What determines corporate tax payments in developing countries? Evidence from firm panel data*

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Abstract

This paper explores the factors determining corporate tax payments in developing countries. Using rich accounting and ownership data on approximately 183,000 firms in 65 developing countries for 1999-2008, we find that large firms face higher marginal and average effective tax rates than smaller firms. Adherence to a multinational group in turn does not play a significant role in determining effective tax payments. The results also suggest that public sector corruption exerts a negative impact on observed effective tax rates.

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1 Introduction

Developing countries face difficulties in raising tax revenue and therefore often lack resources to relieve poverty and provide public goods. According to the United Nations (2005) middle and low income countries should increase their tax to GDP ratios by about four percentage points in order to achieve the Millennium Development Goals of reduction of poverty, diseases, and underdevelopment.[1] However, achieving this is no easy task. Personal income taxation, which is a major source of revenue in developed countries, plays a much smaller role in the developing world. Many developing economies are dominated by subsistence farming and low income self-employment. These activities mostly take place in the informal sector. Corporate taxation, in turn, is more important as a source of revenue. In low and middle income economies corporate income taxes raise about 17 per cent of total tax revenues, compared to around 10 per cent in high income countries (IMF (2011)).

In recent years, the role of corporate taxation as a source of tax revenue for developing countries has played an important role in the policy debate. Some observers, in particular various NGOs such as Christian Aid (2009) argue that corporations, in particular large corporations and multinational firms, fail to pay appropriate taxes on profits they make in developing countries. These critics argue that many firms use transfer prices and debt financing to shift income out of developing countries and into tax havens. Another concern is that corruption within the tax administration allows firms to evade taxation.

While there is a lot of anecdotal evidence about corporate tax avoidance and evasion in the developing world, systematic empirical work on the determinants of corporate tax payments in developing countries and emerging economies is scarce. It is the purpose of this paper to explore empirically the factors determining corporate tax payments in developing countries.

We focus on the widespread view, mentioned above, that firms pay lower taxes when they belong to a multinational group or when they are located in countries with a high degree of corruption. We also address the view that higher revenues can be raised from large firms because they keep more detailed records and the number of employees who would know about tax avoidance or evasion activities would be too high, as emphasized

[1] A few contributions in the literature argue it would be beneficial for some developing countries to restraint their ability to collect revenues as this would curb inefficient spending of corrupt and self-interested elites. For a brief discussion, see footnote 2 in Mansur and Keen (2009).

by recent theoretical work on the role of firm size in raising tax revenue (Kleven et al. (2009)).

We use a unique data base which provides accounting and ownership information on firms in various developing countries between 1999 and 2008. The data is linked to time-varying host country information and allows us to determine the impact of firm characteristics as well as host country variables on corporate tax payments.

We set up an estimation model which controls for time constant heterogeneity between firms and includes a large set of country and firm specific control variables. To account for potential reverse causality problems, we employ an instrumental variable strategy.

Our results suggest that, despite similar statutory tax provisions in developing and developed economies, the effective *marginal* tax burden on corporate profits in our data set is between 6% and 14%, depending on the specification. This is significantly lower than what has been found for developed economies. For firms resident in high income countries, Maffini (2009) estimates that the marginal effective tax rate is around 21% for countries with an exemption system of taxation of foreign profits and around 15 percentage points higher for countries with a worldwide system. Dyreng and Linsey (2009) find very similar results for American companies, with a marginal ETR of around 36%. Markle and Shackelford (2011) find an ETR of around 30% for American companies and of around 25-26% for European companies. For regions such as Africa, Asia, Latin America, and the Middle East, they report higher estimates than what is derived in our study, with ETRs of 26-28%, 21%, 23%, and 18-19% respectively.[2]

Moreover, we find that both the average and marginal effective tax rate on companies in developing countries increase in firm size. There is no significant difference in the marginal effective tax burdens between multinational and national firms, though.

These findings have implications for the current policy debate on corproate taxation in developing countries. On the one hand, our results are consistent with the widespread view that developing countries are less effective in enforcing their tax rules or offer more tax loopholes (such as special tax regimes) to corporations than developed economies do. This leads to a lower effective tax burden on firms. On the other hand, our findings suggest that large firms pay higher taxes. Firms belonging to multinational groups are often also relatively large, and we do not observe that these firms pay lower taxes.Our results therefore question the widespread view that multinational firms are particularly

[2]Markle and Shackelford (2011) calculate the ETR while we estimate it. Additionally, they use consolidated data while we employ unconsolidated accounting data.

successful in avoiding taxation in developing countries.[3]

We also investigate the role of a corrupt environment for tax payments of firms. We find that corporate tax payments are higher, the lower the perceived level of public sector corruption in the firm's host country. If corrupt tax officials demand bribes to lower firms tax payments, the observed tax rates in the data are what Olken and Pande (2010) call the *effective marginal tax rate after corruption*. In accordance with the well-established literature on the measurement of firms tax burden (Devereux and Griffith (1998), Devereux and Griffith (2003)), we rename these estimated rates derived from historical tax charges as *marginal effective tax rates* (ETRs).[4] In this paper, we are able to estimate the marginal ETR without corruption and the marginal ETR after corruption. In our sample, the former is estimated to be around 33% (for a value of the Corruption Index equal to 2.5 - excellent performance) whilst the latter is about 14% for a theoretical value of the Control of Corruption Index equal to zero (average performance). Using our sample values, the marginal ETR is 9% for the median value of the Corruption Index (-0.66) and 4% for the lowest value of the Corruption Index in our sample (-1.28 indicating poor performance). This confirms the view that corruption reduces the effectiveness of the tax system in raising revenue.

Our analysis builds on two streams of literature which have developed independently. Firstly, there is a growing literature on determinants of corporate tax payments in developed countries. A large part of this research focuses on international profit shifting

[3]Note that simple OLS regressions suggest that multinationals on average do observe a smaller effective tax rate than their national counterparts. However, this type of OLS analysis is prone to problems of reverse causality as a high effective tax burden may affect the location decision of multinational companies. This gives rise to a negative reverse causality correlation which implies that the coefficient estimate is biased downwards in a simple OLS analysis. We account for this problem using an instrumental variable strategy and find no significant difference in the marginal effective tax rate of multinational and national companies in developing countries.

[4]The terminology used by Olken and Pande (2010) could be confusing. Effective marginal tax rates (EMTRs) measure the proportionate difference between pre-tax and post-tax required rates of return: $EMTR = \frac{(p^* - r)}{p^*}$ where p^* is the cost of capital for the marginal unit of investment and r is the associated post-tax rate of return. The higher the EMTR, the greater the required pre-tax rate of return, and thus the lower the incentive to invest. For more details, see King and Fullerton (1984), Devereux and Griffith (1998), and Devereux and Griffith (2003). Effective tax rates (ETRs) are instead computed as the ratio of taxes paid by a firm divided by a measure of its operating surplus. The EMTR is a forward-looking measure as it is appropriate for measuring tax burden on marginal investment. The ETR is a backward looking measure as it is calculated using historical tax returns and accounting data. For a comparison of different tax rates, see Maffini (2007).

through transfer pricing[5] and debt financing.[6] For the analysis of multinational firms, using accounting data from OSIRIS, a dataset comparable to the one used here, Markle and Shackelford (2011) do not find any evidence of a systematic differential ETR between domestic and multinational firms. Using ORBIS, Maffini (2009) finds mixed results of the effect of firm size on tax payments (over total assets). As mentioned above, there is little systematic empirical work on the determinants of corporate tax payments in developing countries.[7]

The second strand of literature focuses on the impact of corruption on firm behaviour. The link between corruption and corporate investment has been studied at length for companies in low and middle income countries.[8] Among those studies, a few contributions investigate corruption and taxation jointly. Olken and Pande (2011) compare bribe rates to tax rates. They observes that both distort firm behaviour and that the former may be more distortive than the latter. Shleifer and Vishny (1993) and Wei (2000) argue that bribe rates could be more harmful because of the uncertainty surrounding them. Using the Ugandan Industrial Enterprise Survey, Fisman and Svensson (2007) find that both the bribery rate (measured as the amount of bribe payments divided by total assets) and the tax rate (measured as total taxes paid as a fraction of sales) are negatively associated with firm growth but with very different magnitudes. A one percentage point increase in the bribery rate reduces firm growth by three percentage point whilst an increase of the same magnitude in the tax rate cuts firm growth by one percentage point. When controlling for outliers, the bribes effect increases by 2 to 5 times, depending on the specification whilst the tax effect declines.While these studies explore similarities and differences in tax payments and bribe payments, they do not consider the effect of bribes and corruption on tax payments.The present paper fills this gap.

The rest of the paper is structured as follows: Sections 2 briefly discusses the theoretical basis of the hypotheses we explore in our empirical analysis. Section 3 describes the data. Section 4 presents the estimation strategy. The results are presented in Section

[5]See among others, Swenson (2001), Clausing (2003), Bernard et al. (2006), and Maffini and Mokkas (2011).

[6]See among others, Altshuler and Grubert (2002), Desai et al.(2004), Huizinga et al. (2008), Mintz and Weichenrieder (2005), Buettner et al. (2006), and Buettner and Wamser (2009).

[7]Fuest and Riedel (2011) survey the literature on profit shifting out of developing countries and conclude that the results of many studies are difficult to interpret.

[8]For a recent review of the literature on the magnitude, causes, and consequences of corruption in developing economies, see Olken and Pande (2010).

5. Section 6 concludes.

2 Theory: Which factors should be expected to determine corporate tax payments?

Which are the factors that determine the corporate tax payments of firms? In the theoretical and empirical literature on corporate taxation, various aspects have been identified which are likely to affect taxes paid by firms. It is helpful to address this issue by starting from some notion of true profits which could, in principle, be taxed. Clearly, a bunch of conceptual issues arises with respect to defining corporate profits, but putting those aside assume that there is a corporate profit for each firm i located in country j denoted by P_{ij}. In principle this could be the base for taxation, so that tax payments would be $\tau_{ij} = t_j P_{ij}$. But there are various factors likely to cause deviations from the hypothetical tax payment τ_{ij}. Firstly, there may be legal tax concessions, which include general tax concessions like for example tax holidays or tax incentives in special economic zones as well as firm specific concessions which include tax incentives granted in the context of particular investment projects. [9] We do not observe either of these concessions but it is likely that large and multinational firms will more easily qualify for general concessions or be able to negotiate firm specific concessions.

Secondly, international profit shifting through debt financing, transfer pricing or other arrangements will affect tax payments.[10] Clearly, this can only be imagined for firms belonging to a multinational group. We would expect that these firms pay lower taxes than other firms in particular in high tax countries.

A third determinant of tax payments is tax evasion through underreporting of income. Kleven et al. (2009) argue that tax evasion is less likely to occur, the larger a firm is. The reason is that, as the size and the complexity of a business grows, more rigorous records of the firm's activities have to be kept and the number of employees involved in reporting the firm's income to the tax administration increases. In large firms, tax evasion would require collusion among a large number of people, which is very difficult to achieve. This suggests that tax payments should increase with firm size.[11] Gordon

[9] Klemm and van Parys (2009) provide evidence that special tax incentives are widespread in the developing world.

[10] For a discussion of profit shifting in developing countries see also Fuest and Riedel (2011).

[11] Yaniv (1992) points out that tax evasion in firms requires at least cooperation between employers and employees.

and Li (2009) develop a model where the government can only collect tax revenue from firms in the formal sector, where the formal sector is defined as including all firms with links to the financial sector, through bank loans or other financial contracts.

A fourth factor which is likely to affect tax payments is the degree of corruption in the country where the firm is located. In general one would expect reported tax payments to be lower where corruption is high. This may happen for various reasons. Firstly, tax evasion may be more widespread because tax evaders who are detected might avoid being punished by paying a bribe. Secondly, firms and employees of the tax administration may collude and share the gains from tax evasion.

Overall, we may thus conclude that various firm and country specific factors are likely to drive tax payments by individual firms. These include firm size, whether or not a firm belongs to an international group, and the degree of corruption prevailing in the country where the firm is located.

3 Data

The empirical analysis relies on the commercial database ORBIS which is compiled by Bureau van Dijk and contains detailed accounting and ownership information on firms in a large number of countries worldwide. Beyond that, it provides detailed information on the ownership structure of national and multinational corporations. Our sample includes incorporated firms in 65 developing countries whereas the coverage for many countries is restricted to a rather small number of firms. Table 1 indicates that the majority of firms in our sample are located in China and Russia, which largely reflects the size of the two countries. The time period covered in the data is 1999 to 2008. The observational unit is the corporate firm per year.

The sample statistics are presented in Table 2. In total, the dataset includes $551,002$ observations for $183,553$ firms. Firm information is available for 3.0 years on average. The average firm in our sample has a total asset stock of 43.4 million US dollars. The average corporate profit (loss) before taxation and the average corporate tax payment are 2.7 million US dollars and 0.58 million US respectively. The firms in the data display an average pre-tax profitability (profit (loss) before taxation / total assets) of 0.072 and an average tax to assets ratio (corporate tax payments / total assets) of 0.014.[12] Both variables exhibit a considerable cross-sectional and longitudinal variation as indicated by the large standard deviation. To avoid that our results are driven by outliers, we

[12]For brevity, these data are not included in Table 2.

drop the top and bottom percentile of the distribution of the pre-tax profitability and of the tax to assets ratio.

One advantage of the ORBIS data is that it allows to discriminate between national and multinational firms since information on ownership connections to both parents and subsidiaries is available in the data. Following previous studies (see among others, Huizinga and Laeven (2008), Weichenrieder (2009)), we define a corporation to be part of a multinational group if it either has a parent or a subsidiary firm in a foreign country and the direct or indirect ownership connection comprises more than 50% of the ownership shares. According to this definition, 2.2% of the firms in our sample belong to a multinational group.[13]

We added country specific information to our data. Firstly, we included information on the perceived level of corruption in the host country of the firm. To do so, we employ the World Bank governance data set and here specifically use the Corruption Control Index. The index is designed to capture the perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as capture of the state by elites and private interests. The data sources which are used for the construction of the index are mainly surveys of individuals and firms in the country (for details on the index construction, see Kaufmann et al. (2010)). One advantage of the data is that the index is consistent over time. This allows us to exploit its cross-sectional and longitudinal variation. The index varies between -2.5 and +2.5, with a larger index indicating less corruption. In our data, the average firm is located in a country with a World Bank corruption index of -0.63, whereas the index varies between -1.48 and +1.51.

As an alternative measure for corruption, we use the Corruption Perception Index (CPI) of Transparency International which, similarly to the baseline measure of the World Bank, captures the perceived level of public-sector corruption based on survey information.[14] As the index is known to lack comparability over time, we use an adjustment of the index as published in Lambsdorff (2005). The adjusted index varies between -0.6 and +3.2, with an average of 0.06.

[13]Note that we classify firms as national corporations if information on ownership linkages to parents and subsidiaries is missing. This implies that we may misclassify corporations belonging to multinational groups as national firms if information on all their ownership connections to foreign countries is missing. We are not too concerned about this issue, as it implies that we potentially introduce additional noise to our estimation. Thus, if we find significant effects of the multinational dummy on our outcome variables, we should consider it as a lower bound to the true effect.

[14]For more details, see Transparency International's homepage http://www.transparency.org

We complement the analysis with an index of the efficiency of the host country government equally drawn from the governance data of the World Bank. The governance efficiency index captures the perception of the quality of public services, the quality of the civil service, and the degree of its independence from political pressures and hence also serves as a proxy for the functioning of administrative bodies, including the tax authorities, in the country.

Our study also includes a set of host country controls. First, we account for the host country's statutory corporate tax rate.[15] The average statutory corporate tax rate in our sample is 28.7% varying between 0% and 43%. Second, we control for the country's size and economic development by including information on GDP and GDP per capita measured in US dollars (and obtained from the World Bank World Development Indicator database). The average firm in our data set is located in a country with a GDP of 1.12 trillion US dollars and a GDP per capita of 1863.9 US dollars. Last, we account for the economic cycle and labor market conditions as measured by the country's unemployment rate which is 5.6% on average, although varying strongly between 1.27% and 37.3%.

4 Estimation Strategy

Following our theoretical motivation, we estimate a regression model of the following form.

$$\tau_{it} = \gamma_0 + \gamma_1 p_{it} + \gamma_2 \log a_{it} + \gamma_3 (p_{it} \times \log a_{it}) + \gamma_4 (p_{it} \times MNE_i) + \gamma_5 c_{it} + \gamma_6 t_{it} + \gamma_7 X_{it} + \rho_t + \phi_i + \nu_{it}$$

whereas τ_{it} indicates the ratio of corporate tax payments to total asset as measured by the tax payments reported in the firm's profit and loss accounts over the book value of total assets. The tax variable is regressed on the firm's pre-tax profit/loss per asset p_{it} and a size measure $\log\ a_{it}$.

While the coefficient estimate γ_1 for the profitability variable reflects the marginal effective tax rate on firms in our data[16], we allow the effective marginal tax rate to vary with firm size and include an interaction term between the profitability measure and the firm's total asset stock ($\log a_{it}$). Analogously, we allow the effective marginal tax

[15]The tax data is retrieved from KPMG's corporate tax guide (KPMG (2009)).

[16]In fact, $\gamma_1 = \frac{\partial(\frac{tax\ bill}{tot.\ assets})}{\partial(\frac{P\&L}{tot.assets})} = \frac{\partial(tax\ bill)}{\partial(P\&L)}$.

rate to differ between multinational and national firms and interact the profitability measure with a dummy variable indicating multinational firms. As described above, the sign of the coefficient estimates γ_3 and γ_4 is a priori undetermined, as is the sign of the coefficient estimate γ_2 which captures the effect of firm size on the firm's average tax payments relative to their total assets.

The set of regressors moreover includes an index for the perceived public sector corruption in the firm's host country, depicted by c_{it}. Following the theoretical considerations in section 2, we expect high levels of public sector corruption to deter a country's taxing potential. As the corruption indices are defined to be higher the lower the perceived level of corruption in the public sector, we expect the coefficient estimate for the corruption index to be positive, $\gamma_5 > 0$.

In terms of control variables, equation (1) includes a full set of firm fixed effects to absorb time constant heterogeneity across firms in our sample. Additionally, we include the firm's debt ratio as costs related to debt financing are - in the contrary to equity costs - deductible from the corporate tax base and hence tend to dampen the firm's tax bill. All regressions account for a full set of year fixed effects which capture shocks that are common to all firms in our data. In some specifications, we include a full set of sector-year effects at the one-digit NACE level to account for potential sector specific shocks. Additionally, we control for a set of time-varying country characteristics and include control variables for the country's corporate tax rate, GDP, and GDP per capita to capture changes in the statutory tax system, country size, and the country's level of development. Finally, we include the unemployment rate as a proxy for the country's general economic and labor market condition.

While equation (1) accounts for time-constant and time-varying heterogeneity across firms, the coefficient estimates for our firm specific regressors may potentially still be biased due to reverse causality. First and foremost, a high corporate tax burden on firms may exert a negative effect on corporate investment activity and thus reduce total assets (a_{it}). Analogously, a high corporate tax may reduce the country's attractiveness as a location for multinational corporations and may exert a dampening effect on the firm's reported pre-tax profitability p_{it}. To account for this possibility, we follow Arellano and Bond (1991) and estimate a first difference GMM where we instrument for the first difference in the firm specific regressors such as log total assets, profitability, debt ratio, and the interaction terms with deeper lags of their levels. Formally, the instrumental

variable regressions take on the following form

$$\Delta\tau_{it} = \beta_0 + \beta_1\Delta p_{it} + \beta_2\Delta \log a_{it} + \beta_3\Delta(p_{it} \times \log a_{it}) + \beta_4\Delta(p_{it} \times MNE_i) + \beta_5\Delta c_{it} + \beta_6\Delta t_{it} + \beta_7\Delta X_{it} + \Delta\rho_t + \Delta\epsilon_{it}$$

The variable definitions correspond to the ones in equation (1) and Δ depicts the first difference operator. Because the model is estimated in first-differences, the equation will be characterized by the presence of first-order serial correlation. However, the validity of the GMM estimator relies on the absence of second-order serial correlation. The Arellano/Bond-Test for second-order serial correlation will be reported at the bottom of the result table. We check for the exogeneity of the instrument set by employing a Sargan-Test.

5 Results

The results are presented in Tables 3 to 5.[17]

Table 3 reports the results of our baseline specification. Precisely, in specification (1) we regress the firm's tax payment per total assets on firm profitability, firm size, the corporate debt ratio and a full set of year and firm fixed effects. The coefficient estimate for the profitability variable captures the firm's marginal effective tax rate which is found to be positive and statistically significant. Quantitatively, the coefficient estimate suggests a marginal effective tax burden of 10.1%, implying that an increase in the firm's pre-tax profits by 1 US dollar raises its tax payments by 0.10 US dollars on average. This is smaller than estimates found for firms in developed economies which report marginal effective tax rates of around 30% (see for example, Maffini, 2009). Moreover, the coefficient estimates for both firm size and the debt to asset ratio are negative and statistically significant. The former result suggests that large firms tend to pay less taxes per unit of total asset stock, while the latter indicates that highly leveraged firms observe lower tax to asset ratios.[18]

[17]The observational unit is the firm per year. Heteroscedasticity robust standard errors which account for clustering at the firm level are presented in parentheses below the coefficient estimates.

[18]The negative effect of the debt ratio on the firm's effective tax rate may need some discussion. While capital costs for debt financing are, contrary to equity financing, deductible from the corporate tax base and may thus dampen corporate tax payments, this effect is expected to be absorbed by the pre-tax profitability regressor in the context of our analysis. Note, however, that one may also think

The firm's tax revenues may, however, not only be related to idiosyncratic characteristics of the firm but may be equally determined by the institutional features of the firm's host country. Specification (2) includes the World Bank corruption index which captures the corruption and governance characteristics of a jurisdiction (whereas a higher index indicates less corruption). The coefficient estimate for the corruption index is positive and statistically significant, suggesting that a reduction in the level of corruption significantly increases the tax revenues per total assets collected from the resident firms. Quantitatively, the specification suggests that an increase in the corruption index by one standard deviation (=0.2231, see Table 1) raises the tax to asset ratio by 0.6 percentage points. Evaluated at the sample mean, this corresponds to a quantitatively large relative increase of 43.5%. Column (3) of Table 3 shows that the result is robust to controlling for other host country characteristics such as the corporate tax rate, GDP per capita, GDP, and the unemployment rate.

While the specifications so far suggest that the average tax payments per assets are smaller for larger firms, specification (4) accounts for potential heterogeneity in the marginal effective tax burden levied on firms by interacting the profitability variable with the firm size measured by the logarithm of the firm's total asset stock. Both, the coefficient estimate for the profitability variable as well as the coefficient estimate for the interaction term are positive and statistically significant suggesting that the marginal effective tax rate increases in firm size. Precisely, small firms with a total asset stock close to zero observe a marginal effective tax rate of around 4.0 percentage points, while for the average firm in our sample with a total asset stock of 43.4 million US dollars the effective marginal tax burden is 9.3 percentage points. Analogously, specification (5) determines whether the marginal effective tax burden systematically differs between multinational and national firms. While the coefficient estimate for the profitability variable again turns out to be positive and statistically significant, the coefficient estimate for the interaction term of the profitability measure with a dummy variable indicating multinational firms is significantly negative. Quantitatively, the estimation suggests that domestic firms face an average marginal effective tax rate of 10.3 percentage points while the effective marginal tax rate of multinational firms

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of direct channels through which debt impacts on the firm's tax burden. External debt, for example, puts cash constraints on the corporation (and increases the risk of bankruptcy) which may raise the incentive to strategically structure operations in a way that tax payments and thus cash outflows in the current period are low, even conditional on the reported pre-tax profitability in the accounting books. Another possible explanation might be that high debt ratios are a result of past losses (as suggested by our data) and highly leveraged firms tend to have loss carryforwards.

is on average 4.9 percentage points lower. Similar results are found if the interaction terms with the firm size indicator and the multinational dummy are included in the estimation model simultaneously (see specification (6)).

The baseline specifications described so far account for correlations in the error term at the level of the individual firm. To allow for correlations at broader geographical units, we ran specifications which cluster standard errors at the country-year level and the country level respectively. Precisely, specifications (7) and (8) reestimate specifications (3) and (6) with standard errors that are clustered at the country-year level while specifications (9) and (10) reestimate the baseline specifications with clusters at the country level.[19] The significance of our results is hardly affected by this exercise.

Specifications (11) and (12) reestimate the baseline specifications of columns (3) and (6) including a full set of industry-year fixed effects as additional control variables, which again leaves the results unaffected. Table 4 accounts for the fact that an over-proportional fraction of firms in our data are located in China and Russia. In columns (1) and (2) (columns (3) and (4)) we reestimate our baseline specifications excluding firms located in China (Russia) from the analysis. The qualitative pattern of our results remains unchanged in all specifications. Quantitatively, the marginal effective tax rate estimates are smaller if Chinese firms are included in the analysis, suggesting a small effective tax burden on firms in China. The impact of the corruption index in turn is remarkably stable across specifications indicating a large and positive impact of corruption reduction on the tax payments of firms.

To assess the robustness of the results, we test other corruption indices. Specifications (5) and (6) of Table 4 thus reestimate the baseline specifications using the World Bank government efficiency index instead of the corruption measure. Again, the coefficient estimate for the index turns out to be positive and statistically significant. Analogously, we reestimate the specifications using the Transparency International corruption index of Lambsdorff (2005). The results are presented in column (7) and (8) and again suggest that reducing public sector corruption has a positive impact on tax payments per total assets. This effect is quantitatively smaller than in the previous estimations though.

Specification (9) of Table 4 accounts for the possibility that a country's marginal effective tax rate may vary with particular country characteristics. Most obviously, the marginal effective tax rate may be higher the higher the host country's statutory corporate tax rate and (or) the lower the prevalence of corruption in the national tax

[19] In total, our data comprises firms in 65 countries whereas the firm coverage in many countries is poor though, with information being available for less than 10 firms only.

administration. Specification (9) thus includes interaction terms between the profitability measure and characteristics of the firm's host country. While our baseline results remain unaffected by this modification, the interaction terms tend to support the hypothesis that the effective marginal tax rate decreases with a rising level of public sector corruption. Using this technique, we are able to estimate the marginal ETR without corruption and the marginal ETR after corruption. In our sample, the former is estimated to be around 33% (for a value of the Corruption Index equal to 2.5 - excellent performance) whilst the latter is about 14% for a theoretical value of the Control of Corruption Index equal to zero (average performance). Using our sample values, the marginal ETR is 9% for the median value of the Corruption Index (-0.66) and 4% for the lowest value of the Corruption Index in our sample (-1.28 indicating poor performance).[20]

The coefficient estimate for the corporate tax rate interaction shows a counterintuitive negative sign though. Specifications (10) and (11) reestimate specification (9) and cluster standard errors at the country-year level and country level respectively. In the latter specifications, the coefficient estimates for the interaction terms lose their statistical significance but the coefficient attached to the corruption index (γ_5) remains positive and highly significant.

While our baseline specifications include a full set of firm fixed effects which account for any time-constant heterogeneity across entities in the sample, the estimations have not accounted for potential problems of reverse causality so far. This appears to be important though since a high corporate tax burden may dampen the investment activity of the firm and may also impact on the reported profitability, debt ratio and the location of multinational entities. Thus, we reestimate our baseline specifications instrumenting for all explanatory variables related to firm characteristics (firm size as measured by total assets, pre-tax profitability, debt ratio, and the interaction terms with the profitability variable). We follow Arellano and Bond (1991) and use a specification in first differences where we instrument with deeper lags of the levels of the variables.

The results are presented in Table 5. In specification (1), the tax to total asset ratio is regressed on the profitability variable, firm size as measured by the logarithm of total assets, the firm's debt to asset ratio and a set of country characteristics. Interestingly,

[20]In our sample, the lowest value for the World Bank Control of Corruption Index is -1.28 for Paraguay in 2005. Using the estimates in column (9) of Table 4, the values of marginal ETR with and without corruption are calculated as follows: 0.1397 + 0.0759 * Corruption Index.

the coefficient estimate for the size measure now turns positive suggesting that larger firms tend to pay more taxes per total assets. Quantitatively, the estimate suggests that doubling the firm size (that is an increase by 100%) raises the tax to total asset ratio by 0.43 percentage points. Evaluated at the sample mean, this corresponds to an increase by 31.6%. Moreover, the estimated marginal effective tax rate is now somewhat smaller than in the previous specifications (5.96 percentage points). The coefficient estimate for the corruption variable is positive and significant suggesting that an increase in the corruption variable (and hence a decline in the perceived corruption level) by one standard deviation increases the tax to total asset ratio by 0.9 percentage points or - evaluated at the sample mean - by 69.7%. This again underpins that public sector corruption is related to substantial losses in the tax collection process. Specification (2) moreover adds an interaction term between the profitability variable and the firm size as measured by the logarithm of total assets. The coefficient estimate turns out positive and significant indicating that the marginal effective tax burden on firms in developing countries increases in firm size. Specification (3) additionally includes an interaction term between the profitability variable and a dummy indicating firms that belong to multinational groups. While the coefficient estimates for all other variables remain unaffected by this inclusion, the coefficient estimate for the interaction term turns out statistically insignificant, indicating that the marginal effective tax rates of multinational and national firms in developing countries does not significantly differ from each other. This contrasts the negative effect found in the OLS regressions and suggests that the latter reflects the reverse impact of low effective tax rates on corporate investments (of multinational firms). Note furthermore that the Sargan test reported at the bottom of the table suggests the instrumental variables to be valid.

6 Conclusions

Developing countries are well known to experience difficulties in raising adequate amounts of tax revenues to finance their spending needs. In particular, revenues from direct taxation tend to be low compared to the developed world. A notable exception are revenues from corporate taxation which play a much more prominent role in developed economies than in industrialized countries. The purpose of this paper was to assess the determinants of corporate tax payments in low and middle income economies using rich panel data on firms in 65 developing countries.

The analysis derives a set of results. First, conditional on the statutory tax law, the marginal effective tax burden on firms in the developed world is significantly smaller

than the effective tax burden in developed economies. Second, we find that the average and marginal effective tax burden on firms in low and middle income economies increases in firm size. This confirms theoretical considerations which suggest that larger firms are more visible to tax authorities and have less options to engage in tax evasion strategies than smaller firms. Many tax authorities in developing countries strongly focus their resources on the administration of large corporations, for example through large tax payer units, which may equally contribute to the result. Third, our results in turn do not suggest that multinational entities display a systematically lower marginal effective tax rates than national firms. This contradicts recent claims that multinational firms reduce their effective corporate tax rates in the developing world below rates faced by national firms. It is claimed that the reduction of the tax burden is achieved through international profit shifting strategies and other forms of tax avoidance.

The analysis also suggests that corporate tax payments are not only related to idiosyncratic characteristics of the firm but may also be related to institutional features of the host country. Precisely, we find that a corrupt environment exerts a significantly negative impact on corporate tax payments per assets. In general, this may reflect a host of different effect. In a corrupt environment, firms may collude with corrupt tax officials and pay bribes to reduce their overall corporate tax burden. Graft and demands for bribe payments may also dampen profits and consequently the tax base of the firm. This would lead to a reduction in tax payments collected per asset. We also estimate the marginal ETR without corruption and the marginal ETR after corruption. In our sample, the former is estimated to be around 33% (for a value of the Corruption Index equal to 2.5 - excellent performance) whilst the latter is about 14% for a theoretical value of the Control of Corruption Index equal to zero (average performance). Using our sample values, the marginal ETR is 9% for the median value of the Corruption Index (-0.66) and 4% for the lowest value of the Corruption Index in our sample (-1.28 indicating poor performance). In other words, without corruption, the marginal ETR of firms located in developing economies would approach the marginal ETR found in the literature for firms resident in high income countries. Anti-corruption measures seem to be fundamental to mobilise corporate tax revenues in developing countries.

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Tables

Table 1: Country Statistics

Country	*Firmnumber*
Bosnia and Herzegovina	542
Brazil	179
Chile	200
China	103,088
Colombia	141
Ecuador	45
Croatia	1,965
Indonesia	276
India	4,163
Kuwait	55
Sri Lanka	114
Moldova	251
Montenegro	54
Macedonia	240
Malaysia	864
Peru	626
Philippines	1,756
Pakistan	283
Paraguay	47
Serbia	2,784
Russia	54,020
Thailand	627
Ukraine	10,532
Vietnam	387
Others	314
Sum	183,553

Table 2: Descriptive Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Taxes over Total Assets	551,002	.0136	.0298	−.9239	.9385
Profitability	551,002	.0721	.1468	−.9974	1.0000
Total Assets★	551,002	43,399.32	59,8361.6	1001	$1.75e+08$
Profit before Taxation★	551,002	2,680.106	53,099.72	−5,314,697	$2.37e+07$
Taxation★	551,002	582.6816	12,740.97	−1,344,651	5,147,046
Debt Ratio	551,002	.5932	.2769	0	1
Multinational Firms	551,002	.0282	.1655	0	1
WB Corruption Index	538,600	−.6289	.2231	−1.4823	1.5075
WB Government Efficiency Index	538,600	−.1798	.2224	−1.4053	1.4751
TPI Corruption Index	190,953	.0592	.1263	−.6	3.2
Corporate Tax Rate	548,587	.2873	.0573	0	.43
Unemployment Rate	519,581	5.6084	2.2433	1.27	37.3
GDP▲	538,535	$1.12e+12$	$7.96e+11$	$2.81e+08$	$2.69e+12$
GDP per Capita▲	538,535	1,863.886	937.5385	254	22,100

Notes:

★ In thousand US dollars, current prices.

▲ In US dollars, current prices.

Table 3: Baseline Estimations

Dependent Variable: Tax Payments over Total Assets)

Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
Profitability	.1007***	.1032***	.1027***	.0403***	.1032***	.0375***	.1027***	.0375	.1027**	.0375	.1034***	.0399***
	(.0010)	(.0010)	(.0011)	(.0066)	(.0011)	(.0067)	(.0210)	(.0325)	(.0408)	(.0468)	(.0011)	(.0067)
Profitability				.0073***		.0077***		.0077***		.0077***		.0075***
× Log Total Assets				(.0008)		(.0008)		(.0024)		(.0017)		(.0008)
Profitability × MNE					−.0488***	−.0580***		−.0580***		−.0580**		−.0588***
					(.0061)	(.0060)		(.0140)		(.0266)		(.0061)
Corruption Index		.0265***	.0328***	.0327***	.0328***	.0327***	.0328***	.0327***	.0328***	.0327***	.0248***	.0247***
		(.0005)	(.0006)	(.0006)	(.0006)	(.0006)	(.0080)	(.0079)	(.0048)	(.0047)	(.0007)	(.0007)
Log Total Assets	−.0021***	−.0019***	−.0020***	−.0026***	−.0020***	−.0026***	−.0020***	−.0026***	−.0020***	−.0026***	−.0020***	−.0025***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0005)	(.0004)	(.0003)	(.0002)	(.0001)	(.0001)
Debt Ratio	−.0050***	−.0054***	−.0056***	−.0051***	−.0056***	−.0051***	−.0056**	−.0051**	−.0056***	−.0051	−.0057***	−.0052***
	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)	(.0006)	(.0023)	(.0023)	(.0042)	(.0042)	(.0004)	(.0004)
Corporate Tax Rate			.0683***	.0676***	.0684***	.0678***	.0683***	.0678***	.0683***	.0678***	.0563***	.0559***
			(.0037)	(.0037)	(.0037)	(.0037)	(.0345)	(.0342)	(.0257)	(.0253)	(.0039)	(.0039)
GDP			.192***	.222***	.192***	.223***	.0192	.0223	.0192	.0223	−.0115	.0024
			(.507)	(.0507)	(.507)	(.0507)	(.0687)	(.0677)	(.0312)	(.0304)	(.0067)	(.0067)
GDP per Capita/1000			.0113***	.0109***	.0113***	.0108***	.0113***	.0108***	.0113***	.0108***	.0091***	.0086***
			(.0065)	(.0065)	(.0065)	(.0065)	(.0051)	(.0050)	(.0053)	(.0053)	(.0007)	(.0007)
Unemployment Rate			−.0015***	−.0016***	−.0016***	−.0016***	−.0015	−.0016	−.0015	−.0016	−.0007***	−.0008***
			(.0001)	(.0001)	(.0001)	(.0001)	(.0011)	(.0011)	(.0016)	(.0016)	(.0001)	(.0001)
Year Dummies	√	√	√	√	√	√	√	√	√	√	√	√
Industry-Year Dummies											√	√
Observations	551,002	538,600	517,674	517,674	517,674	517,674	517,674	517,674	517,674	517,674	504,895	504,895
Firms	183,553	180,697	177,609	177,609	177,609	177,609	177,609	177,609	177,609	177,609	169,818	169,818
R Squared Within	0.2289	0.2411	0.2429	0.2447	0.2434	0.2453	0.2429	0.2453	0.2429	0.2453	0.2492	0.2515

Notes: Heteroscedasticity robust standard errors adjusted for firm clusters in parentheses. *, **, *** indicates significance at the 10%, 5%, 1% level. The observational units are firms per year. The dependent variable is the firm's tax payment per total assets. Profitability indicates the firm profitability as measured by pre-tax profits over total assets. Log Total assets depicts the logarithm of the firm's total assets and MNE indicates multinational entities with either a foreign parent or a foreign subsidiary. Debt ratio is the firm's debt over total assets. Corruption indicates the World Bank corruption index, corporate tax rate the country's statutory corporate tax rate. GDP stands for the host country's GDP in 10 trillions of dollars and GDP per capita for the host country's GDP per capita in thousands of US dollar. Unemployment rate is the host country's unemployment rate in percent. Year Dummies and Industry-Year Dummies indicates a full set of year fixed effects and industry-year fixed effects at the one-digit NACE level. All specifications include a full set of firm fixed effects. The within R-squared is reported at the bottom of the table.

Table 4: Robustness Checks I

Dependent Variable: Tax Payments over Total Assets

Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*
Profitability	.1485***	.1294***	.0640***	.0220***	.1026***	.0381***	.0923***	.0531***	.1397***	.1397***	.1397
	(.0015)	(.0084)	(.0012)	(.0085)	(.0011)	(.0067)	(.0026)	(.0161)	(.0160)	(.0877)	(.1470)
Profitability ×		.0022**		.0050***		.0076***		.0047***	.0020***	.0020	.0020
Log Total Assets		(.0009)		(.0010)		(.0008)		(.0019)	(.0008)	(.0020)	(.0017)
Profitability × MNEs		−.0460***		−.0203***		−.0582***		−.0065	−.0528***	−.0528***	−.0528***
		(.0147)		(.0060)		(.0060)		(.0145)	(.0066)	(.0165)	(.0143)
Profitability × Corruption									.0759***	.0759	.0759
									(.0076)	(.1025)	(.1414)
Profitability ×									−.3014***	−.3014	−.3014
Corporate Tax Rate									(.0385)	(.3767)	(.5305)
Profitability × GDP									−.0394***	−.0394	−.0394**
									(.0024)	(.0339)	(.0186)
Profitability ×									.0226***	.0226*	.0226
GDP per Capita									(.0020)	(.0129)	(.0252)
Profitability ×									−.0053***	−.0053	−.0053
Unemployment									(.0006)	(.0053)	(.0043)
Corruption Index	.0029***	.0028***	.0340***	.0339***	.0404***	.0400***	.0030**	.0030***	.0287***	.0287***	.0287***
	(.0010)	(.0009)	(.0007)	(.0007)	(.0007)	(.0007)	(.0014)	(.0014)	(.0007)	(.0071)	(.0063)
Log Total Assets	−.0022***	−.0023***	−.0021***	−.0026***	−.0021***	−.0026***	−.0020***	−.0023***	−.0023***	−.0023***	−.0023***
	(.0002)	(.0002)	(.0002)	(.0001)	(.0001)	(.0001)	(.0003)	(.0003)	(.0001)	(.0003)	(.0004)
Debt Ratio	.0234***	−.0071***	−.0002	.0001	−.0055***	−.0050***	−.0007	−.0027***	−.0027	−.0027	−.0027
	(.0042)	(.0007)	(.0004)	(.0004)	(.0004)	(.0004)	(.0009)	(.0004)	(.0004)	(.0017)	(.0029)
Corporate Tax Rate	.0234***	.0232***	.0682***	.0677***	.0947***	.0936***	.0730***	.0721***	.0874***	.0874**	.0874**
	(.0042)	(.0042)	(.0069)	(.0067)	(.0042)	(.0042)	(.0094)	(.0094)	(.0041)	(.0419)	(.0384)
GDP per Capita	.0092***	−.0029***	.0064***	.0063***	−.0057	−.0094*	−.0106***	−.0101**	.0079***	.0079*	.0079*
	(.0008)	(.0008)	(.0010)	(.0009)	(.0056)	(.0056)	(.0049)	(.0049)	(.0007)	(.0046)	(.0046)
GDP	.1700***	.1580***	.0417***	.0427***	−.0257***	−.0251***	−.0267	.0381	.0069***	.0069	.0069***
	(.0048)	(.0048)	(.0084)	(.0083)	(.0007)	(.0007)	(.3870)	(.3890)	(.0005)	(.0067)	(.0025)
Unemployment Rate	−.0003***	−.0003***	−.0007***	−.0007***	.0003**	.0002*	.0015**	.0014*	−.0012***	−.0012	−.0012
	(.0001)	(.0001)	(.0002)	(.0001)	(.0001)	(.0001)	(.0007)	(.0007)	(.0001)	(.0010)	(.0014)
Year Dummies	√	√	√	√	√	√	√	√	√	√	√
Observations	234,776	234,776	344,373	344,373	517,674	517,674	177,024	177,024	517,674	517,674	517,674
Number of Firms	74,521	74,521	123,589	123,589	177,609	177,609	120,554	120,554	177,609	177,609	177,609
R Squared Within	0.4022	0.4026	0.1715	0.1724	0.2418	0.2442	0.1750	0.1757	0.2849	0.2849	0.2849

Notes: Heteroscedasticity robust standard errors adjusted for firm clusters in parentheses. *, **, *** indicates significance at the 10%, 5%, 1% level. The observational units are firms per year. The dependent variable is the firm's tax payment per total assets. Profitability indicates the firm profitability as measured by pre-tax profits over total assets. Log Total assets depicts the logarithm of the firm's total assets and MNE indicates multinational entities with either a foreign parent or a foreign subsidiary. Debt ratio is the firm's debt over total assets. Corruption indicates the World Bank corruption index, corporate tax rate the country's statutory corporate tax rate. GDP stands for the host country's GDP in 10 trillions of dollars and GDP per capita for the host country's GDP per capita in thousands of US dollar. Unemployment rate is the host country's unemployment rate in percent. Year Dummies and Industry-Year Dummies indicates a full set of year fixed effects and industry-year fixed effects at the one-digit NACE level. All specifications include a full set of firm fixed effects. The within R-squared is reported at the bottom of the table.

Table 5: Robustness Checks II - IV Estimations
Dependent Variable: Tax Payments over Total Assets

Variable	*(1)*	*(2)*	*(3)*
Profitability	.0596***	−.0305	−.0274
	(.0225)	(.0234)	(.0231)
Profitability ×		.0094***	.0090***
Log Total Assets		(.0034)	(.0034)
Profitability × MNEs			.0455
			(.0574)
Corruption Index	.0425***	.0313***	.0320***
	(.0030)	(.0023)	(.0023)
Log Total Assets	.0043***	.0060***	.0059***
	(.0017)	(.0018)	(.0017)
Debt Ratio	−.0434***	−.0186*	−.0194*
	(.0130)	(.0105)	(.0104)
Corporate Tax Rate	.1316***	.1114***	.1121***
	(.0118)	(.0086)	(.0085)
GDP per Capita	−.0100***	−.0099***	−.0090**
	(.045)	(.0040)	(0.0040)
GDP	.0171***	.0267***	.0262***
	(.0041)	(.0036)	(.0036)
Unemployment Rate	−.0049***	−.0062***	−.0061***
	(.0008)	(.0005)	(.0005)
Year Dummies	√	√	√
Observations	349, 419	349, 419	349, 419
Number of Firms	142, 753	142, 753	142, 753
AR(2)	0.902	0.729	0.779
Sargan Test	0.567	0.236	0.337

Notes: *, **, *** indicates significance at the 10%, 5%, 1% level. The observational units are firms per year. The dependent variable is the firm's tax payment per total assets. Profitability indicates the firm profitability as measured by pre-tax profits over total assets. Log Total assets depicts the logarithm of the firm's total assets and MNE indicates multinational entities with either a foreign parent or a foreign subsidiary. Debt ratio is the firm's debt over total assets. Corruption indicates the World Bank corruption index, corporate tax rate the country's statutory corporate tax rate. GDP stands for the host country's GDP in trillions of dollars and GDP per capita for the host country's GDP per capita in thousands of US dollar. Unemployment rate is the host country's unemployment rate in percent. Year Dummies indicates a full set of year fixed effects. The model is estimated in first differences and the vector of firm variables (Profitability, Log Total Assets, Debt Ratio) is instrumented with lags of its levels. An Arellano-Bond test for second order autocorrelation and a Sargan test for exogeneity of the instruments with respect ot the error term are reported at the bottom of the table.