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## **Are less developed countries more exposed to multinational tax avoidance?**

Method and evidence from micro-data

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**Abstract:** We use a global dataset with information on 210,000 corporations in 142 countries to investigate whether cross-border profit shifting by multinational firms is more prevalent in less developed countries. We propose a novel technique to study aggressive profit shifting and improve the credibility of existing techniques. Our results consistently show that the sensitivity of reported profits to profit shifting incentives is negatively related to the level of economic and institutional development. This may explain why many developing countries opt for low corporate tax rates despite spite of urgent revenue needs and severe constraints on the use of other tax bases.

**Keywords:** profit shifting, multinational firms, tax avoidance, tax evasion, developing countries, fiscal capacity, international taxation

**JEL classification:** H25, H26, H87, O23

**Figures and tables:** at the end of the paper. All authors' own work.

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## 1. Introduction

There is solid empirical evidence that multinational firms reduce their tax bills considerably by shifting profits from countries with high corporate taxes to countries with low corporate taxes and the various profit shifting techniques are fairly well understood.<sup>1</sup> The global loss of government revenue caused by profit shifting is most likely counted in hundreds of billions of dollars and has been increasing over time.<sup>2</sup>

While almost all of the empirical evidence on profit shifting concerns developed countries, the problem may be even more acute in developing countries. First, given the limitations on tax design imposed by a large informal sector (Gordon and Li, 2009), many developing countries depend heavily on tax payments from large corporations in the formal sector (UNCTAD, 2015). Second, a recent line of research shows that sophisticated anti-avoidance rules targeted multinational firms successfully limit profit shifting<sup>3</sup>; however, such rules rarely exist in developing countries (OECD, 2014) where the regulatory and bureaucratic capacity is limited. Third, there is a broader concern that weak governance in developing countries, reflected in high levels of corruption, weak law enforcement and a lack of political accountability, may foster an environment with low tax compliance.

This paper studies profit shifting in developing countries and investigates whether the intensity of profit shifting differs systematically between countries with different levels of economic and institutional development. While this would have been impossible a few years ago because suitable data was only available in developed countries, we exploit that the leading global firm database, Orbis, has recently increased its coverage considerably in less developed countries. The database includes financial information at the level of individual corporations as well as ownership information serving to link

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<sup>1</sup> There are two main profit shifting techniques. First, transfers between affiliates are systematically mispriced: goods (Cristea and Nguyen, 2016) and services (Hebous and Johannesen, 2015) are overpriced when flowing from low-tax to high-tax affiliates and underpriced when flowing in the opposite direction. Second, balance sheet items are allocated strategically: income-generating assets such as patents (Karkinsky and Riedel, 2012) and financial assets (Ruf and Weichenrieder, 2012) are allocated to low-tax affiliates whereas cost-generating liabilities such as external debt (Desai, Foley and Hines, 2004) and internal debt (Buettner and Wamser, 2013) are allocated to high-tax affiliates.

<sup>2</sup> With a variety of methods, the annual revenue loss due to profit shifting has recently been estimated at \$130 billion for U.S. multinational firms (Zucman, 2014); \$100-240 billion globally (OECD, 2015), \$90 billion and \$100 billion for developing and developed countries respectively (UNCTAD, 2015).

<sup>3</sup> Ruf and Weichenrieder (2012) show that *controlled foreign corporation rules*, which subjects the income of foreign subsidiaries to domestic taxation when the foreign tax rate is below a threshold, discourages the allocation of financial assets to low-tax affiliates; Lohse and Riedel (2013) show that *transfer pricing rules*, which require firms to document that transfer prices are in line with observed prices in comparable arms-length transactions, reduce the responsiveness of firm profits to tax differentials; and Buettner et al. (2012) show that *thin capitalization rules*, which disallow the tax deductibility of interest payments on internal debt exceeding a threshold, discourage the allocation of liabilities to high-tax affiliates.

corporations in different countries that belong to the same multinational group. Our estimating sample covers 210,000 corporations in 142 countries, including 25,000 corporations in 94 developing countries.

Our empirical strategy to detect profit shifting builds on the most widely used method, which relates the reported profits of each corporation to its inputs of labor and capital and its tax incentive to engage in profit shifting with foreign affiliates (Hines and Rice, 1994).<sup>4</sup> To the extent that corporations systematically report lower profits when they face higher taxes relative to their affiliates, this is taken as evidence of profit shifting. While early models were identified from cross-sectional variation in tax incentives across corporations belonging to the same group (Huizinga and Laeven, 2008), most recent papers exploit time variation and control for unobserved heterogeneity in the ability to generate profits with corporation-level fixed effects (Heckemayer and Overesch, 2013).

We develop this methodology along several dimensions; often with the aim of addressing specific issues arising in the context of developing countries where data quality is lower and heterogeneity across countries is more pronounced.

First, contrary to the norm in the existing literature, we are careful not to identify profit shifting from variation in the domestic tax rate facing corporations.<sup>5</sup> A high domestic tax rate creates an incentive to shift profits to foreign affiliates, but also induces other behavioral responses that reduce the tax base, for instance to rely more on debt financing as implied by trade-off models of capital structure (Myers, 1984); exert less managerial effort as implied by standard models of labor supply (Feldstein, 1999); and keep a larger part of the business operations in the informal sector as might be a highly relevant margin of response in developing countries (Gordon and Li, 2009). Hence, if high domestic tax rates are associated with low reported profits, this may be due to profit shifting, but could also reflect purely domestic responses.

We therefore improve the identification of profit shifting by relying exclusively on variation in the tax rates facing foreign affiliates. In cross-sectional models, we thus ask whether

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<sup>4</sup> A notable methodological exception is Dharmapala and Riedel (2013) who use shocks to profits rather than to taxes to identify profit shifting.

<sup>5</sup> In our literature review, we have found over 25 papers that use some variant of the empirical approach sketched above. These papers all measure the tax incentive for profit shifting as the domestic tax rate or as the differential between the domestic tax rate and the tax rates facing foreign affiliates. In either case, the identifying tax variation is (at least partly) domestic. Panel models typically include corporation-level fixed effects, which nest country-fixed effects; however, in the absence of country-time fixed effects, the identifying time variation in tax incentives still comes from changes in both domestic and foreign tax rates. Three papers effectively identify profit shifting solely from variation in foreign tax rates because their sample of corporations are located in the same country and therefore face the same domestic tax rate: Mills and Newberry (2004) and Grubert (2012) for the U.S. and Weichenrieder (2009) for Germany.

corporations whose foreign affiliates face relatively low tax rates systematically report less profits than similar corporations *in the same country* whose foreign affiliates face relatively high tax rates. In panel models, we ask whether corporations whose foreign affiliates experience a reduction in the tax rate reduce reported profits relative to similar corporations *in the same country* whose foreign affiliates experience a constant tax rate. All our regressions fully absorb the effect of domestic corporate tax rates and other country-level factors by employing country fixed effects in the cross-sectional models and country-time fixed effects in the panel models.

Second, we propose to identify profit shifting with a zero-profit dummy variable that indicates whether profits fall within a narrow range around zero.<sup>6</sup> Our argument departs from the observation that the global tax bill of a multinational group is minimized when all profits are shifted to the corporation facing the lowest tax rate and zero profits are reported in all other corporations. This theoretical benchmark of extreme tax aggressiveness suggests that corporations reporting almost precisely zero profits should be observed more frequently when profits are shifted more aggressively. Drawing on this insight, we estimate how the propensity to report zero profits correlates with the tax incentives to shift profits.

This approach is attractive because it focuses directly on the most salient manifestation of profit shifting: multinational groups that consistently report zero profits in their high-tax affiliates despite being profitable at the global level. By comparison, existing studies typically employ log-level models that transform zero-profit outcomes into missing values. Moreover, our approach does not require precise measurement of factor inputs, which is likely to be particularly problematic in developing countries, and makes no parametric assumptions about the technology that transforms factor inputs into profits. Finally, the empirical patterns detected in the regressions using zero profits as an outcome can be observed directly in the raw distributions of profits, which greatly enhances the transparency of the analysis.

Equipped with these methods for detecting profit shifting, we investigate whether there are systematic differences across countries at different levels of development. A simple comparison of profit shifting in high-income countries and low/middle-income countries provides our first test of how the tax avoidance of multinational firms is shaped by the

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<sup>6</sup> A previous study has documented that foreign-owned corporations are more likely to report profits close to zero than domestic firms, but does not study how the propensity to report zero profits varies across foreign-owned corporations with different tax incentives for profit shifting (Grubert, Goodspeed and Swenson, 1993).

development level of the host country. However, we also estimate models that fully exploit the cross-country variation in economic and institutional development.

Our results provide robust evidence that firms' profit shifting responses to tax incentives are stronger in less developed countries.<sup>7</sup>

We show that the tax rates facing the foreign affiliates of a corporation have a significant positive effect on the propensity to report zero profits and that this effect is decreasing in development: a 10 percentage point decrease in foreign affiliates' tax rates increases the likelihood that the corporation reports zero profits by around 3.5 percentage points in low/middle-income countries, but only by around 1.5 percentage point in high-income countries. This difference is clearly visible when we plot the raw profitability distributions for the two countries groups separately. Our regressions indicate that increasing either income per capita or the quality of governance by one standard deviation reduces the effect of a 10 percentage point decrease in foreign affiliates' tax rates on the propensity to report zero profits by roughly 1 percentage point.

Likewise, we find that the tax incentives for profit shifting matter more on the intensive margin of profit reporting in less developed countries: a 10 percentage point decrease in foreign affiliates' tax rates is found to decrease reported profits by around 10% in low/middle-income countries, but by less than 2% in high-income countries.<sup>8</sup> In the global sample, our regressions indicate that increasing the level of development by one standard deviation reduces the effect of a 10 percentage point decrease in foreign affiliates' tax rates on reported profits by around 5 percentage points.

Our finding that less developed countries are highly exposed to cross-border profit shifting may help explain why they, often in spite of desperate revenue needs, do not raise corporate taxes rates. When firms respond strongly to profit shifting incentives, increases in tax rates generate little or no increases in government revenue. The inability to contain profit shifting therefore constitutes an effective constraint on tax policy and low rates may be the best feasible policy given this constraint. This illustrates the broader finding that fiscal capacity tends to be low in developing countries (Besley and Persson 2013).

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<sup>7</sup> This result is consistent with the broader literature on corporate tax evasion in developing countries, which tends to find that evasion among small and medium-sized domestic firms is pervasive (e.g. Best et al, 2015; Johnson et al., 2000).

<sup>8</sup> By comparison, previous studies of profit shifting in high-income countries typically report that a 10 percentage point reduction in the tax differential between a corporation and its foreign subsidiaries increases reported profits by around 8% (Heckemeyer and Overesch, 2013). We obtain similar results when we identify from all variation in taxes, but these estimates are not robust to a more demanding identification strategy where the variation only derives from foreign tax rates.

While we find a robust relation between a country's level of development and the tax aggressiveness of the multinational firms it is hosting, the precise causal mechanism is elusive. Because of the strong correlation between the various dimensions of economic and institutional development – income, control of corruption, rule of law, political accountability, regulatory quality, government effectiveness and political stability – disentangling their effect on profit shifting is highly challenging.

The paper contributes to a small existing literature that addresses profit shifting in developing countries. Fuest, Hebous and Riedel (2011, 2013) use detailed micro-data on the capital structure of German multinational firms to show that the use of internal debt in foreign affiliates is more sensitive to tax incentives in developing countries than in developed countries. Taking a macro perspective, Crivelli, de Mooij and Keen (2015) demonstrate that corporate tax externalities, encompassing both real investment and profit shifting responses to corporate taxation, are larger in developing countries than in developed countries. Also relying on macro data, UNCTAD (2015) shows that the average rate of return on foreign direct investment in developing countries decreases rapidly with the share of investment deriving from offshore financial centers, which is suggestive of profit shifting. Finally, Johannesen and Larsen (2016) find a significant decrease in the value of multinational oil, gas and mining firms in response to new financial disclosure rules, which is consistent with widespread profit shifting in developing countries. To the best of our knowledge, no existing paper studies the responsiveness of reported profits to tax incentives using micro-data from low- and middle income countries.

The paper also makes a number of methodological contributions that, while generally applicable to any study of profit shifting, are particularly designed to ensure credible identification of tax avoidance by multinational firms in the context of developing countries and thus pave the way for future work in this field.

The paper proceeds in the following way. Section 2 describes the data; Section 3 develops and applies a novel framework to study aggressive profit shifting; Section 4 improves and applies the standard framework to studying profit shifting; and Section 5 concludes.

## 2. Data

### *2.1 Sources, sample and summary statistics*

Firm data are drawn from the full version of the proprietary database Orbis maintained by Bureau Van Dijk. The database includes basic information from the balance sheet and the profit and loss accounts for each individual corporation for the period 2003-2012. The information derives from financial statements, but is adapted by Bureau Van Dijk to be comparable across countries. The database also identifies the current ultimate owner of each corporation, which we use to construct corporate groups comprising all corporations with the same ultimate owner.<sup>9</sup>

Starting from the full Orbis database, corporations enter our gross sample if they satisfy two requirements. First, they must have at least one foreign affiliate; we do not consider purely national firms for the simple reason that these firms cannot engage in international profit shifting. Second, there must be basic financial information about the corporation in Orbis; even the least demanding regression framework requires that total assets, profits and the industry classification is observed. Both requirements imply that our gross sample is far smaller than the total number of corporations in Orbis. The vast majority of corporations have no foreign affiliates and for the majority of those that do, no financial information is available.

Table 1 shows summary statistics for the largest estimating sample of corporations used in the cross-sectional regressions.<sup>10</sup> The information is for the financial years ending in

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<sup>9</sup> Our dataset was drawn from the database in October 2013 and the corporate groups reflect ownership information at that time. To the extent that corporate groups have changed between the time when financial information is reported and the time when the ownership information is observed, the incentives for profit shifting may be mismeasured. This measurement problem applies to almost all empirical studies of profit shifting.

<sup>10</sup> Our estimating sample is always smaller than the gross sample for three reasons. First, we exclude observations with a return on assets above 96% (the 99th percentile in the gross sample) to avoid that corporations with implausibly high profits, for instance due to measurement error, drive our results. Second, some observations with negative returns are dropped. In the standard empirical framework, the logarithmic transformation of profits implies that only observations with strictly positive profits enter the estimating sample. Our novel “zero-profit” framework, in principle, allows observations with negative profits by relying on a dummy transformation of profits rather than a logarithmic transformation. However, this would be problematic since losses change the marginal tax incentives in highly complex ways. In a simple static analysis, corporate groups always have a tax incentive to shift profits to loss-making corporations *regardless* of the tax rates. Taking into account dynamic aspects, incentives depend on tax rates as well as rules for loss-carry forward and expected future profits. We sidestep these intricacies and include only observations with strictly positive profits and profits sufficiently close to zero to switch on the “zero-profit” dummy, that is returns on assets between -0.5% and 0.5%. Finally, we exclude the smallest corporations with assets below \$1 million.

2010, which is the year with the highest data coverage in developing countries.<sup>11</sup> Columns (1)-(3) describe the world sample whereas Columns (4)-(6) and Columns (7)-(9) describe the subsamples of low/middle-income and high-income countries respectively.

Panels A and B describe the income and institutional variables that we use to analyze how development shapes tax avoidance. The average corporation operates in a country where GNI per capita is around \$32,000, which reflects that around 7 out of 8 corporations in the sample are located in high-income countries. However, there is considerable variation in the global sample: GNI per capita is only around \$5,000 for the average corporation in low/middle-income countries compared to \$36,000 in high-income countries. To make our results comparable across development measures with different scales, our regressions employ a standardized measure of GNI where, by construction, the global mean is zero and one unit represents one standard deviation in the global distribution.

The lower income levels in low/middle-income countries are mirrored by lower quality of governance as indicated by standardized measures of corruption, government effectiveness, political stability, regulatory capacity, rule of law and political accountability (World Bank, 2015). In all six dimensions, the governance outcome facing an average corporation in low/middle-income countries is considerably worse than that facing an average corporation in high-income countries; in most cases the difference is around 1.5 standard deviations.

Since the six variables capturing different dimensions of governance are highly correlated, as shown in Table 2, it is extremely challenging to disentangle their effects on tax avoidance. In the main analysis, we therefore use the first principal component of the governance variables as an index of the quality of governance. The correlation coefficient between the first principal component and the individual governance variables ranges from 0.79 (political stability) to 0.99 (rule of law) and thus captures most of the variation in the quality of governance. The Online Appendix provides regression results where each of the governance variables enter separately.

Panel C in Table 1 describes the financial information in Orbis. Corporations in low/middle-income countries have almost exactly the same size as corporations in high-income countries in terms of assets, but are larger in terms of the number of employees, which is consistent with a more labor-intensive production. Average reported profits are somewhat higher in low/middle-income countries when measured in absolute terms, but

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<sup>11</sup> Notably in developing countries, there is often a considerable time lag from the ending of the financial year until accounts are closed, financial information is published and this information is adapted by Bureau van Dijk and entered into Orbis.

the profitability is very similar across the two groups of countries whether measured as the return on assets or the probability that the return on assets falls within a narrow range around zero (between -0.5% and 0.5%).

Panel D describes the tax variables that determine the incentive to shift profits within the corporate group. The variables are computed on the basis of statutory corporate tax rates taken from the KPMG Corporate Tax Rate Tables and information on corporate group structures from Orbis. Absent special tax regimes and tax holidays, statutory corporate tax rates are precisely the effective tax rates that apply to the *marginal* dollar of profits and thus capture the incentive to manipulate the tax base with profit shifting (Devereux and Maffini, 2007).

We report summary statistics on domestic corporate rates and two measures of foreign tax rates: the simple average of the tax rates facing foreign corporations belonging to the same group and the tax rate facing the foreign parent.<sup>12</sup> The table shows that, in our sample, tax rates are lower in low/middle-income countries than in high-income countries: the domestic tax rate facing an average corporation in the former group is around 21% compared to around 29% for an average corporation in the latter; also the tax rates of parents and foreign affiliates tend to be lower in countries with lower incomes.

Finally, we illustrate the geographical composition of our estimating sample in Table 3. As noted by several previous studies, a large fraction of the corporations, for which financial information is available in Orbis, are located in Europe. This is notably true within the group of high-income countries (94%) and to a somewhat lesser extent in the group of low/middle-income countries (75%).

The geographical composition implies that much of the variation in income and institutional variables that identifies the development gradient in profit shifting comes from Europe. In other words, our results largely derive from a comparison of developed countries in Western Europe and developing countries in Eastern Europe. Within Europe, income levels range from less than \$3,000 in Georgia and Ukraine to around \$80,000 in Norway and Switzerland and the continent includes countries like Russia and Bosnia, which score well below the global average on all dimensions of governance, as well as countries like Sweden and Finland, which are among the best governed in the world.

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<sup>12</sup> Parent companies are typically large relative to the size of the group and have been shown to play a prominent role in the profit shifting strategies of multinational firms (Dischinger, Knoll and Riedel, 2013).

## 2.2 Measurement and identification

The use of accounting information to study tax motivated profit shifting poses several challenges. First, book profits are not identical to taxable profits and the book-tax difference may vary systematically across countries and over the business cycle. This highlights another advantage of employing country-time dummies in the empirical model: since we control fully for the average book-tax difference in a country in a given year, we do not need to assume that book-tax differences are uncorrelated with corporate tax rates and the level of development.<sup>13</sup> Second, some forms of tax avoidance do not aim to shift profits from high-tax to low-tax countries, but to ensure that profits are not taxable in any country.<sup>14</sup> These forms of tax avoidance do not leave any traces in accounting data and are not included in our estimates. Thus, strictly speaking, we are estimating the extent of cross-border profit shifting rather than the full extent of all forms of tax avoidance.

A potential concern with our empirical approach is measurement error in the tax incentive to shift profits due to imperfect coverage of the Orbis database. As illustrated in Table 3, Orbis covers some countries better than others and it is plausible that coverage is particularly low in tax havens infamous for financial secrecy. A recent study conducts a cross-validation of Orbis with other data sources and report that, in a sample of large corporate groups known to have tax haven affiliates, Orbis correctly identifies the tax haven presence in 70% of the cases (Johansson et al., 2016). It is important to note that while tax havens may not themselves have public corporate registers, Orbis uses information from registers in other countries to identify tax haven affiliates. For instance, the corporate register in South Africa may identify a corporation on the British Virgin Islands (BVI) as the owner of a given South African corporation. While this does not provide sufficient accounting information on the BVI parent to include it in the estimating sample, we are able to account for its presence when measuring the incentive to shift profits facing the corporation in South Africa.

Some mismeasurement surely persists due to Orbis' partial coverage as well as our inability to account for special tax regimes that reduce effective marginal tax rates on profits below the statutory rates. In our preferred panel specification with corporation fixed effects where we identify from *changes* in foreign tax rates, however, the

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<sup>13</sup> Rather, the identifying assumption is that book-tax differences within a country do not correlate with the corporate tax rates facing foreign affiliates.

<sup>14</sup> This is true for avoidance structures using hybrid financial instruments and hybrid corporate entities (Johannesen, 2014). Profit that is not taxable in any jurisdiction has been labeled "stateless income" (Kleinbard, 2011)

measurement error is plausibly uncorrelated with unexplained *changes* in profits, in which case the resulting bias is unambiguously toward zero.

A final feature of the data that deserves to be discussed is the fact that we rely on a snapshot of corporate group structures. On the one hand, this adds another source of measurement error in the tax incentives for profit shifting because we do not account for changes in these incentives created by changes in the group structure. On the other hand, it addresses the concern that variation in the profit shifting incentives deriving from firms' own location choices is inherently endogenous. We effectively disregard this source of variation by holding ownership structures constant and only identifying from the variation in profit shifting incentives that come from plausibly exogenous changes in statutory corporate tax rates in foreign countries.

### **3. A new approach to studying aggressive profit shifting**

This section first argues that aggressive profit shifting, the shifting of all profits to low-tax affiliates, requires a new empirical framework where the key outcome is the reporting of zero profits. It then investigates empirically, with graphical analysis and in regression models, whether the prevalence of zero profits correlates with the tax incentive to shift profits in line with the theoretical prediction and whether this correlation varies systematically across countries with different income levels.

#### *3.1 Theoretical motivation*

The standard framework for studying profit shifting can be illustrated with the following simple example. A multinational firm consists of two profitable corporations: one in country H with a high tax rate  $t^H$  and one in a country L with a low tax rate  $t^L$ . Shifting a dollar of profits from the former to the latter yields a tax saving of  $t^H - t^L$ , but also creates a cost in the form of concealment efforts, expected tax penalties, or similar. Assuming that shifting costs,  $C$ , are a convex function of the amount of profits shifted,  $S$ , the firm will optimally shift profits from H to L until  $t^H - t^L = C'(S)$ . This implies that a small increase in  $t^H$  or decrease in  $t^L$  induce a small increase in profit shifting; less profits are reported in H and more are reported in L for a given amount of production inputs in the two countries. The empirical profit shifting literature is largely devoted to testing this theoretical prediction.

This framework relies on the implicit assumption that shifting costs are large enough to sustain an optimum with positive reported profits in both countries. If shifting costs are sufficiently small, however, the firm optimally chooses to report all its profits in L and zero profits in H. More precisely, if  $t^H - t^L > C'(S)$  at the allocation where all profits in H are shifted to L, this is the firm's optimum, because the tax bill in H is then zero and

cannot be reduced any further by shifting profits to L.<sup>15</sup> Clearly, this profit allocation is insensitive to small changes in tax rates; the key theoretical prediction of the standard framework no longer holds.

Moreover, it is also assumed that shifting costs are variable, whereas in reality they may have an important fixed component.<sup>16</sup> If shifting costs are fixed at  $C$ , the firm optimally chooses either to report all profits in L or to report profits truthfully in both countries. Letting  $\pi^H$  denote true profits in H, full shifting is optimal when  $\pi^H(t^H - t^L) > C$  while no shifting is optimal when  $\pi^H(t^H - t^L) < C$ . The profit allocation is not affected by small tax changes except in the special case where  $\pi^H(t^H - t^L) = C$ .

While this simple example illustrates the limitations of the standard framework as a guide to empirical analysis, it also suggests an alternative approach that focuses on the prevalence of zero profits. Whether full shifting occurs because variable shifting costs are low or shifting costs are fixed altogether, we should expect a more frequent reporting of zero profits among firms with a large saving from profit shifting, i.e. firms for which  $t^H - t^L$  is large.

### *3.2 Graphical evidence*

Figures 1a-1b provide a graphical analysis of the prevalence of zero profits by showing raw histograms of the return to assets in high-income and low/middle-income countries respectively. The histograms are shown separately for corporations with different tax incentives to shift profits as measured by the parent tax rate: corporations whose parent is facing a higher tax rate than themselves (red line) and corporations whose parent is facing a lower tax rate than themselves (blue line).

The figures offer clear evidence of bunching at zero profits regardless of the profit shifting incentives. In each sample, more than 2% of corporations report a return to assets between 0% and 0.1%. By comparison, less than 1% report a return to assets in the similar-sized windows between -1% and -0.9% and between 1% and 1.1%.

While bunching at zero profits among corporations with high-tax parents cannot be explained with profit shifting, it can be rationalized with other tax- and non-tax incentives. The marginal incentive to reduce the tax base through other channels than profit shifting,

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<sup>15</sup> Technically, an optimum where negative profits are reported in H would require that  $-t^L = C'(S)$ . This is not possible given that marginal shifting costs are positive,  $C'(S) > 0$ , and there is some taxation of profits in L,  $t^L > 0$ . Intuitively, when reported profits in H are negative, reducing shifting to L by one dollar, yields a tax saving of  $t^L$  in L with no offsetting tax cost in H.

<sup>16</sup> Shifting cost components such as consultant fees, costs of operating shell corporations and risk of negative publicity are presumably largely independent of the scale of the profit shifting and could reasonably be considered fixed.

whether legitimate (e.g. external leverage) or illegitimate (e.g. non-reporting of income), changes fundamentally at zero profits where there are no more taxes to pay. Hence, corporations with no incentives to shift profits abroad may bunch at zero profits for domestic tax reasons. In the accounting literature, bunching at zero profits has been discussed and interpreted as evidence that firm managers have discretion to shift profits across financial years and choose to report slightly positive profits in years where true profits are slightly negative to maintain a record of “consistent profitability” (Burgstahler and Dichev, 1997).

From a profit shifting perspective, the interesting feature is therefore not bunching at zero profits *per se*, but that the magnitude of the bunching varies systematically with the incentives to shift profits.

In low/middle-income countries, the fraction reporting a return between 0% and 0.1% is around 5% for corporations with low-tax parents, but only 2.5% for corporations with high-tax parents. Similarly, there is more mass immediately to the left and to the right of this interval for corporations with low-tax parents than for those with high-tax parents. Assuming that true returns are distributed similarly for the two groups, the striking difference in reported returns close to zero is suggestive of aggressive profit shifting whereby all profits are shifted to foreign affiliates with lower tax rates and no taxes are paid domestically.

In high-income countries, by contrast, the fraction of corporations reporting a return between 0% and 0.1% is around 2% regardless of the tax difference to the parent. More generally, the distributions of reported returns are very similar for corporations with low-tax and high-tax parents. Hence, the clear signs of aggressive profit shifting that we observed in low/middle-income countries are not present in high-income countries. This represents our first suggestive evidence that the exposure to profit shifting is larger in less developed countries.

In the Online Appendix, we show that a very similar picture emerges when we group countries according to institutional quality rather than per capita income (Figure A1). This is not surprising given the high correlation between the two dimensions of development. Moreover, we show that measuring the tax incentive for profit shifting with reference to the average tax rate facing foreign affiliates rather than the tax rate facing the parent has little bearing on the observed patterns (Figures A2-A3).

### 3.3 Regression framework

The graphical analysis has several limitations. First, the simple comparison of corporations with low-tax and high-tax parents only uses part of the variation in the tax incentive to shift profits; it ignores that the tax saving from profit shifting is not the same for all corporations with low-tax parents, but proportional to the tax differential. Second, we are effectively making comparisons across corporations operating in different countries, comparing, for instance, a corporation in South Africa with a low-tax parent to a corporation in Ukraine with a high-tax parent. This is problematic if there are cross-country differences in the propensity to report zero profits for other reasons than profit shifting.

We address both of these limitations in the following simple cross-sectional regression model:

$$zero_i = \alpha_c + \beta_3 tax_i^{for} + \varepsilon_i$$

The dependent variable is a dummy variable indicating whether the reported return to assets falls between -0.5% and 0.5%. In the spirit of the bunching literature (e.g. Saez, 2010), we are effectively assuming that firms cannot fully control their true income and expenses such that profits realized after profit shifting may be slightly positive or negative even when firms aim for exactly zero profits. The specific range chosen corresponds roughly to the range in which there is excess mass in the raw profit distributions shown in Figures 1 and 2, but given that the choice is somewhat arbitrary, the Online Appendix includes robustness tests where the dummy is defined for a narrower interval.

The main explanatory variable is the tax rates facing foreign affiliates,  $tax^{for}$ . Given that the equation includes country fixed effects,  $\alpha_c$ , we are effectively comparing the probability of reporting zero profits of corporations in the same country whose incentive to shift all profits to foreign affiliates differs because these affiliates are facing different tax rates. The domestic tax rate is not identified in the model due to the country fixed effects.

The parsimony of this novel empirical framework for detecting profit shifting is appealing; it requires very little financial information and makes no parametric assumptions about the technology that transforms production inputs into profits. It is therefore especially useful in the context of developing countries where financial information is often incomplete and measurement error in the financial variables is always a serious concern.

Further, we estimate the following panel regression model, which further exploits the time dimension of the data.

$$zero_{it} = \alpha_{ct} + \mu_i + \beta_3 tax_{it}^{for} + \varepsilon_{it}$$

The model includes corporation fixed effects and country-time fixed effects and thus ensures that identification only comes from within-country time variation in foreign tax rates. We are effectively asking whether corporations whose foreign affiliates experience a change in their corporate tax rate exhibit a change in their propensity to report zero profits relative to corporations in the same country whose foreign affiliates experience no changes in their tax environment. When examining how these responses vary with the level of development, we condition on income and governance measured as the average over the sample period.

### *3.4 Regression results*

The cross-sectional results are presented in Table 4. Estimating the model separately for countries at different income levels suggests that a 10 percentage point decrease in the parent tax rate increases the likelihood that a corporation reports zero profits by around 3.6 percentage points in low/middle-income countries (Column 1), but only by around 1.6 percentage point in the high-income countries (Column 2). The estimated effects of a change in the average foreign tax rate are similar (Columns 3-4).

While the large difference between the two samples supports the notion that less developed countries are more exposed to aggressive profit shifting, we exploit all the underlying variation in development levels across 97 countries by estimating an augmented version of the model for the full sample where the tax variable is interacted with our two development measures: income per capita and the quality of governance.<sup>17</sup>

The results suggest that increasing GNI per capita by one standard deviation reduces the effect of a 10 percentage point decrease in the parent tax rate on the propensity to report zero profits by around 0.9 percentage points (Column 5) and reduces the effect of a 10 percentage point decrease in the average foreign tax rate by around the same magnitude (Column 6). Likewise, increasing the quality of governance by one standard deviation reduces the effect of a 10 percentage point decrease in the parent tax rate on the propensity to report zero profits by around 1.2 percentage points (Column 7) and reduces the effect of a 10 percentage point decrease in the average foreign tax rate by around 0.9 percentage points (Column 8)

Analogous results for the panel model are presented in Table 5 for the sample period 2003-2012. The estimates suggest that a 10 percentage point decrease in the parent tax

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<sup>17</sup> This number does not include countries where all outcomes are perfectly predicted by country fixed effects because all corporations or no corporations have zero profits. Such observations do not contribute to the identification of the variables of interest.

rate or the average foreign tax rate increases the likelihood that a corporation reports zero profits by around 2 percentage points in the subsample of low/middle-income countries (Columns 1 and 3) while there is no such effect in the subsample of high-income countries (Columns 2 and 4). Further, fully exploiting the variation in development levels across 142 countries, we estimate the panel model for the global sample while including interactions between the tax terms and the development measures. The results indicate that increasing GNI per capita by one standard deviation reduces the effect of a 10 percentage point decrease in foreign tax rates on the propensity to report zero profits by around 0.9 percentage points (Columns 5 and 7) while increasing the quality of governance by one standard deviation has a slightly larger effect of around 1.2 percentage points (Columns 6 and 8).

In sum, the panel model produces somewhat smaller estimates of the sensitivity of aggressive profit shifting with respect to profit shifting incentives in both developed and developing countries; however, the estimated development gradient in this sensitivity is strikingly similar in the cross-sectional and panel models.

We conduct two robustness tests, which are reported in the Online Appendix. First, in order to address the fuzziness of the threshold between zero and non-zero profits, we exclude returns between 0.5% and 2% and thus effectively compare profits that are close to zero to profits that are clearly non-zero (Table A1). Second, we define the zero profits dummy over a narrower window of profitability between -0.25% and 0.25% (Table A2). In both cases, the results are very similar to the baseline results reported in Table 5.

Finally, we re-estimate the model while replacing the governance index with the underlying governance measures (Table A3). For all combinations of the two tax measures and the six governance measures, our results indicate that increasing governance by one standard deviation reduces the effect of a 10 percentage point decrease in foreign tax rates on the propensity to report zero profits by between 0.6 and 1.1 percentage points. Given the strong correlation between the governance measures, however, these results should be interpreted with caution. While they corroborate our finding that aggressive tax avoidance is more prevalent in less developed countries, it is not clear which particular aspects of development are driving this correlation.

#### **4. Improving identification in the standard framework**

In this section, we first discuss and modify the standard framework for detection of profit shifting with the aim of making identification more credible. We then use this framework to investigate whether the sensitivity of reported profits with respect to tax incentives for profit shifting varies systematically across countries with different income levels.

#### 4.1 Regression framework

Our regression framework uses the following standard specification for detecting profit shifting as a point of departure:

$$\log(\text{profits}_{it}) = \alpha_t + \mu_i + \beta_1 \log(\text{capital}_{it}) + \beta_2 \log(\text{labor}_{it}) + \beta_3 (\text{tax}_{it}^{\text{dom}} - \text{tax}_{it}^{\text{for}}) + \varepsilon_{it}$$

The equation explains the level of reported profits with a set of non-tax variables, the levels of production inputs and corporation and time fixed effects, and a tax variable expressing the difference between the domestic tax rate facing corporation  $i$  and the foreign tax rates facing its affiliates. Conceptually, the non-tax variables describe true profits under the assumption of Cobb-Douglas production technology with time-invariant differences in total factor productivity across corporations whereas the tax term measures the incentive to engage in cross-border profit shifting within the corporate group.

This specification raises the major concern that profit shifting may be confounded with domestic tax responses. As argued in the introduction, the domestic tax rate is likely to affect both profit shifting and other behavioral margins: it shapes the incentives to finance the firm with external debt, to move transactions to the informal sector and to exert effort for all employees and managers with a stake in after-tax profits. Since the tax term varies one-to-one with the domestic tax rate, it is likely to effectively confound profit shifting and a number of entirely unrelated behavioral responses to domestic taxation. These behavioral responses are likely to be especially pronounced in developing countries (Besley and Persson, 2013).

To address this concern, we separate domestic and foreign tax rates and augment the model with country-time fixed effects that fully absorb the variation in domestic tax rates. This yields the following estimating equation:

$$\log(\text{profits}_{it}) = \alpha_{ct} + \mu_i + \beta_1 \log(\text{capital}_{it}) + \beta_2 \log(\text{labor}_{it}) + \beta_3 \text{tax}_i^{\text{for}} + \varepsilon_{it}$$

Since all cross-sectional variation in profits are absorbed by the corporation fixed effects, profit shifting is identified exclusively from *time variation* in the foreign tax rates faced by affiliates. Analogous to the zero-profit panel framework developed in the previous section, we are now asking whether corporations whose foreign affiliates experience a change in the tax rate systematically change the level of reported profits relative to corporations in the same country whose foreign affiliates experience a constant tax rate. The identifying assumption is that within countries, changes in the ability of a corporation to transform production factors into profits are uncorrelated with changes in the tax rates faced by its foreign affiliates.

It should be emphasized that, even with the improvements we are proposing, this framework cannot capture aggressive profit shifting where all profits are shifted to foreign affiliates because observations with zero and negative profits are effectively discarded. Nevertheless, it allows us to measure reporting responses on the intensive margin and therefore represents a natural complement to the analysis of the extensive margin in the zero-profit framework.

Finally, before estimating the models, we need to take a stand on the precise definitions of the variables. Profits are measured after financial income and expenses, which implies that profit shifting in the form of interest payments on intra-firm loans are accounted for in the regressions, but before taxes. Capital is measured as fixed assets, which is in line with most of the literature, whereas labor is measured as the number of employees, which is more commonly available in developing countries than the total wage bill.

#### *4.2 Regression results*

The results are presented in Table 6. The estimates suggest that a 10 percentage point reduction in the parent tax rate decreases reported profits by around 7.5% in low/middle-income countries (Column 1), but only by around 2% in high-income countries (Column 2). Even more strikingly, a 10 percentage point reduction in the average foreign affiliate tax rate appears to decrease reported profits by around 13% in low/middle-income countries (Column 3) while there is no effect in high-income countries (Column 4).

When employing continuous measures of development in the full sample, we find that both higher income and better governance are associated with a large and strongly significant decrease in the effect of foreign taxes on reported profits. For instance, a 10 percentage point reduction in the parent tax rate decreases reported profits by around 7% in a country with a per capita income level at the global average; decreasing the income level by one standard deviation raises the magnitude of this effect to 11.5% while increasing the income level by one standard deviation reduces it to 2.5% (Column 5). Similar effects are found when using the average foreign affiliate tax rate as a measure of profit shifting incentives (Column 6) and when using governance as a measure of development (Columns 7-8). Finally, our findings indicate that the interaction effects between the six underlying governance measures and the two tax foreign tax rate measures are all of roughly the same magnitude (Table A4 in the Online Appendix).

The regressions reported in Table 6 include corporations in 62 countries as compared to 142 countries in the zero-profit panel regressions reported in the previous section. The loss of observations occurs because financial reporting in developing countries is often incomplete and erratic, which leads to missing information about production inputs and

short panels and because observations with zero and negative profits are censored.<sup>18</sup> This highlights that the zero-profit framework proposed in this paper is less vulnerable to the data limitations often present in the context of developing countries than existing methods.

It is instructive to compare our estimates to the benchmark provided by a recent meta-study (Heckemayer and Overesch, 2013). Based on 25 papers that use the standard empirical framework, they estimate that a 10 percentage point reduction in the *difference* between the domestic tax rate facing a corporation and the foreign tax rates facing its affiliates increases reported profits by around 8%. By comparison, our modified framework where profit shifting is identified exclusively from foreign tax variation tends to yield larger tax sensitivities than this benchmark in low/middle-income countries and smaller tax sensitivities (close to zero) in high-income countries.

A set of additional results reported in the Online Appendix attempts to reconcile our results with those of the literature. First, we show that when the standard empirical framework is applied to all corporations in the European Union, a typical sample in the studies covered by the meta-study, a 10 percentage point increase in the domestic-foreign tax differential reduces reported profits by 6-7% (Table A5). This is very close to the central estimates of the meta-study and reassures us that our results are not driven by peculiarities of our data source or the sample period. Moreover, we show that the negative correlation between the level of development and the tax responsiveness of reported profits is just as pronounced in the standard empirical framework as in ours: a 10 percentage point increase in the difference between the domestic tax rate and the foreign parent tax rate reduces reported profits by around 11% in low/middle-income countries, but only by around 4% in high-income countries; the analogous estimates using the difference between the domestic tax rate and the average foreign affiliate tax rate as a measure of profit shifting incentives are 8% in low/middle-income countries and a borderline significant 1% in high-income countries (Table A6). Hence, our main finding that developing countries are more exposed to profit shifting than developed countries holds irrespective of the methodological improvements we are proposing.

## 5. Concluding remarks

This paper provides empirical evidence on the link between the tax aggressiveness of multinational firms and the economic development of their host countries. We develop new techniques to detect cross-border profit shifting while paying special attention to the methodological challenges that arise in the context of developing economies. Applying

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<sup>18</sup> Not uncommonly, we only observe corporations once, in which case profits are perfectly predicted by the corporation fixed effects in the panel specification.

these techniques to a global firm dataset with a reasonable coverage in developing countries, we show that the sensitivity of firms' reported profits to incentives for cross-border profit shifting varies systematically with economic and institutional development: less developed countries appear to be significantly more exposed to tax avoidance by multinational firms. This is consistent with the broader view that developing countries have a relatively low fiscal capacity (Besley and Persson 2013).

The negative relation between a country's development level and its exposure to multinational tax avoidance is very robust and emerges in a wide array of empirical specifications, however, it is less clear what causal mechanisms are at play. All our indicators of development, whether related to income or governance, correlate with tax aggressiveness, however, the high correlation between the indicators themselves makes it difficult to disentangle their effects. Credible identification of the mechanisms that lead to low tax compliance in developing countries is an important goal for future research.

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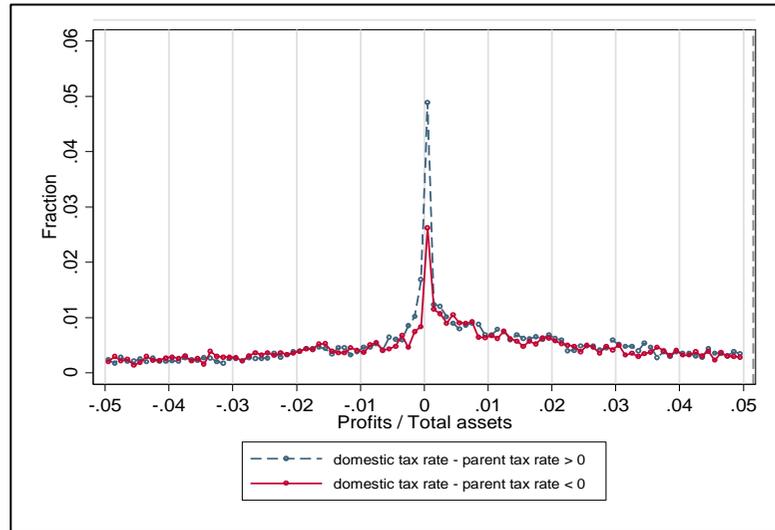
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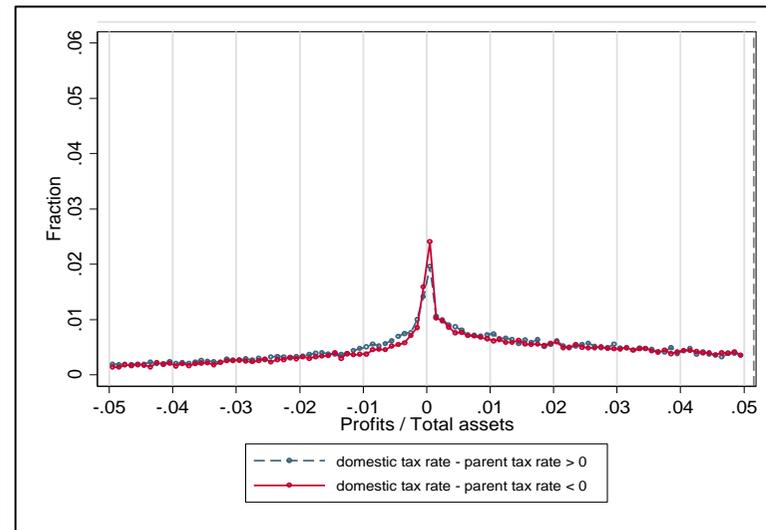
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**Figure 1: Tax incentives for profit shifting, economic development and return on assets**

*1a: Low/middle-income countries*



*1b: High-income countries*



Notes: The figure shows histograms of the return on assets in countries with a GNI (Atlas Method) below and above \$12,275 respectively. The return on assets is the ratio of profits (after financial income and expenses but before taxation) to total assets.

**Table 1: Descriptive statistics (2010)**

	Full sample			Low/middle income			High-income countries		
	(1) Obs	(2) Mean	(3) Std. Dev.	(4) Obs	(5) Mean	(6) Std. Dev.	(7) Obs	(8) Mean	(9) Std. Dev.
<b>Panel A: Income</b>									
GNI per capita (US dollars)	211,670	31,868	15,061	26,313	5,100	1,947	186,707	35,571	12,044
GNI per capita (standardized)	211,670	1.37	0.96	26,319	-0.27	0.16	186,707	1.60	0.79
<b>Panel B: Governance</b>									
Control over corruption (standardized)	212,376	1.07	0.95	27,039	-0.61	0.49	186,706	1.30	0.73
Government Effectiveness (standardized)	212,376	1.14	0.72	27,039	-0.22	0.37	186,706	1.34	0.51
Political stability (standardized)	212,390	0.54	0.57	27,053	-0.46	0.59	186,706	0.68	0.40
Regulatory quality (standardized)	212,376	1.19	0.58	27,039	-0.04	0.48	186,706	1.36	0.33
Rule of Law (standardized)	212,390	1.15	0.78	27,053	-0.41	0.45	186,706	1.38	0.52
Voice and Accountability (standardized)	212,390	1.05	0.58	27,053	-0.23	0.66	186,706	1.23	0.24
First principal component (standardized)	212,376	1.15	0.74	27,039	-0.37	0.48	186,706	1.37	0.46
<b>Panel C: Financial information</b>									
Total Assets (mill. USD)	212,410	699	17,200	27,073	704	17,100	186,707	697	17,100
Fixed Assets (mill. USD)	207,012	110	1,610	25,627	90	1,187	182,719	112	1,655
Turnover (mill. USD)	193,395	124	1,134	26,998	153	1,369	167,644	119	1,089
Profits (mill. USD)	212,410	16	220	27,073	24	282	186,707	15	208
Employees (number)	143,061	283	3,975	22,341	586	9,107	121,776	227	1,833
Return to Assets	212,410	0.10	0.13	27,073	0.10	0.13	186,707	0.10	0.13
Zero profits (dummy)	212,410	0.15	0.35	27,073	0.18	0.38	186,707	0.14	0.35
<b>Panel D: Tax</b>									
Domestic tax rate	210,233	0.28	0.06	26,859	0.21	0.07	186,697	0.29	0.05
Foreign parent tax rate	198,543	0.29	0.07	25,154	0.23	0.09	175,736	0.30	0.07
Average foreign affiliate tax rate	209,444	0.26	0.06	25,516	0.22	0.08	185,303	0.26	0.05

Notes: The table shows descriptive statistics for our gross sample of corporations in 2010. Starting from the full sample of corporations in Orbis we have excluded: (i) corporations with no foreign affiliates, (ii) corporations with assets below \$1 million; (iii) corporations with a return to assets in excess of 96% (the 99th percentile). Variables: *GNI per capita* is the gross national income per person measured with the World Bank's Atlas Method; *Control over corruption* captures perceptions of the extent to which public power is exercised for private gain; *Government effectiveness* captures perceptions of the quality of public services and civil service and the degree of its independence from political pressures; *Political stability* measures perceptions of the likelihood of political stability and politically motivated violence; *Regulatory quality* captures perceptions of the government's ability to formulate and implement sound policies and regulation; *Rule of law* captures perceptions of the extent to which agents have confidence in and abide by the rules of society; *Voice and Accountability* captures perceptions of the extent to which a country's citizens are able to participate in selecting their government as well as freedom of expression; *First principal component* is the first principal component of the 6 governance variables. *Total assets* is the book value of the total assets; *Fixed assets* is the book value of fixed assets; *Turnover* is total sales of a corporation; *Profits* is net income after financial income and expenses but before taxation; *Employees* is the number of employees; *Return on assets* is the ratio of profits to total assets; *Zero profits* is a dummy variable coded one when the return on assets is between -0.5% and 0.5% and zero otherwise; *Domestic tax rate* is the corporate tax rate faced by the corporation; *Parent tax rate* is the corporate tax rate faced by the parent company of the corporation. *Average foreign affiliate tax rate* is the simple average of the corporate tax rates faced by the foreign affiliates of the corporation. When variables are standardized, we have subtracted the global mean and divided by the global standard deviation. Columns labelled "Low/middle-income" include countries with a GNI (Atlas method) below \$12,275. Columns labelled "High-income" include all countries with a GNI (Atlas method) above \$12,275. Data sources: Governance variables are from World Governance Indicators (2016); income per capita is from World Development Indicators (2016); Financial information is from Orbis; Tax rates are from KPMG (2015).

**Table 2: Correlation between quality of governance and per capita income (standardized variables)**

	Control over Corruption	Regulatory Quality	Rule of Law	Voice and Accountability	Government effectiveness	Political Stability	First Principal Component of Governance Indicators	Gross National Income pr. capita
Control over Corruption	1							
Regulatory Quality	0.90	1						
Rule of Law	0.97	0.95	1					
Voice and Accountability	0.83	0.90	0.88	1				
Government effectiveness	0.98	0.91	0.97	0.83	1			
Political Stability	0.68	0.71	0.68	0.76	0.70	1		
Principal Component	0.97	0.96	0.98	0.92	0.97	0.78	1	
GNI pr. capita	0.81	0.73	0.78	0.75	0.80	0.66	0.81	1

Notes: The table shows the correlation matrix for the following 8 variables: 6 measures of quality of governance (control over corruption, regulatory quality, rule of law, voice and accountability, government effectiveness and political stability), the first principal component of these 6 variables and gross national income per capita. The sample is the 154 countries that enter into one or more of the estimations and where the year is 2010. All income and governance variables are standardized by subtracting the mean and dividing by the empirical standard deviation.

**Table 3: Number of observations, by region and income (2010)**

	High-income	Low/middle-income	Full sample
Europe	175,903	19,957	195,860
Asia / Australia	9,017	3,505	12,516
Americas	1,787	2,687	4,480
Africa	0	170	170
	186,707	26,319	213,026

Notes: The table shows the number of observations in the estimating sample by income group and geographical region. "Low/middle-income" refers to corporations in countries with a GNI (Atlas method) below \$12,275 whereas "High-income" refers to corporations in countries with a GNI (Atlas method) above \$12,275. The definition of geographical regions follows the regional codes in World Development Indicators.

**Table 4: Zero profits, cross-sectional model**

	Dependent variable: Indicator for zero profits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low/middle- income	High-income	Low/middle- income	High-income	All countries	All countries	All countries	All countries
Parent tax rate	-0.364*** (0.0610)	-0.164*** (0.0550)			-0.308*** (0.0520)		-0.333*** (0.0306)	
Average foreign affiliate tax rate			-0.303*** (0.105)	-0.166*** (0.0290)		-0.281*** (0.0650)		-0.276*** (0.0558)
Parent tax rate × GNI per capita (standardized)					0.0877** (0.0393)			
Average foreign affiliate tax rate × GNI per capita (standardized)						0.0727* (0.0373)		
Parent tax rate × Governance (standardized)							0.123*** (0.0363)	
Average foreign affiliate tax rate × Governance (standardized)								0.0877* (0.0453)
Observations	16,517	80,388	24,841	184,421	96,599	208,531	96,884	209,233
R-squared	0.060	0.056	0.065	0.045	0.057	0.048	0.058	0.049
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows results from an ordinary least squares regression with observations at the corporation-level for 2010. Variables: *zero profits* is a dummy variable coded one when the corporation's return to assets is between -0.5% and 0.5% and zero otherwise; *parent tax rate* is the the corporate tax rate in the country of the corporation's ultimate owner; *average foreign affiliate tax rate* is the unweighted average of the corporate tax rates in the countries of the corporation's foreign affiliates; *GNI per capita* is the standardized value of the gross national product in the country of the corporation; *Governance* is the standardized value of the first principal component of the 6 indicators of quality of governance (control over corruption, regulatory quality, rule of law, voice and accountability, government effectiveness and political stability). The income and governance variables are standardized by subtracting the global mean and dividing by the standard deviation. Sample: in Columns (1) and (3) the sample is corporations in *low/middle-income* countries; in columns (2) and (4), the sample is corporations in *high-income* countries; in Columns (5)-(8), the sample includes corporations in all countries. The sample is winsorized by excluding corporations with a return to assets exceeding 96% (the 99th percentile in the gross sample). Standard errors: all reported standard errors are robust to heteroscedasticity and clustered at the country-level. Statistical significance: \*, \*\* and \*\*\* Indicate significance at the 10%, 5% and 1% level respectively.

**Table 5: Zero profits, panel model**

	Dependent variable: Indicator for zero profits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low/middle- income	High-income	Low/middle- income	High-income	All countries	All countries	All countries	All countries
Parent tax rate	-0.235*** (0.06)	-0.008 (0.03)			-0.124*** (0.04)		-0.165*** (0.04)	
Average foreign affiliate tax rate			-0.177** (0.07)	0.01 (0.03)		-0.118*** (0.04)		-0.150*** (0.05)
Parent tax rate × GNI per capita (standardized)					0.086*** (0.03)			
Average foreign affiliate tax rate × GNI per capita (standardized)						0.087*** (0.03)		
Parent tax rate × Governance (standardized)							0.116*** (0.03)	
Average foreign affiliate tax rate × Governance (standardized)								0.117*** (0.04)
Observations	138,562	676,235	216,895	1,572,877	814,503	1,786,927	814,553	1,066,828
Number of corporations	35,762	135,048	52,055	303,759	170,743	355,304	170,766	238,951
Corporation fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year-income group fixed effects	-	-	-	-	Yes	Yes	Yes	Yes

Notes: The table shows results from an ordinary least squares regression with observations at the corporation-level for 2003-2012. Variables: *zero profits* is a dummy variable coded one when the corporation's return to assets is between -0.5% and 0.5% and zero otherwise; *parent tax rate* is the the corporate tax rate in the country of the corporation's ultimate owner; *average foreign affiliate tax rate* is the unweighted average of the corporate tax rates in the countries of the corporation's foreign affiliates; *GNI per capita* is the standardized value of the gross national product in the country of the corporation; *Governance* is the standardized value of the first principal component of the 6 indicators of quality of governance (control over corruption, regulatory quality, rule of law, voice and accountability, government effectiveness and political stability). The income and governance variables are standardized by subtracting the global mean and dividing by the standard deviation. Sample: in Columns (1) and (3) the sample is corporations in *low/middle-income* countries; in columns (2) and (4), the sample is corporations in *high-income* countries; in Columns (5)-(8), the sample includes corporations in all countries. The sample is winsorized by excluding corporations with a return to assets exceeding 96% (the 99th percentile in the gross sample). Standard errors: all reported standard errors are robust to heteroscedasticity and clustered at the corporation-level. Statistical significance: \*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% level respectively.

**Table 6: Reported profits**

	Dependent variable: Profits (in logs)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Low/middle-income	High-income	Low/middle-income	High-income	All countries	All countries	All countries	All countries
Parent tax rate	0.746** (0.308)	0.212* (0.118)			0.688*** (0.172)		0.744*** (0.209)	
Average foreign affiliate tax rate			1.307*** (0.318)	0.117 (0.120)		0.832*** (0.206)		0.829*** (0.215)
Parent tax rate × GNI per capita (standardized)					-0.450*** (0.145)			
Average foreign affiliate tax rate × GNI per capita (standardized)						-0.548*** (0.161)		
Parent tax rate × Governance (standardized)							-0.439*** (0.167)	
Average foreign affiliate tax rate × Governance (standardized)								-0.525*** (0.168)
Fixed assets (in logs)	0.145*** -0.00893	0.0707*** (0.00348)	0.163*** (0.00735)	0.0757*** (0.00254)	0.0814*** (0.00326)	0.0858*** (0.00241)	0.0814*** (0.00326)	0.0858*** (0.00241)
Employees (in logs)	0.357*** (0.0146)	0.288*** (0.00706)	0.341*** (0.0129)	0.275*** (0.00471)	0.305*** (0.00646)	0.286*** (0.00450)	0.305*** (0.00646)	0.286*** (0.00450)
Observations	90,061	417,072	136,946	929,745	503,716	1,058,226	503,783	1,060,236
R-squared (within)	0.127	0.058	0.123	0.057	0.071	0.065	0.071	0.065
Number of corporations	25,695	93,214	36,867	202,320	118,791	238,579	118,805	238,951
Corporation fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year-income group fixed effects	-	-	-	-	Yes	Yes	Yes	Yes

Notes: The table shows results from an ordinary least squares regression with observations at the corporation-level for the period 2003-2012. Variables: *profits* is reported profits; *parent tax rate* is the the corporate tax rate in the country of the corporation's ultimate owner; *average foreign affiliate tax rate* is the unweighted average of the corporate tax rates in the countries of the corporation's foreign affiliates; *GNI per capita* is the standardized value of the gross national product in the country of the corporation (average over the sample period); *Governance* is the standardized value of the first principal component of the 6 indicators of quality of governance: control over corruption, regulatory quality, rule of law, voice and accountability, government effectiveness and political stability (average over the sample period); *fixed assets* is the value of the corporation's fixed assets; *employees* is the number of employees at the corporation. The income and governance variables are standardized by subtracting the global mean and dividing by the standard deviation. Sample: in Columns (1) and (3) the sample is corporations in *low/middle-income* countries; in columns (2) and (4), the sample is corporations in *high-income* countries; in Columns (5)-(8), the sample includes corporations in all countries. The sample is winsorized by excluding corporations with a return to assets exceeding 96% (the 99th percentile in the gross sample). Standard errors: all reported standard errors are robust to heteroscedasticity and clustered at the corporation-level. Statistical significance: \*, \*\* and \*\*\* Indicate significance at the 10%, 5% and 1% level respectively.