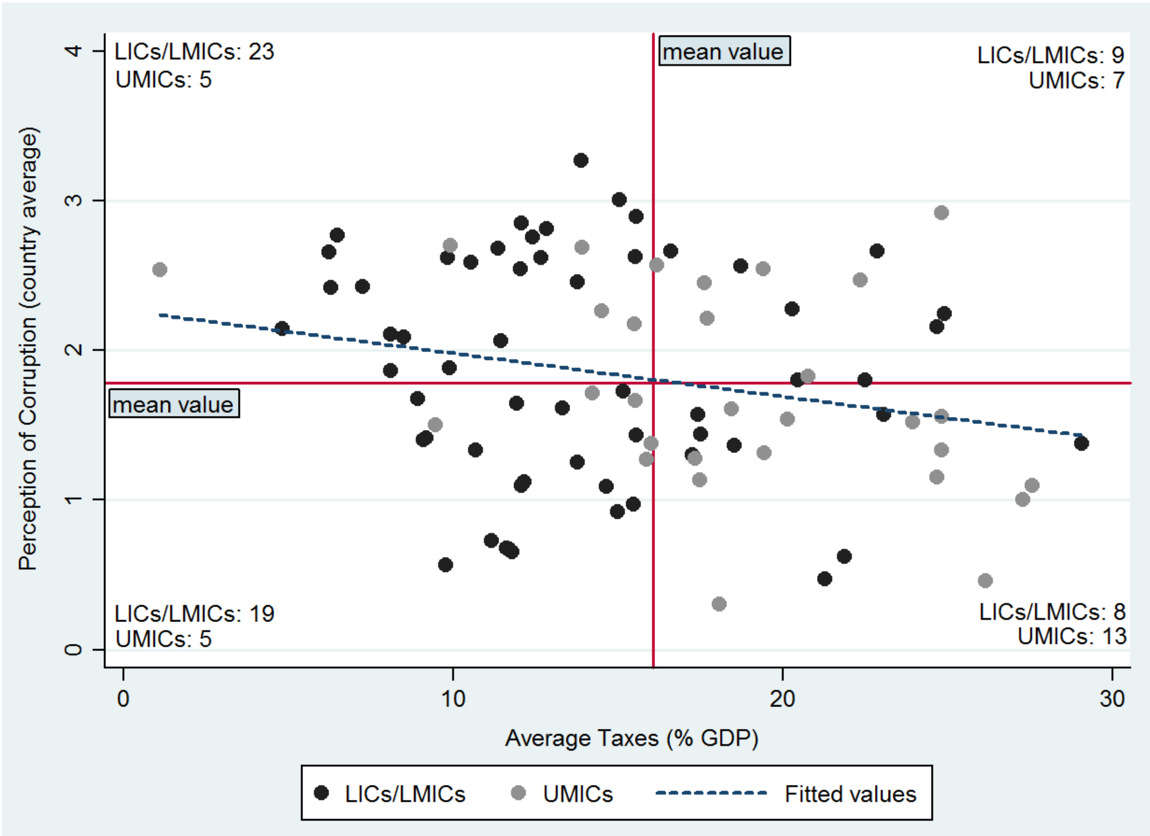
	(1)	(2)	(3)	(4)
	Total	LICs/LMICs	UMICs	Diff. (2)-(3)
Observations:	138	90	48	-
	mean (sd)	**mean (sd)**	**mean (sd)**	**mean (sd)**
$\text{TAX}_{j,(t,t-2)}$	16.078 (6.860)	14.618 (6.984)	18.819 (5.750)	-4.201***
$\text{CORRUPTION}_{j,t}$	1.785 (0.748)	1.841 (0.768)	1.681 (0.703)	0.161 (p=0.115)
$\text{BRIBE}_{j,t}$	0.320 (0.338)	0.353 (0.328)	0.258 (0.350)	0.085* (p=0.057)

[a] Number of observations at the country-year level. Difference significance :$^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$.

Source: authors.

Figure 2 first suggests that, within our sample, tax revenue is negatively associated with corruption. This is in line with the existing literature (Ghura, 1998; Tanzi and Davoodi, 1998; Teera and Hudson, 2004; Bird et al., 2008; Bornhorst et al., 2009). Yet we also note that over three-quarters of the LICs/LMICs post a level of taxes below the average value for the entire sample of developing countries. Among them, more than half even display both a lower-than-average level of taxation and a higher-than-average level of corruption (north-west area in Figure 2). Therefore, the dampening effect of corruption on the positive relation between taxation and firm growth should be higher in LICs/LMICs since the few taxes they manage to collect compared with UMICs is more likely to be diverted away from infrastructure financing given the higher incidence of corruption. Indeed, in UMICs, although corruption also prevails, the higher level of tax revenue logically gives government public funds (even after bribes have been paid) to finance promising projects for firms. Panel B of Table 8 displays the results when the sample is restricted to LICs/LMICs.

Figure 2: Corruption and tax revenue by income group.



Notes: Red lines represent the average value of both taxes and corruption for the sample of developing countries. Lesotho has been removed from the graph in order to obtain a more legible scatter. Since taxes for Lesotho amount to 56% of GDP, it tends to squash the scatter for countries with tax-to-GDP ratio lower than 20%. However, including Lesotho does not change the overall look of the graph, but just add one country to the number of LICs/LMICs in the north-east square.
Source: authors.

In all columns (II) to (V), the interaction term between taxes (either all taxes or non-resource taxes) and the corruption variables (either perceived or observed) is significantly negative. In line with Aghion et al. (2016) and Goyette (2015), our results suggest that taxation has a positive impact on firm performance except in the case where corruption is too pervasive. The level at which perceived corruption is so great that taxation has a negative impact on firm performance (the negative incentive effect outweighs the positive public good effect) is around 2.5 (which is the case for almost 30% of the sample of just LICs/LMICs).

Overall the results of Tables 6 and 8 provide indirect evidence that the positive effect of taxation crucially depends on how taxes are spent. When taxes are not associated with government accountability or when corruption is too pervasive, then taxation has no positive effect on firm growth (and may even have a negative effect).

Table 8: Impact of taxation on growth depending on corruption.

	(I)	(II)	(III)	(IV)	(V)
Dependent variable:			$GROWTH_{i,k,j,(t,t-2)}$		
Panel A			*All DCs*		
TAX.VAR:					
$TAX_{j,(t,t-2)}$	4.482***	3.297	2.648*		
	(4.102)	(1.577)	(1.779)		
$NRTAX_{j,(t,t-2)}$				2.830	1.830
				(1.370)	(1.281)
CORR. VAR:					
$CORRUPTION_{j,t}$	-7.628	-17.098		-15.108	
	(-1.316)	(-0.828)		(-0.796)	
$BRIBE_{j,t}$			-15.135		-6.923
			(-0.898)		(-0.595)
INTERACTION:					
TAX.VAR * $CORR.VAR_{j,t}$		0.659	0.639	0.608	0.605
		(0.579)	(0.566)	(0.571)	(0.676)
Observations	62,482	62,482	61,161	61,639	60,318
R-squared	0.256	0.256	0.257	0.257	0.257
Nb. of countries	89	89	89	88	88
Panel B			*LICs/LMICs*		
TAX VAR:					
$TAX_{j,(t,t-2)}$	3.266**	7.904***	5.613***		
	(2.370)	(4.566)	(4.570)		
$NRTAX_{j,(t,t-2)}$				7.074***	4.790***
				(4.309)	(2.880)
CORR. VAR:					
$CORRUPTION_{j,t}$	8.167	50.785***		60.615***	
	(0.793)	(2.710)		(3.043)	
$BRIBE_{j,t}$			91.262**		87.302*
			(2.090)		(1.810)
INTERACTION:					
TAX.VAR * $CORR.VAR_{j,t}$		-3.171***	-5.148**	-3.743***	-4.849**
		(-2.965)	(-2.485)	(-3.631)	(-2.050)
Observations	39,458	39,458	38,137	38,767	37,446
R-squared	0.180	0.181	0.181	0.181	0.181
Nb. of countries	59	59	59	59	59
Country-level var.	Yes	Yes	Yes	Yes	Yes
Firm-level var.	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

5 The Missing Link: Public Goods Provision

As discussed above, if taxation drives up firm growth, this suggests that it finances the public goods required for firm activity. This condition has been assumed in previous papers (Aghion et al., 2016; Goyette, 2015) without ever being tested. Simple descriptive statistics indeed imply that the infrastructure constraint is perceived as being less pervasive in countries with higher taxation rates (see Figure 3 below).

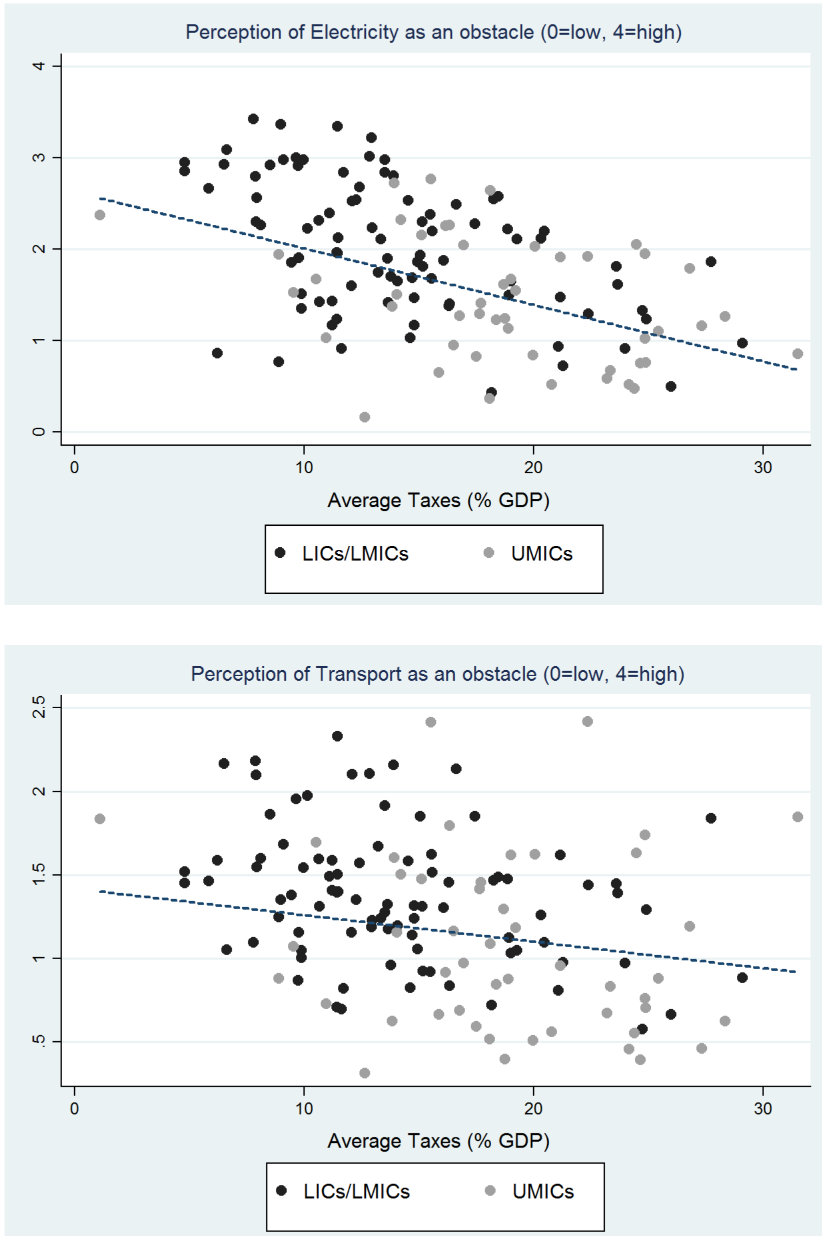
In the following we provide evidence that taxation has a greater impact on the growth performance of firms whose activity is structurally more dependent on infrastructure and social facilities. To do so, we adopt the empirical strategy used by Rajan and Zingales (1998). These authors examine the impact of financial development on growth. They address the omitted variable bias that plagues this relationship by working on industry level data and filtering the effect of financial development (at the country level) based on the dependence of each industry on external finance. This strategy moreover solves the country-level omitted variable bias since the equation includes country-year dummies and the country-level variable of interest is introduced in interaction with reliance on external financing measured at the industry level. We apply this methodology to our research question to estimate the following equation:

$$GROWTH_{i,k,j,(t,t-2)} = \alpha + \beta X_{i,k,j,t} + \delta TAX_{j,(t,t-2)} * INTENSITY_k + \gamma_{j,t} + \mu_k + \tau_t + \varepsilon_{i,k,j,t} \qquad (2)$$

where we replace the country-level variables in Equation 1 with country-year dummies, $\gamma_{j,t}$, and include an interaction term of taxation with various industry-level intensities, INTENSITY_k. We also control for an industry fixed effect, μ_k, and year dummies, τ_t. This strategy reduces the endogeneity issue at the macro level thanks to the country-year dummies. It also demonstrates the potential channels through which taxation positively affects firm growth.

We use four different intensity variables. The main characteristic of these intensity variables is that they have to be exogenous to the industry characteristics in the developing countries. In their analysis, Rajan and Zingales (1998) use US data on firms' dependence on external financing, assuming that the US credit market is frictionless. We use the same strategy. In keeping with Levchenko (2007) and Nunn (2007), we use the 2000 US input-output matrix which provides information on how much each sector uses as inputs from other sectors, especially from public utilities (electricity and gas supply), transport, telecommunications, construction, and education. We download the US input-output matrix from the WIOD (2015) database (World Input Output Database. See also Timmer et al. (2015)). The 2000 US input-output matrix is used to calculate the intensity in public goods for each sector in the economy.

Figure 3: Infrastructures Provision and Level of Taxation



Notes: Lesotho has been removed from the graph for the same reasons as these exposed in Figure 1 footnote. Including Lesotho into the graph does not change the fitted line neither. Obstacle perception and taxes excluding social contribution are averaged over the period on which sales growth is computed (t, t-2).
Source: authors.

For infrastructure, we identify three kinds of intensities: intensity in public utilities, $Pub\_Utilities_k$, which is the share of public utilities in the total intermediate consumption of sector k; intensity in transport, $Transport_k$, which is the share of transportation (inland, water, rail, and transportation support activities) in total intermediate consumption; and intensity in both transport and construction, $Transp\_Constr_k$, into which the additional input from the construction sector is added. We also examine whether there is greater consumption of the education input in some sectors than in others. Taking the same input-output matrix, we construct, for each sector, the intensity in education, $Education_k$, which is the share of education in the sum of all inputs. Table A.2 in the Appendix displays the four intensities sector by sector. Table 9 shows the estimation results for Equation 2 with the different public good intensities.

Table 9: Channel of public good provision.

	(I)	(II)	(III)	(IV)
Dependent variable:	GROWTH$_{i,k,j,(t,t-2)}$			
INTENSITY$_k$:	Pub_Utilities	Transport	Transp_Constr	Education
Panel A	*All DCs*			
TAX * INTENSITY$_{k,j,(t,t-2)}$	-26.039*	0.486	-1.233	104.346**
	(-1.679)	(0.041)	(-0.103)	(2.662)
Observations	62,482	62,482	62,482	62,482
R-squared	0.228	0.226	0.226	0.227
Nb. Of countries	89	89	89	89
Panel B	*LICs/LMICs*			
TAX * INTENSITY$_{k,j,(t,t-2)}$	21.509*	10.358	11.200	154.646**
	(1.690)	(1.510)	(1.620)	(2.068)
		(p=0.131)	(p=0.106)	
Observations	39,458	39,458	39,458	39,458
R-squared	0.160	0.159	0.159	0.161
Nb. Of countries	59	59	59	59
Firm-level var.	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

We again identify two samples, the sample of all developing countries (Panel A) and the sample restricted to LICs/LMICs (Panel B). The interaction term between the tax variable and the different intensities across the full sample of developing countries does not produce clear results. This hardly surprising since the positive effect of taxation is driven mostly by the LIC/LMIC sub-sample of countries. Indeed, for Panel B, the interaction term between the tax variable and intensity in public utilities and education is positive and significant (while it is marginally significant for transport and construction). This suggests that taxation has a positive effect on firms in sectors that tend to rely more on public utilities, transport and education. Hence, sectors more intensive in public goods tend to benefit more from taxation.

6 Conclusion

In recent years, taxation issues have come back to center stage with a peak in interest at the latest International Conference on Financing for Development. The public finance crisis in advanced economies and the prioritization of national defense expenditures in response to the terrorism threat are cutting back official development assistance budgets, and pushing developing countries to look for new sources of financing. Some have recently managed to borrow on international financial markets. However, even though a positive view can be taken of such options, development players all agree that the best source of financing is inevitably domestic revenue mobilization.

The macroeconomic literature has indeed pointed up, quite extensively, the positive impact that taxation can have on economic development. However, little work has been done on the micro effects of domestic revenue mobilization in developing countries. The lack of contributions on this issue is due mainly to the poor quality of taxation data available to researchers in past decades. However, the impressive work done by the ICTD and UNU-WIDER in recent years has produced a priceless database (The Government Revenue Dataset) including domestic revenue time series for more than 200 countries with high levels of disaggregation. By combining this database with the World Bank Enterprise Surveys which contain remarkable information on firm performance for more than 100 countries, we can now investigate the relationship between taxation and firm performance.

Our results suggest that tax revenue benefits to firm growth in developing economies, and especially in LICs and LMICs. This study runs several robustness checks to show that our findings are robust to the addition of macro and firm-level covariates, and that sample dependence does not plague our results. Throughout this paper, we also seek to identify the channels through which taxation can positively affect firm growth. First, we find that when tax revenue is not raised from the general public's income or corporate profits, such as windfall from natural resources exploitation, the positive effect of taxation on firm activity disappears. We argue that, since this kind of revenue is not levied on citizens (both individuals and corporates), governments feel less accountable to redistribute taxes through the provision of public goods. Then, using an alternative specification, we provide evidence that the positive effect of domestic revenue mobilization on firm performance is likely to be reduced when corruption is too pervasive. In particular, our results show that this crowding-out effect of corruption is only observed for countries where tax revenue is low and where corruption incidence is relatively higher than in other developing countries. This finding suggests that when corruption is pervasive, tax revenue is diverted and therefore not used to finance public infrastructure vital for firm activity. In keeping with Rajan and Zingales (1998), we lastly test whether the positive contribution of taxation to firm growth is driven by this "infrastructure provision" argument. Using exogenous measure of infrastructure dependence, we find that tax revenue has a positive effect on firms operating in sectors that tend to rely more on public utilities, transport and education. This highlights public infrastructure as a plausible transmission channel for the positive effect of taxation.

This study shows that taxation can be good for economic development, particularly for the private sector, thus supporting improvements in domestic revenue mobilization in developing countries. Yet our findings also underline the need for a healthy and accountable institutional environment to turn tax revenues into growth-enhancing public goods.

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Appendix A Appendix

Table A.1: Whole sample of study.

country	nb. of firms	year of survey	country	nb. of firms	year of survey	country	nb. of firms	year of survey
Afghanistan	332	2008; 2014	El Salvador	781	2006; 2010	Mozambique	430	2007
Albania	260	2007; 2013	***Estonia***	***236***	***2009***	Namibia	428	2006; 2014
Argentina	1,574	2006; 2010	Ethiopia	332	2011	Nepal	772	2009; 2013
Armenia	394	2009; 2013	Gambia, The	120	2006	Nicaragua	635	2006; 2010
Azerbaijan	460	2009; 2013	Georgia	401	2008; 2013	Niger	98	2009
Bangladesh	2,761	2007; 2013	Ghana	900	2007; 2013	Nigeria	1,644	2007
Belarus	384	2008; 2013	Guatemala	813	2006; 2010	Pakistan	1,253	2007; 2013
Belize	145	2010	Guinea	182	2006	Panama	468	2006; 2010
Benin	94	2009	Guinea-Bissau	123	2006	Paraguay	592	2006; 2010
Bhutan	444	2009; 2015	Honduras	564	2006; 2010	Peru	1,36	2006; 2010
Bolivia	533	2006; 2010	***Hungary***	***402***	***2009; 2013***	***Poland***	***561***	***2009; 2013***
Bosnia and Herzegovina	517	2009; 2013	India	8,308	2014	***Romania***	***678***	***2009; 2013***
Botswana	444	2006; 2010	Indonesia	1,093	2009	***Russian Federation***	***2,922***	***2009; 2012***
Brazil	983	2009	Iraq	702	2011	Rwanda	318	2006; 2011
Bulgaria	***1,343***	***2007; 2009; 2013***	***Israel***	***415***	***2011***	Senegal	759	2007; 2014
Burkina Faso	300	2009	Jordan	461	2013	Serbia	598	2009; 2013
Burundi	351	2006; 2014	Kenya	1,184	2007; 2013	Sierra Leone	144	2009
Cameroon	314	2009	Kosovo	146	2013	***Slovak Republic***	***156***	***2009***
Central African Republic	109	2011	Kyrgyz Republic	346	2009; 2013	South Africa	812	2007
Chad	114	2009	Lao PDR	526	2008; 2012	Sudan	163	2013
Chile	1,596	2006; 2010	***Latvia***	***388***	***2009; 2013***	Suriname	152	2010
China	2,528	2012	Lebanon	382	2013	Swaziland	207	2006
Colombia	1,613	2006; 2010	Lesotho	113	2009	***Sweden***	***528***	***2013***
Congo, Dem. Rep.	826	2006; 2010; 2013	Liberia	116	2009	Tajikistan	386	2008; 2013
Congo, Rep.	37	2009	***Lithuania***	***374***	***2009; 2013***	Tanzania	716	2006; 2013
Costa Rica	327	2010	Macedonia, FYR	583	2009; 2013	Togo	89	2009
Cote d'Ivoire	298	2009	Malawi	397	2009; 2014	Tunisia	557	2013
Croatia	***766***	***2007; 2013***	Mali	502	2007; 2010	Turkey	1,256	2008; 2013
Czech Republic	***357***	***2009; 2013***	Mauritania	197	2006	Uganda	900	2006; 2013
Djibouti	63	2013	Mexico	2,349	2006; 2010	Ukraine	824	2008; 2013
Dominican Republic	276	2010	Moldova	586	2009; 2013	Uruguay	773	2006; 2010
East Timor	81	2009	Mongolia	622	2009; 2013	Venezuela	136	2010
Ecuador	738	2006; 2010	Montenegro	162	2009; 2013	Vietnam	860	2009
Egypt, Arab Rep.	1,997	2013	Morocco	337	2013	Zambia	931	2007; 2013

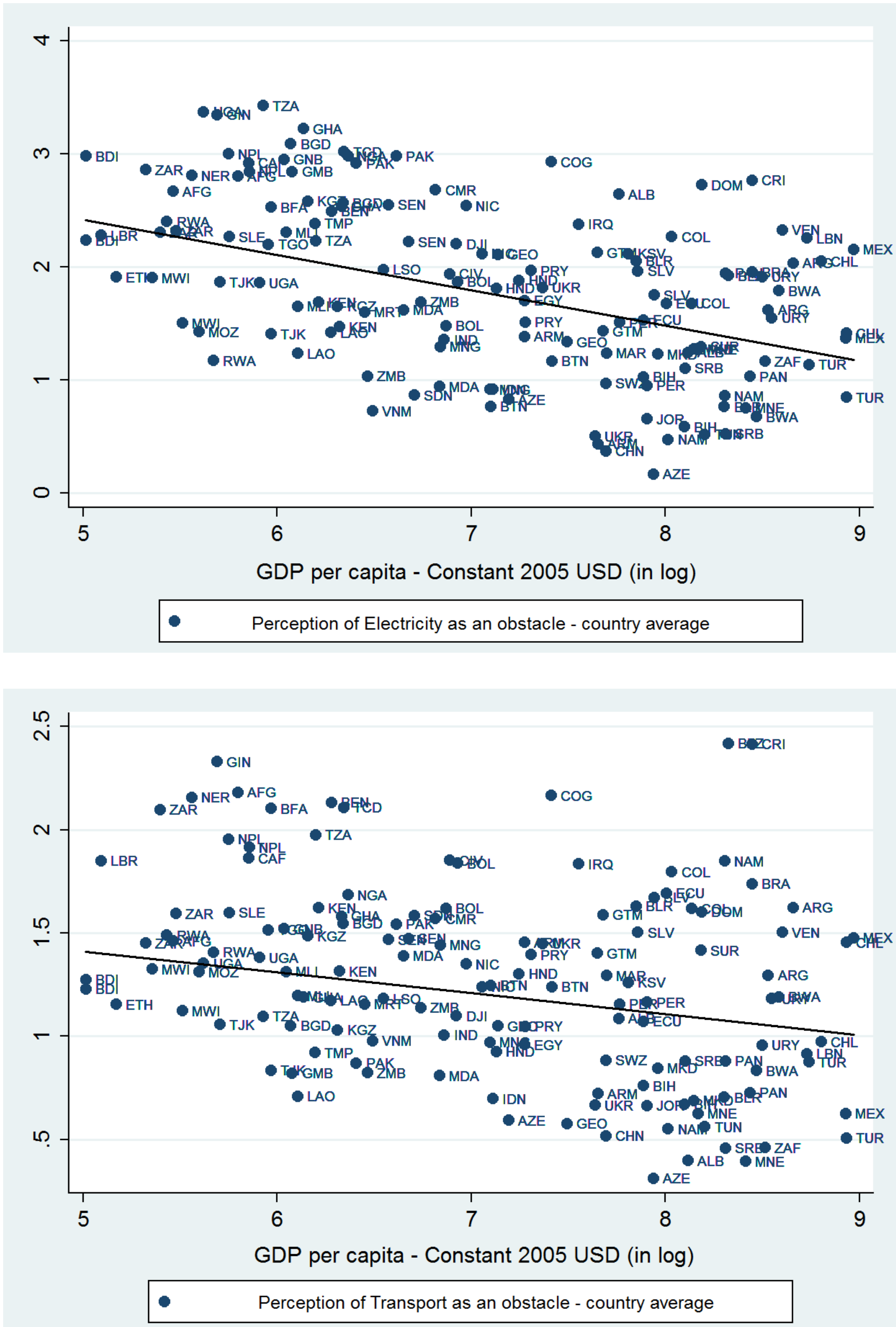
Countries in italic and bold font are non-developing countries.

Table A.2: Intensities by sectors.

INTENSITY	Pub_Utilities	Transport	Transp_Constr	Education
MANUFACTURING				
FOOD AND TOBACCO	2.535	4.668	5.046	0.001
TEXTILE AND GARMENTS	2.978	3.070	3.391	0.001
LEATHER	1.819	3.195	3.450	0.002
WOOD AND FURNITURE	3.543	5.134	5.866	0.001
PAPER AND PUBLISHING	3.664	4.876	5.494	0.063
CHEMICALS	4.282	3.392	3.965	0.005
RUBBER & PLASTIC	4.142	3.066	3.737	0.004
METALLIC & MINER.	7.922	9.970	11.05	0.002
FABRICATED METAL	4.779	3.806	4.575	0.002
MACHINERY AND EQUIP.	1.539	2.492	2.887	0.003
ELECTRONICS	1.729	1.666	2.150	0.005
MOTOR VEHICLES	0.980	2.048	2.245	0.002
REFINED PETRO	1.310	3.214	3.386	0.011
OTHER MANUF	1.899	3.950	4.445	0.002
SERVICES				
RETAIL	5.152	7.215	8.060	1.281
WHOLESALES	2.505	9.300	9.745	0.458
IT	1.771	2.105	4.192	0.140
TRANSPORT & CONSTR.	1.034	8.410	8.878	0.034
SALES OF MOTOR VEHICLES	2.011	3.031	3.348	0.024
HOTEL	6.086	3.991	4.839	0.001
OTHER SERVICES	3.668	2.608	3.140	0.145

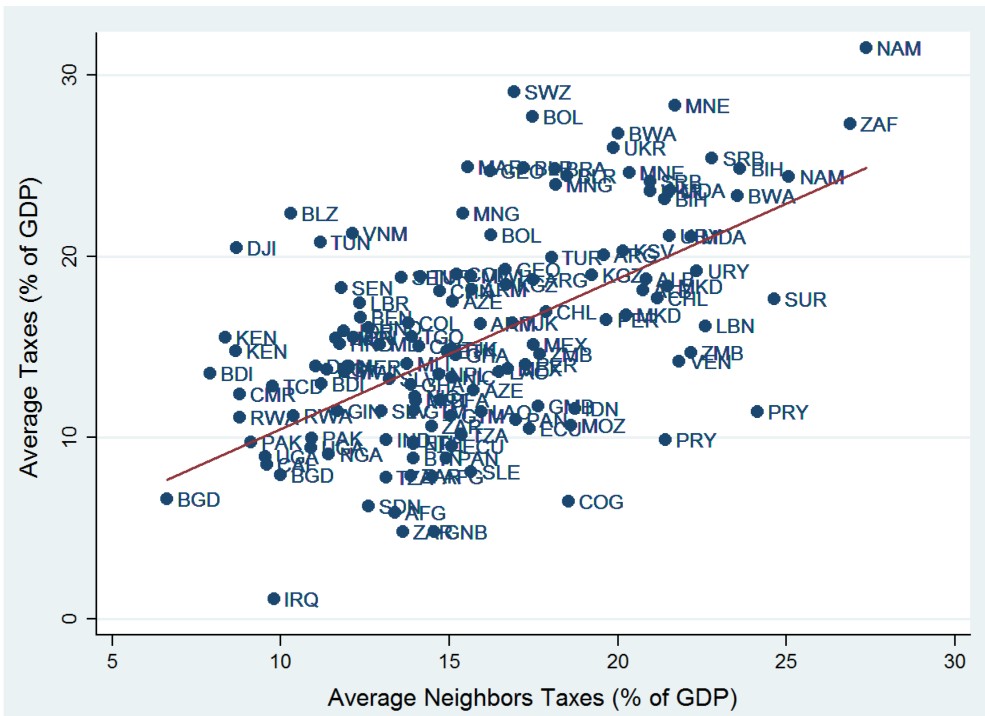
Source: authors.

Figure A.1: Infrastructures Provision and Level of Development



Note: To assess infrastructure quality, we use the perception of electricity and transport as obstacles. Both variables are measured at the firm level in the World Bank Enterprise Survey (WBES) and aggregated at the country level. We use firm probability weights provided by the WBES to compute the mean value of the perception of electricity and transport as obstacles at the country-level. A higher infrastructure variable value denotes a stronger obstacle to firm activity.
Source: authors.

Figure A.2: Correlation between countries' tax rates and the average tax rate of their neighbors



Notes: Lesotho has been removed from the graph in order to obtain a more legible scatter. Since taxes for Lesotho amount to 56% of GDP, it tends to squash the scatter for countries with tax-to-GDP ratio lower than 20%. However, including Lesotho into the graph leads to the same fitted line (though little bit less steep).
Source: authors.

Appendix B Supplementary Appendix

Table B.1: Estimations with alternative fixed effects specifications and clusters.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Dependent variable	$\text{GROWTH}_{i,k,j,(t,t-2)}$					
Sample	**All countries**		**Non-DCs**	**DCs**		
Sub-samples				*All*	*LICs/LMICs*	*UMICs*
Panel A	*country, sector, year fixed effects - cluster (country-year level)*					
$\text{TAX}_{j,(t,t-2)}$	1.958*	16.339***	-2.637*	4.942***	3.573**	1.560
	(1.766)	(3.197)	(-1.954)	(4.526)	(2.607)	(0.799)
$\text{TAX * INCOME}_{j,(t,t-2)}$		-1.877***				
		(-3.014)				
Panel B	*country, sector-year fixed effects - cluster (country level)*					
$\text{TAX}_{j,(t,t-2)}$	1.440	14.695**	-2.864*	4.482***	3.266*	2.422
	(0.960)	(2.160)	(-1.905)	(3.241)	(1.886)	(1.023)
$\text{TAX * INCOME}_{j,(t,t-2)}$		-1.729**				
		(-2.095)				
Panel C	*country, sector, year fixed effects - cluster (country level)*					
$\text{TAX}_{j,(t,t-2)}$	1.958	16.339**	-2.637	4.942***	3.573**	1.560
	(1.355)	(2.455)	(-1.739)	(3.547)	(2.099)	(0.584)
$\text{TAX * INCOME}_{j,(t,t-2)}$		-1.877**	(p=0.108)			
		(-2.300)				
Observations	71,608	71,608	9,126	62,482	39,458	23,024
Nb. of countries	102	102	13	89	59	30
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics (based on standard-errors clustered at the level specified for each panel) in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

Table B.2: Estimations on regional sub-samples.

Sample: **DCs**	(I)	(II)	(III)	(IV)	(V)	(VI)
Dependent variable:			$\text{GROWTH}_{i,k,j,(t,t-2)}$			
Region dropped	**EAP**	**ECA**	**LAC**	**MENA**	**SA**	**SSA**
$\text{TAX}_{j,(t,t-2)}$	4.701***	5.871***	3.560***	4.458***	3.617***	4.635***
	(4.284)	(3.766)	(2.634)	(4.059)	(2.638)	(4.146)
Impact tax (+10%)	68.4	100.2	66.3	57,6	44,1	77,5
Observations	56,772	55,179	46,074	57,983	48,612	47,790
R-squared	0.353	0.261	0.185	0.252	0.257	0.263
Nb. of countries	83	74	69	82	83	54
Countries dropped	6	15	20	7	6	35
Country-level var.	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level var.	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. **EAP** stands for East-Asia and Pacific, **ECA** for Europe and Central Asia, **LAC** for Latin America and Caribbean, **MENA** for Middle-East and North Africa, **SA** for South-Asia and finally **SSA** for Sub-Saharan Africa. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

Table B.3: Dropping one country at a time.

Sample: **DCs**	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
Dependent variable:				$\text{GROWTH}_{i,k,j,(t,t-2)}$			
Country omitted		AFG	ALB	ARG	ARM	AZE	BDI
$\text{TAX}_{j,(t,t-2)}$	4.482***	4.696***	4.492***	4.434***	4.700***	4.732***	4.746***
	(4.102)	(4.265)	(4.093)	(4.056)	(4.305)	(4.443)	(4.262)
Observations	62,482	62,150	62,222	60,908	62,088	62,022	62,131
Country omitted	BEN	BFA	BGD	BIH	BLR	BLZ	BOL
$\text{TAX}_{j,(t,t-2)}$	4.482***	4.482***	3.556***	4.884***	3.479***	4.482***	3.824***
	(4.103)	(4.102)	(3.162)	(4.592)	(2.910)	(4.101)	(3.204)
Observations	62,388	62,182	59,721	61,965	62,098	62,337	61,949
Country omitted	BRA	BTN	BWA	CAF	CHL	CHN	CIV
$\text{TAX}_{j,(t,t-2)}$	4.570***	4.482***	4.445***	4.482***	4.437***	4.459***	4.479***
	(4.210)	(4.101)	(4.050)	(4.102)	(4.028)	(4.052)	(4.098)
Observations	61,499	62,038	62,038	62,373	60,886	59,954	62,184
Country omitted	CMR	COG	COL	CRI	DJI	DOM	ECU
$\text{TAX}_{j,(t,t-2)}$	4.484***	4.480***	4.490***	4.469***	4.482***	4.484***	4.348***
	(4.104)	(4.100)	(4.101)	(4.084)	(4.102)	(4.106)	(3.886)
Observations	62,168	62,445	60,869	62,155	62,419	62,206	61,744
Country omitted	EGY	ETH	GEO	GHA	GIN	GMB	GNB
$\text{TAX}_{j,(t,t-2)}$	4.488***	4.482***	3.819***	4.220***	4.482***	4.482***	4.482***
	(4.101)	(4.101)	(3.422)	(3.898)	(4.102)	(4.102)	(4.102)
Observations	60,485	62,150	62,081	61,582	62,300	62,362	62,359
Country omitted	GTM	HND	IDN	IND	IRQ	JOR	KEN
$\text{TAX}_{j,(t,t-2)}$	4.663***	4.581***	4.358***	4.434***	4.483***	4.474***	4.426***
	(3.982)	(4.170)	(3.986)	(4.006)	(4.103)	(4.093)	(4.211)
Observations	61,669	61,918	61,389	54,174	61,780	62,021	61,298
Country omitted	KGZ	KSV	LAO	LBN	LBR	LSO	MAR
$\text{TAX}_{j,(t,t-2)}$	4.478***	4.482***	4.483***	4.492***	4.469***	4.482***	4.481***
	(4.097)	(4.102)	(4.102)	(4.114)	(4.091)	(4.103)	(4.100)
Observations	62,136	62,336	61,956	62,100	62,366	62,369	62,145

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

Table B.3: Dropping one country at a time. (continued)

Sample: **DCs**	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
Dependent variable:				$\text{GROWTH}_{i,k,j,(t,t-2)}$			
Country omitted	MDA	MEX	MKD	MLI	MNE	MNG	MOZ
$\text{TAX}_{j,(t,t-2)}$	4.848***	4.385***	4.510***	4.622***	4.560***	4.840***	4.483***
	(4.208)	(3.937)	(4.126)	(4.207)	(4.074)	(4.432)	(4.102)
Observations	61,896	60,133	61,899	61,980	62,320	61,860	62,052
Country omitted	MRT	MWI	NAM	NER	NGA	NIC	NPL
$\text{TAX}_{j,(t,t-2)}$	4.483***	5.106***	4.155***	4.485***	4.479***	4.576***	4.577***
	(4.103)	(5.081)	(3.077)	(4.106)	(4.101)	(4.253)	(3.606)
Observations	62,285	62,085	62,054	62,384	60,838	61,847	61,710
Country omitted	PAK	PAN	PER	PRY	RWA	SDN	SEN
$\text{TAX}_{j,(t,t-2)}$	4.556***	4.451***	4.267***	4.445***	4.484***	4.482***	4.703***
	(4.112)	(4.047)	(3.654)	(4.038)	(4.103)	(4.102)	(4.169)
Observations	61,229	62,014	61,122	61,890	62,164	62,319	61,723
Country omitted	SLE	SLV	SRB	SUR	SWZ	TCD	TGO
$\text{TAX}_{j,(t,t-2)}$	4.484***	4.429***	4.258***	4.482***	4.483***	4.482***	4.479***
	(4.104)	(4.020)	(3.891)	(4.102)	(4.103)	(4.102)	(4.098)
Observations	62,338	61,701	61,884	62,330	62,275	62,368	62,393
Country omitted	TJK	TMP	TUN	TUR	TZA	UGA	UKR
$\text{TAX}_{j,(t,t-2)}$	4.513***	4.482***	4.461***	4.216***	4.535***	4.428***	4.363***
	(4.129)	(4.102)	(4.077)	(3.393)	(4.139)	(3.993)	(4.104)
Observations	62,096	62,401	61,925	61,226	61,766	61,582	61,658
Country omitted	URY	VEN	VNM	ZAF	ZAR	ZMB	
$\text{TAX}_{j,(t,t-2)}$	4.384***	4.478***	4.567***	4.388***	4.854***	4.447***	
	(3.939)	(4.098)	(4.223)	(4.044)	(4.703)	(3.975)	
Observations	61,709	62,346	61,622	61,670	61,656	61,551	

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01$, $^{**}p \leq 0.05$, $^{*}p \leq 0.1$.

Source: authors.

Table B.4: Dropping one sector at a time.

Sample: **DCs**	(I)	(II)	(III)
Dependent variable:		$\text{GROWTH}_{i,k,j,(t,t-2)}$	
Omitted sector	Food & Tobacco	Textile & Garments	Leather
$\text{TAX}_{j,(t,t-2)}$	4.394***	4.542***	4.514***
	(3.758)	(4.126)	(4.179)
Observations	54,899	54,697	61,426
Omitted sector	Wood & Furniture	Paper & Publishing	Refined petroleum
$\text{TAX}_{j,(t,t-2)}$	4.672***	4.371***	4.491***
	(3.938)	(4.058)	(4.115)
Observations	59,444	60,670	62,397
Omitted sector	Chemicals	Rubber & Plastics	Metal. & non-Met. Mineral pdt
$\text{TAX}_{j,(t,t-2)}$	4.665***	4.562***	4.219***
	(4.288)	(4.170)	(4.146)
Observations	58,953	60,247	58,545
Omitted sector	Fabricated Metal pdt	Machinery & Equipment	Electronics
$\text{TAX}_{j,(t,t-2)}$	4.244***	4.431***	4.488***
	(3.853)	(4.031)	(4.085)
Observations	59,344	60,404	61,063
Omitted sector	Motor Vehicles	Other Manufacturing	Sales of Motor Vehicles
$\text{TAX}_{j,(t,t-2)}$	4.456***	4.443***	4.574***
	(4.067)	(3.961)	(4.058)
Observations	61,479	61,830	60,939
Omitted sector	Wholesales trade	Retail trade	Hotel & Restaurants
$\text{TAX}_{j,(t,t-2)}$	4.815***	4.536***	4.787***
	(4.103)	(3.787)	(4.547)
Observations	56,548	59,732	59,690
Omitted sector	IT	Transport & Constr.	Other services
$\text{TAX}_{j,(t,t-2)}$	4.637***	3.769***	4.487***
	(4.047)	(3.469)	(3.611)
Observations	61,608	57,739	57,986

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust t-statistics based on standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

Table B.5: Sensitivity to firms' characteristics.

Effect of $\text{TAX}_{j,(t,t-2)}$ on $\text{GROWTH}_{i,k,j,(t,t-2)}$		
Panel A: All firms	4.482***	(1.093)
Observations	62,482	
Panel B: Not owned by the state	4.371***	(1.085)
Observations	61,603	
Panel C: Not foreign-owned	4.410***	(1.102)
Observations	56,62	
Panel D: Exporting firms	4.776***	(2.102)
Observations	14,069	
Panel E: Not exporting firms	4.313***	(1.145)
Observations	48,413	
Panel F: More than 20 employees	3.312***	(1.420)
Observations	35,064	
Panel G: Not medium firms (20-100 employees)	5.291***	(1.547)
Observations	40,942	
Panel H: Less than 100 employees	4.304***	(1.164)
Observations	50,191	
Panel J: Without a website	5.351***	(1.152)
Observations	35,009	
Panel I: With a website	3.862***	(1.323)
Observations	27,473	

Notes: The higher one percent of firms with the largest growth rates has been dropped from the sample. OLS estimations using firm probability weights. Robust standard-errors clustered at the country-year level in parentheses. $^{***}p \leq 0.01, ^{**}p \leq 0.05, ^{*}p \leq 0.1$.

Source: authors.

Table B.6: Random draw of firms.

Dependent variable: $\text{GROWTH}_{i,k,j,(t,t-2)}$	(1)	(2)	(3)
Nb of firms randomly draw	100	200	300
Coefficient of $\text{TAX}_{j,(t,t-2)}$, 500 replications			
Mean	3.259	3.483	3.473
Standard deviation	1.378	0.644	0.426
Percent not significant	23.6	1.6	0.2
Observations	13,575	24,775	32,941
Country FE	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes
Level of se clustering	country-year	country-year	country-year
Firm-level controls	Yes	Yes	Yes
Country-level controls	Yes	Yes	Yes

Source: authors.