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Full Length Research Paper

Corporate taxation, investment and productivity: A firm level estimation

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This paper analyses how corporate taxes can affect investment and productivity. To address this question the paper uses data from a set of 42 developing countries taken from the World Bank Business Environment Surveys and examines whether firms with different sizes are affected differently by taxation. We extend the analysis that has been carried out relating tax rates to investment into the analysis of the impact of taxation on total factor productivity. Investment and productivity are shown to respond negatively to an increase in the corporate tax rate. These effects are stronger in bigger firms.

Key words: Taxation, investment, total factor productivity.

INTRODUCTION

Many public finance economists have studied the relationship between corporate income taxes, investment and productivity, and have found evidence suggesting that excessive government regulatory and tax policies have negative consequences on the business environment and economic development. Since Hall and Jorgenson (1967) work showing that changes in the user cost of capital can explain aggregate investment reasonably well, several studies have searched for theoretical and empirical explanations for this relationship. In general, this research finds adverse effects of corporate income taxes on investment, albeit using different estimation techniques and not reaching consensus on the magnitude of such effect.[1] Recent investment models are based on the neoclassical theory that normally uses the Q-theory and the theory of the user cost of capital where a representative firm maximizes its present value. This theory relies on the assumption that aggregate investment can be expected to depend positively in a stable way on *q*, the ratio of the stock market valuation of existing capital to its replacement cost. In this context an increase in corporate taxes, by increasing the user cost of capital should have a negative impact on investment. Moreover, if productivity is imbedded in capital goods, a decline in investment should also affect productivity growth negatively. As opposed to literature on the impacts of taxes on investment, the relationship between taxes and productivity has been less studied, in part perhaps, because there is no single measure of productivity. Auerbach and Hines (2002) suggest that taxes create distortions by affecting prices and the decision making of firms and households, distorting the allocation of inputs within and between firms and thereby lowering the efficiency in the use of production inputs, thus decreasing TFP.

Numerous authors and studies have shown that the scope and nature of regulations on economic activity and factor markets can significantly and adversely impact productivity, growth and economic activity[2]. As the tax code is an important element in the map of regulations that determine the business environment, many of the ideas explored in this research can be extrapolated to tax

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[1]Some examples of this are Summers (1981), Feldstein et al. (1983), Cummins et al. (1996) and Gordon and Hines (2002).

[2]Bosworth and Collins (2003), Dollar et al. (2004), Rodrik and Subramanian (2004), Loayza et al. (2004), McMillan (1998, 2004), OECD (2001), Wilkinson (2001), Alexander et al. (2004), Djankov et al. (2008), Haltiwanger (2002), He et al. (2003) and World Bank (2003, 2004a, b).

policy. The analysis of the potential links between productivity or investment and taxes is based on the idea that taxes affect productivity through different channels and that due to some relevant industry or firm specific characteristics, like the firm size, some firms and industries are essentially more affected than others. Using Djankov et al. (2010) database on taxes throughout the World and a firm level database from the World Business Environment Surveys of the World Bank (WBES), this paper estimates the impact of corporate taxation on firm level investment and total factor productivity (TFP) in emerging economies. We also explore if the previous effects identified in the literature, namely the negative impact of tax rates on investment, vary across firm sizes. Our results suggest that both investment and TFP are negatively affected by higher tax rates. This impact is greater for larger firms, that is the firms that tend to concentrate most of a country's employment and hence the drivers of growth. These results are in line with recent findings by Arnold and Schwellnus (2008) that use a data set on OECD firms to test a similar hypothesis, and find that in OECD countries, higher tax rates also reduce productivity, especially for larger firms[3].

Our paper adds to this literature by extending this result to developing countries. The rest study describes the empirical methodology and the data used in the analysis, then it presents the main results and finally the conclusion is given.

DESCRIPTION OF THE DATA AND METHODOLOGY

Using the World Business Environment Survey, a database of firm surveys assembled by the World Bank, we construct measures of investment in capital goods and total factor productivity for a sample of 42 developing countries[4]. The survey gathers information on how firms perceive the business environment and on production inputs, their costs and their outputs in a given year. The sample covers the years 2004 to 2006, but most of the sample corresponds to surveys done in 2006. The survey asks specific questions regarding investment in capital good, as well as firm sales, labor inputs and expenses in intermediate production inputs. We use the questions on capital expenditure to proxy investment and compute total factor productivity (TFP), using a Solow residual approach in which we estimate cost shares under The computation of the cost shares associated with each input in the production function is done considering three alternatives. Under the first specification we assume that they are equal for all firms in all countries and all industries. Secondly, we allow the parameters to change across industries but remaining the same different alternatives[5].

[3]Vartia (2008) finds similar results using industry level, rather than firm level information for the OECD.

[4]The sample is determined by the availability of data, and includes the following countries: Algeria, Angola, Argentina, Bangladesh, Bolivia, Botswana, Brazil, Burundi, Cambodia, Cameroon, Chile, Colombia,Congo, Ecuador, Egypt, El Salvador, Ethiopia, Ghana, Guatemala, Guinea-Bissau, Guyana, Honduras, India, Indonesia, Malawi, Mauritania, Mauritius, Mexico, Mozambique, Namibia, Nicaragua, Niger, Oman, Pakistan, Panama, Peru, Rwanda, Senegal, Tanzania, Uganda, Uruguay and Zambia.

[5]Here TFP is computed assuming a Cobb Douglas. After taking logs and rearranging we obtain an equation for A (total factor productivity) in terms of Y, K, L and M: Log (A_{cij}) = Log (Y_{cij}) – α Log (K_{cij}) – β Log (L_{cij}) – γLog (M_{cij}), where Y is output, K is capital, L is labor, M are intermediate inputs and c, i and j denote the firm j in industry i in country c.

across countries. Thirdly the computation allows the parameters to differ across industries and countries.

In all specifications the cost share is computed as the average cost share of the firms in the relevant group. Once TFP is computed we estimate different specifications for the following benchmark equation:

$$X_{cij} = \beta' controls_{cij} + \psi' size_{cij} + \lambda` tx_c \times size_{cij} + \omega + \varepsilon_{cij}$$

Where, X is either the ratio of investment to the capital stock (I/K) or TFP, controls are a series of firm level controls including the ownership structure of the firm (foreign vs domestically owned), the log of the age of the firm, and a dummy indicating if the firm exports its product directly; *tx* indicates the country's corporate tax rate[6], size are dummies indicating the firm's size (micro, small, medium, large)[7] and ε is the residual[8].

In a first set of specifications, $\omega = \mu_{ci}$, where μ are country-industry fixed effects that should capture unobserved characteristics that vary at the country-industry level. Note that in this specification we cannot account for the direct impact of *tx*, since we are controlling for country-industry dummies, hence these estimates only allow us to identify the marginal effect of taxes on firms relative to the size assigned to the dummy excluded from the regression. In other words, our estimates show us if the impact of taxes is greater in small, medium and large firms, compared to micro firms (the excluded dummy). In order to account for the total impact of the tax variable we also estimate a second specification where, $\omega = \rho tx_c + \varpi' macro_c + \eta_i$. Here, macro is a vector of country-wide controls (the log of GDP per capita and the log of the Heritage Foundation's measure of economic freedom that we include as a measure of the regulatory environment) and η□ are industry level effects. The main interest of this paper is in the estimated coefficients of *tx* which the literature has suggested to be negative, and on the coefficient on the interaction of *tx* and the *size* dummies.

This coefficient shows if there is a differential effect of the corporate tax rate on investment or on TFP on firms of different sizes. Descriptive statistics of the relevant variables used in the analysis are shown in Table 1.

RESULTS

The results are reported in Table 2. The estimation of the coefficients of the firm size in all regressions is consistent

[6]This data is taken from the World Bank's "Paying taxes" website (http://www.doingbusiness.org/exploretopics/payingtaxes/)

[7]Size is measured according to the relative size of firm's sales with respect to the distribution of sales in each country. Firms whose sales lie in the lower 25% of the distribution are considered micro enterprises, those with sales within the 25 and 50th percentile are small, between the 50 and 75th percentile are medium and above the 75th percentile are defined as large.

[8]A relevant caveat that we ought to note is that there is a possible relationship between taxes and firm size as suggested in Zimmerman (1983), Heshmati et al. (2010) and Markle and Shackelford (2011) among others. This would call for the specification of a dynamic empirical model to capture the impact of taxation on firm growth and allow for the endogeneity of the firm's size. Unfortunately, the nature of our dataset (a cross section of firms per country) does not allow us to explore this relevant dimension of the taxes productivity nexus.

Table 1. Descriptive statistics.

	Mean	Std Dev	Min	Max
I/K	0.11	0.22	0.00	1.00
TFP	1.97	1.10	-3.05	8.83
TFPj	2.41	1.80	-4.56	11.40
TFPij	2.31	1.76	-3.04	10.71
Corporate tax rate	0.20	0.10	0.03	0.73

Table 2. Regression results.

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	I/K	I/K	TFP	TFP	TFPj	TFPj	TFPij	TFPij
Small	0.0265**	0.0264**	0.130***	0.153***	0.150***	0.256***	0.131***	0.217***
	[0.0121]	[0.0126]	[0.0328]	[0.0484]	[0.0492]	[0.0643]	[0.0354]	[0.0737]
Medium	0.0443***	0.0417***	0.209***	0.456***	0.331***	0.691***	0.255***	0.733***
	[0.0128]	[0.0127]	[0.0382]	[0.0536]	[0.0660]	[0.0758]	[0.0414]	[0.0818]
Large	0.0685***	0.0624***	0.430***	0.675***	0.498***	0.948***	0.482***	0.955***
	[0.0132]	[0.0130]	[0.0447]	[0.0589]	[0.0709]	[0.0785]	[0.0469]	[0.0868]
Foreign	-0.000452	0.00214	0.0228	0.239***	0.0168	0.258***	0.00376	0.340***
	[0.00695]	[0.00714]	[0.0255]	[0.0339]	[0.0402]	[0.0428]	[0.0274]	[0.0505]
Log (Age)	-0.0215***	-0.0225***	-0.00435	0.00569	-0.0249**	0.0227*	0.000765	0.00765
	[0.00257]	[0.00263]	[0.00739]	[0.0106]	[0.0103]	[0.0138]	[0.00846]	[0.0161]
Export	0.00434	0.0218***	-0.021	-0.195***	0.0424*	-0.316***	0.0183	-0.359***
	[0.00524]	[0.00513]	[0.0161]	[0.0220]	[0.0228]	[0.0292]	[0.0175]	[0.0332]
Corporate tax rate		0.0253		0.0497		0.229		-0.443**
		[0.0461]		[0.168]		[0.226]		[0.224]
Corporate tax rate * small	-0.057	-0.0676	-0.108	-0.258	0.0653	-0.371	-0.229	-0.473
	[0.0622]	[0.0637]	[0.158]	[0.216]	[0.213]	[0.291]	[0.172]	[0.306]
Corporate tax rate * medium	-0.0974	-0.102*	-0.0474	-0.910***	-0.132	-1.410***	-0.405**	-1.959***
	[0.0626]	[0.0616]	[0.176]	[0.233]	[0.269]	[0.326]	[0.189]	[0.337]
Corporate tax rate * large	-0.161***	-0.165***	-0.474**	-1.368***	-0.479*	-1.760***	-1.107***	-2.800***
	[0.0600]	[0.0596]	[0.191]	[0.244]	[0.285]	[0.329]	[0.202]	[0.350]
Log (GDP per capita)		0.0236***		0.0920***		0.0999***		0.346***
		[0.00339]		[0.0136]		[0.0182]		[0.0226]
Log (Ec. freedom)		0.354***		2.862***		3.284***		3.377***
		[0.0295]		[0.107]		[0.129]		[0.181]
Observations	12211	12211	11661	11661	11662	11662	11658	11658
R-squared	0.188	0.085	0.71	0.296	0.777	0.535	0.854	0.333
Number of countries	42	42	42	42	42	42	42	42
Country-industry effects	Yes	No	Yes	No	Yes	No	Yes	No
Industry effects	No	Yes	No	Yes	No	Yes	No	Yes

with the idea that the level of investment and the level of TFP are increasing in firm size. The coefficients on firm specific characteristics (ownership, age and export orientation) vary across specifications as well as their significance. The relevant coefficients for this study suggest that the impact of corporate taxes on investment and productivity are also increasing in the size of firms. The larger the firms the bigger the negative effect of the corporate tax rate on investment and any of the measures of TFP. With respect to investment, columns (1) and (2) show that the corporate tax rate has a negative impact for medium and large firms. The estimates are not only statistically significant but are also economically important. For example, a one standard deviation increase in the corporate tax rate (0.10) would reduce I/K for large firms in 0.0165, which is close to 15% of the sample average. Columns (3) to (8) show different estimations of the impact of the corporate tax rate considering different measures of productivity. While the estimates change from one specification to the other, the result that corporate taxes hurt larger firms more than smaller ones is consistent across specifications. As mentioned earlier, the impact estimated is also economically relevant.

For example, the estimates in column (8) suggest that a one standard deviation increase in the corporate tax rate would reduce TFP in 0.8, which is equal to nearly 35% of the sample average.

Conclusions

This paper estimates the relationship between corporate taxes, investment and productivity using a data set for 42 developing countries. The main findings suggest that corporate taxes have a negative impact on investment and productivity and that the impact is bigger on larger firms which are most likely to be formal and to pay taxes anyway. These results contribute to the research in this topic and suggest that tax policies may have large consequences for the business environment as well as for economic development, since large firms tend to concentrate most of an economy's employment, and leads to the discussion of potential tradeoffs between collecting revenue and long term growth.

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