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Abstract

There exists an intense debate about the effects of corporate tax cuts on the formation of private capital in the real sector. This paper studies the investment impact of the effective fiscal burden of firms during the period 1995-2014. To this end, in a first step national accounts data is used to calculate backward looking average Effective Corporate Tax Rates (ECTR) for 73 developed and developing countries. In a second step, a dynamic panel approach is employed to estimate the impact of the ECTR on private gross fixed capital formation and foreign direct investment inflows. The obtained results indicate that: (i) ECTR not only tend to be much lower than statutory corporate tax rates, but also have different dynamics over time; and (ii) there exists no clear statistically significant negative relationship between ECTR and private investment. Instead, private capital formation and FDI inflows are rather explained by economic growth, the persistence of investment spending, trade openness, and the quality of institutions. This finding is robust when alternative effective corporate tax rate measures or statutory corporate tax rates are considered.

Key Words: Effective tax rates; corporate taxes; investment; private gross fixed capital formation; foreign direct investment (FDI)

JEL Classification: F21; F32; O11

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1. Introduction

Investment expenditure is seen as a major determinant of economic growth (Keynes, 1936; Harrod, 1939; Solow, 1956; Kaldor and Mirrlees, 1962; Romer, 1986), and it is therefore common that governments employ policies that are aimed at stimulating domestic investment and attracting foreign direct investment (FDI) inflows. Among these policies are tax incentives for firms, given that conventional economic theories find that corporate taxation raises the cost of capital and thus affect its accumulation negatively (Modigliani and Miller, 1958; Jorgenson, 1963; Chirinko, 2002; Bösenberg *et al.*, 2018).

Accordingly, many countries have substantially reduced their corporate tax rates in the last three decades (Abbas and Klemm, 2013; Dyreng et al., 2017). One prominent recent example is the "Tax Cuts and Jobs Act" by the Trump administration, which includes a statutory corporate tax reduction by 14 percentage point (from 35% to 21%), among other favorable provisions for firms, and has the explicit aim to foster investment from domestic and foreign firms.

However, instead of being used for physical investment, rising profits often are used for financial investment, mergers and acquisitions, debt reductions or share buy-backs; this is especially true in the recent era of financialisation (Froud et al., 2001; Stockhammer, 2004; 2008; van Treeck, 2009; Tori and Onaran, 2018).[3] Furthermore, tax cuts tend to reduce the revenue of governments, which in turn can affect negatively the provision of public goods that have a complementary function with private investment, such as infrastructure, R&D and education (Aschauer, 1989; Corsetti & Roubini, 1996). Additionally, tax cuts can lead to fiscal deficits, which can translate into higher interest rates that raise the opportunity costs of capital formation (Gale & Orzag 2005).

[3] In line with this research, the FOMC (2017, pg. 6) states that the capital spending effect of the "Tax Cuts and Jobs Act" is uncertain because business survey respondents "*noted that the increase in cash flow that would result from corporate tax cuts was more likely to be used for mergers and acquisitions or for debt reduction and stock buybacks*".

All of these factors can limit the potential positive effect of corporate tax reductions on physical investment spending, and explain why survey responses[4] and the results of empirical studies on this matter are mixed. With regard to the latter, approximately 60% of the cross-country literature that we reviewed find a statistically significant and robust negative impact of the tax burden on inward FDI, while only approximately 35% find the same result in the case of fixed capital formation (see Section 2 for details).

To measure the tax burden of firms (and housheholds), four approaches are commonly used. The first approach is to consider statutory corporate income tax rates (CIT), tax incentives (like tax credits and deductions) and depreciation and inventory valuation rules that are reported in the national tax codes. The second approach is to calculate forward looking effective marginal tax rates (EMTR) on hypothetical investment projects, considering all available information from tax codes. The third approach is to derive an effective average tax rate (EATR) by considering the ratio between the net present value of tax payments (including personal taxes on interest income and capital gains) and the net present value of pre-tax capital income.[5] The fourth approach is to calculate backward looking effective tax rates by considering the ratio between the tax payments and pre-tax profits that are reported in the balance sheets of firms (Micro-BL ETR), or by using the ratio between aggregate corporate tax revenues and pre-tax profits that are reported in the national accounts (Macro-BL ETR).

Given the complex tax structures and the selective use of tax incentives, it is questionable if the reliance on national tax code information adequately captures the actual amount of tax incentives reaped by firms (including the shifting of profits to tax havens). Furthermore, tax code based measures are most appropriate when countries administer tax rates uniformly across firms, which is unlikely given that incentives are highly negotiable (Mutti and Grubert, 2004). A further limitation of EMTR and EATR is that the calculation of capital costs requires detailed information that is not available for many countries, and that their

[4] For example, Lim *et al.* (2013) examines tax expert surveys from the National Tax Association in the USA and finds that only approximately 50% of the respondents believe that capital gains tax cuts boost investment. World Bank's Multilateral Investment Guarantee Agency survey survey shows that only 29% of the largest transnational firms consider national taxes as an important factor in investing in a location (MIGA, 2002), and Wunder (2001) finds that only 4 out of 75 surveyed Fortune 500 companies consider fiscal factors as crucial to deciding on what location to invest

[5] Please see Devereux & Griffith (2003) for details on how EMTR and EATR are derived.

aggregation is difficult because they are calculated for specific investment projects, with specific rates of return and methods of finance (Devereux, 2007).

Although backward looking effective tax rates are far from perfect, they have the advantage that profit and revenue data captures the sum of all tax incentive and elusions schemes that are effectively employed.[6] However, Micro-BL ETR data typically is only available for OECD countries, whereas the national accounts data that is necessary to calculate Macro-BL ETR is also available for many developing countries. That is to say, of the potential corporate tax burden measures Macro-BL ETR are the easiest to compute, with the most broadly available data, and probably are the most consistent in a cross-country setting.

A shortcoming of the existing studies that are using Macro-BL ETR is that they consider the jointly taxation of corporate profits and household capital income, which means that there is a gap in the literature regarding the magnitude and evolution of Macro-BL corporate ETR and their impact on investment. This paper tries to close this gap by providing new evidence on the existing effective corporate tax burden and its effect on private investment by: (i) calculating Macro-BL based average effective corporate tax rates (ECTR) for 73 developed and developing countries for the period 1995-2014, and (ii) establishing empirically whether changes in ECTR affect the inflow of FDI and private gross private fixed capital formation (PGFCF).

The main findings of this exercise are: (i) ECTR not only tend to be much lower than statutory corporate tax rates, but also have different dynamics over time; and (ii) there exists no clear statistically significant negative relationship between ECTR and private investment. Instead, the dynamic panel models indicate that private capital formation and FDI inflows are rather explained by economic growth, the persistence of investment spending, trade openness, and the quality of institutions. This finding is robust when alternative effective corporate tax rate measures or statutory corporate tax rates are considered for a reduced sample size.

[6] Backward looking "*tax liabilities of a firm at any point in time reflects (i) the history of its investment up to that point (in determining what allowances it can claim in that period) (ii) tax liabilities in possibly several jurisdictions, (iii) the history of losses in the firm (that is, it may be carrying forward losses from some previous period), and (iv) the history of the tax system up to that point*" (Devereux, 2007: 18)

The remainder of this paper is organized as follows. The second section discusses briefly the results from the empirical literature that has tried to measures the impact of the tax burden on investment in cross-country settings. The third section details the methodology used for calculating ECTR and to establish empirically their impact on PGFCF and FDI inflows. The fourth section presents the obtained results, and the fifth section draws conclusions.

2. Existing empirical cross-country evidence on the impact of taxation on investment

A wide range of empirical studies has tried to corroborate the predictions of theoretical models that corporate taxes have a negative impact on inward FDI and fixed capital formation. These studies have used various methodologies in terms of how to measure the tax burden as well as how to determine its impact on investment.

As mentioned above, the results of these studies are rather mixed. We have reviewed 20 articles that either measure the impact of taxation on fixed capital formation, inward FDI or both. The summary of Table 1 shows that out of the thirteen studies that measure the impact of corporate taxation on inward FDI, only eight (62%) report a robust significant negative impact. In the case of (private) capital formation, this figure even drops to four out of eleven (36%).

Table 1 also shows that the articles vary widely in terms of the used tax and investment measures, methodology, and time period. Moreover, most studies concentrate on high-income OECD countries, whereas few studies use a mixed sample of developed countries and emerging markets (EM) or concentrate solely on EM.

The divergence in country coverage might explain in part the mixed findings. For example, Klemm and Van Parys (2012: 420) find that "in Latin America and the Caribbean lowering the tax rate or extending tax holidays help to attract FDI, but not in Africa", while Lim (2014: 174) concludes that a for developing countries as a whole "favorable investment climate is characterized not so much by traditional policy areas [like tax incentives] but more by the broader institutional environment in which firms operate". However, even when studies consider (the same) OECD countries and similar time periods their results differ substantially. Hence, they seem sensitive to the use of different tax and investment measures and the empirical methodology employed.

Table 1: Summary of the cross-country evidence on the impact of taxation on investment

Study	Tax variable	Investment variable	Empirical Methodology	No. of countries / Period	Sign. and robust negative impact
Cummins et al. (1996)	CIT, tax incentives & valuation rules	GFCF of firms (% of capital stock)	OLS & GMM	14 OEDC 1982-1992	yes
Mendoza et al. (1997)	Macro-BL capital income ETR	Private gross investment (% of GDP)	Panel model with time dummies	18 OEDC 1966-1990	yes
Beyer (2002)	CIT & tax incentives	Inward FDI stock per capita	Multivariate regressions	15 OEDC 1993-1998	CIT: yes Incentives: no
Grubert & Mutti (2000)	Micro-BL corporate ETR	US FDI assets	OLS	60 mixed 1992	yes
Volkerink et al. (2002)	Macro-BL capital income ETR	Private gross investment (% of GDP)	Fixed effects panel	18 OEDC 1965-1991	no
Mutti & Grubert (2004)	Micro-BL corporate ETR	US MNC real gross product in host countries	Random and fixed effects panel	47 mixed 1982, '89, '94	yes
Bénassy-Quéré et al. (2005)	CIT, EMTR, EATR & Macro BL capital income ETR	Bilateral FDI flows	Fixed effects gravity model	11 OEDC 1984-2000	yes
Buettner & Ruf (2007)	CIT, EMTR & EATR	Outward FDI positions of German firms	Fixed effects logit	18 OEDC 1996-2003	CIT: yes ETRs: no
Razin & Sadka (2007)	CIT & EATR	Bilateral FDI flows	Fixed effects gravity model	18 OECD 1987-2003	yes
Romero-Avila & Strauch (2008)	Macro-BL capital income ETR	Private physical investment (% of GDP)	Distributed lag model	15 OECD 1960-2001	no
Egger et al. (2009)	EMTR & EATR	Firm-level asset growth	Fixed effects panel	38 mixed 2001-2005	Firm-specific: yes Country-specific: no
Djankov et al. (2010)	CIT & BL corporate ETR from PWC accountant survey	GFCF & FDI inflows (both % of GDP)	OLS	85 mixed 2003-2005	CIT: GFCF no FDI yes ETR: yes
Van Parys & James (2010)	CIT & tax incentives	PGFCF & FDI inflow (both % of GDP)	Dynamic fixed effects panel	12 EM 1994-2006	no
Arnold et al. (2011)	EMTR	Gross investment (% capital stock)	Pooled Mean Group	12 OECD 1971-2004	yes
Klemm & Van Parys (2012)	CIT & tax incentives	PGFCF & FDI inflow (both % of GDP)	fixed effects panel & system GMM	47 EM 1985-2004	no
Barrios et al. (2012)	CIT	FDI location decision	Conditional logit with year fixed effects	33 mixed 1999-2003	yes
Hansson & Olofsdotter (2013)	EMTR & EATR	Bilateral FDI flows	Heckman two-step estimations	15 OECD 1985-2004	no
Abbas & Klemm (2013)	EMTR & EATR	PGFCF & FDI inflows (both % of GDP)	Fixed effects panel & system GMM	50 EM 1996-2007	no
Lim (2014)	CIT	GFCF	System GMM	79 mixed 1980-2009	no
Herger et al. (2016)	CIT, EMTR & EATR	Number of cross-border acquisitions	Fixed effects Poisson model	30 mixed 1999-2010	CIT & EATR: yes EMTR: no

The remainder of this paper contributes to the existing literature by providing a new Macro-BL average effective corporate tax rate measure (ECTR) for a broad sample of 73 developing and developed countries, and by estimating the impact of this measure on PGFCF and FDI inflows for a more recent time period (1995-2014) than previous studies.

3. Research Design

This paper proposes a new approach to calculate backward looking effective corporate tax rates (ECTR), which intends to capture the average tax burden of corporations when they carry out their activity. More precisely, our ECTR measure relies on aggregate data of the systems of national accounts (SNA), and is based on the ratio between the taxes that corporations pay and their pre-tax profits:[7]

$$ECTR_{it} = \frac{(D5C_{it} + D29_{it})}{(B2g_{it} + D29_{it})} \quad (1)$$

where i represents country, t is time, $D5C$ are current taxes on income and wealth paid by non-financial and financial corporations, $D29$ are other taxes paid on production by non-financial and financial corporations[8], and $B2g$ is the gross operating surplus of non-financial and financial corporations. Please note that other taxes on production are added to the gross operating surplus because the SNA deducts them from the valued added when calculating the gross operating surplus (i.e. without these taxes the profit of corporations would be higher).

Considering the publicly available SNA data of the United Nations and the OECD, we calculate yearly ECTR for an unbalanced sample of 73 countries during 1995-2014. The country sample consists of 36 high income, 20 upper-middle income and 17 lower-middle income countries (please see Appendix A for a detailed country list).

[7] This approach is in the spirit of Mendoza et al.'s (1997) Macro-BL capital income ETR, but does not consider personal capital income and tax payments as their measure does.

[8] Other taxes on production consist of taxes on payroll or work force (excluding social security contributions); on land, buildings or other structures; in order to obtain a license to carry on a particular kind of business or profession; on the use of vehicles or machinery and equipment; on legal procedures that are related to production purposes; on pollution; and on international transactions.

In line with the above-discussed literature, in a second step the following ad hoc dynamic panel model is used to estimate the impact of the ECTR on private investment:

$$(\frac{I}{GDP})_{it} = \beta_0 + \beta_1(\frac{I}{GDP})_{it-1} + \beta_2 ECTR_{it-1} + \sum_{z=3}^{k-2} \beta_z X_{zit} + \rho_i + \mu_{it} \quad (2)$$

where $\frac{I}{GDP}$ is private investment as percentage of GDP (measured as FDI inflows or PGFCF), X is a vector of control variables, ρ are fixed country effects that account for unexplained heterogeneity across countries, and μ is a random error term.[9] ECTR is considered with a lag because it is likely that firms do not respond immediately to changes in the tax burden, while the lag of the dependent variable tries to capture the well-established correlation between current and past investment.

The data for the dependent variables, net FDI inflows (as % of GDP) and gross fixed capital formation of the private sector (as % of GDP), are retrieved from the World Development Indicators (WDI). For our purpose it would be preferable to use corporate gross fixed capital formation (CGFCF) instead of PGFCF (which includes fixed investments of private non-profit agencies) but unfortunately this measure is not available for most of the sample countries.

In line with previous literature we use GDP growth, GDP per capita, inflation, trade openness, government expenditure and the rule of law as control variables. The rule of law data is taken from the Worldwide Governance Indicators (WGI), while the other variables are available in WDI. The GDP growth measure captures economic dynamics; it is expected that higher growth rates foster domestic investment and attract foreign investors (van Parys & James 2010b; Abbas & Klemm 2013; Lim 2014). GPD per capita is a proxy for the level of development. Higher development levels might foster investment but at the same time can also mean that investment returns are lower. Hence, both a negative or a positive sign are theoretically plausible (Razin et al., 2007; Klemm & van Parys, 2012).

The inflation rate is considered on the grounds that high rates might discourage private investment because they can be seen as sign of economic instability (Hansson & Olofsdotter

[9] In line with Razin and Sadka's (2007) model, we assume that the host country's tax rate is important for the magnitude of FDI flows, whereas the source country's tax rate is not (i.e. we do not consider tax rate differentials between countries). This assumption is also in accordance with Grubert and Mutti's (2001) observation that in the USA corporate tax payments on repatriated income are very small (i.e. less than six percent).

2013; Abbas & Klemm 2013). Trade openness, on the other hand, is expected to foster private investment in general and FDI inflows in specific (Van Parys & James, 2010). Government spending proxies the revenue necessities of governments, their productive investment (which can foster investment) and potential crowding-out effects (Mendoza et al., 1997; Romero-Avila & Strauch, 2008). Last but not least, the quality of institutions is proxied by WGI's rule of law index. It has been widely shown that institutions that protect investors are important determinants to foster domestic and foreign investment (see, for example, La Porta et al., 1997; Haggard et al., 2008; Lysandrou et al., 2016).

The use of backward looking ETR implies a potential endogeneity issue, given that investments in period *t* can generate lower tax payments in the periods *t+n* (for instance due to tax allowance for deprecation) (Devereux, 2007; Egger *et al.*, 2009). Moreover, effective tax rates are not likely to be exogenous because governments can increase or decrease the tax burden according to the observed investment behavior. Finally, there also exist potential reverse causation issues with the other explanatory variables: private investment is likely to foster economic growth and to influence to some degree government expenditure, inflation, trade openness and the quality of institutions.

In line with recent articles on the subject (Klemm & Van Parys, 2012; Abbas & Klemm, 2013; Lim, 2014), Blundell and Bond's (1995) system GMM estimator is used to overcome these potential endogeneity issues. System GMM uses the combination of lagged first differences to instrument levels and lagged levels to instrument current differences. To limit the number of instruments we restrict the lags to two years. Another issue is that investment and profits are likely to be affected by the economic cycle. To smooth this effect three-year averages are used in the regressions. This approach has the additional advantage that it increases the efficiency of the system GMM estimator, which is designed for datasets with a relatively small T and large N.

4. Results

4.1 The magnitude of average backward looking effective corporate tax rates (ECTR)

Table 2 shows the average CIT and ECTR for the period 1995-2014, and each country's ECTR of the first three years and the last three years for which data are available. As

expected, we find that in most cases our calculated effective corporate tax rates are much lower than the statutory ones (at least in the countries with available CIT data). To be more precise, the average ECTR during the whole period is 17.5%, whereas the average CIT is approximately 29%.

The results also indicate that the sample countries are quite heterogeneous with regard to their effective corporate tax burden. In general, high-income countries have generally lower rates (mean 16.5%) than upper-middle (mean 17.5%) and lower-middle (mean 19.3%) income countries. In specific, China (43.7%) has the highest ECTR while Kuwait's effective tax burden is close to cero (0.7%). Other countries that have low ECTR are Turkey (7.9), Mexico (8.6%), Germany (10.4%), Switzerland (11.3%), and Ireland (12%), while Nigeria (35.5%), Sweden (31%), Luxembourg (26.4%), Norway (26%) and France (25.9%) are among the countries with a relatively high ECTR.

The table furthermore shows that the dynamics of the ECTR are also quite distinct: 38 countries have a lower ECTR in the last than in the first observation period, while 35 have a higher one, with the most extreme cases Kyrgyzstan (-40 percentage points) and Bolivia (+20 percentage points). These figures suggest that in many countries the ECTR had different movements than the CIT. While most countries have substantially reduced their statutory corporate tax rates during the last two decades (Abbas and Klemm, 2013; Dyreng et. al., 2017), the same is not generally visible for the ECTR; this is especially true for high-income countries, where the mean ECTR in the first and last period is nearly identical (16.3% vs. 16.2%).

The discrepancy in the developments of CIT and ECTR suggests that governments that lowered their CIT at the same time removed/lowered tax incentives and/or loopholes in the corporate tax legislations. This probably also partly explain why Devereux et al. (2002) and Abbas & Klemm (2013) find that, despite substantial reductions of CIT, corporate tax revenues have remained fairly stable in developed and developing countries.

Table 2: Average statutory and effective corporate tax rates in 73 countries

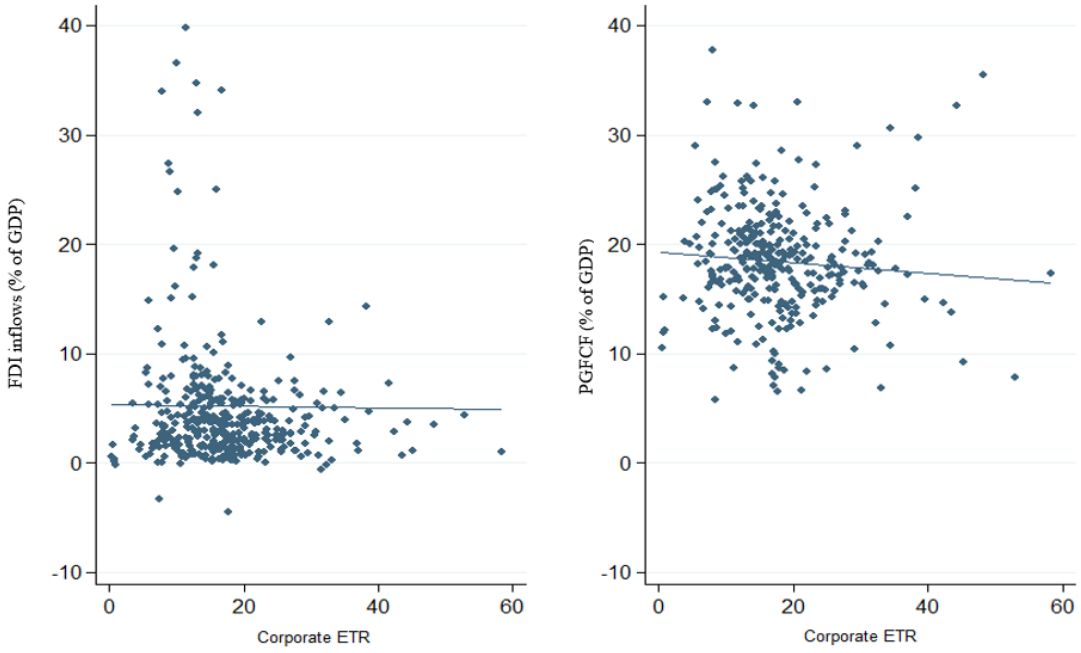
Country	*Mean CIT 1995-2014*	*Mean ECTR 1995-2014*	*ECTR first obs.*	*ECTR last obs.*	*Country*	*Mean CIT 1995-2014*	*Mean ECTR 1995-2014*	*ECTR first obs.*	*ECTR last obs.*
Argentina	34.3	25.9	21.9	30.5	Ivory Coast		23.1	25.1	21.2
Armenia		12.5	19.2	13.3	Korea	27.7	12.4	12.5	12.2
Aruba		14.4	13.4	15.3	Kuwait		0.7	1.0	0.4
Austria	29.3	17.0	17.9	18.2	Kyrgyzstan		24.8	52.9	12.9
Azerbaijan		8.9	9.6	8.7	Latvia		10.3	16.6	8.2
Bahrain		3.5	3.6	3.5	Lithuania		5.9	7.5	4.5
Belarus		24.2	27.8	16.8	Luxembourg	32.7	26.4	27.5	20.4
Belgium	36.3	17.0	16.5	17.7	Mexico	31.7	8.6	8.0	9.4
Bolivia		14.5	6.0	24.7	Mongolia		14.6	16.8	12.5
Brazil	34.5	23.6	20.3	26.1	Morocco		18.8	15.3	20.2
Bulgaria		13.1	24.3	9.8	Netherlands	30.3	12.9	15.6	10.2
Burk. Faso		17.6	16.9	18.4	Nicaragua		23.1	19.5	27.6
Cameron		17.3	17.9	14.6	Niger		35.5	33.0	26.9
Cape Verde		14.9	14.5	15.0	Norway	27.9	26.0	21.3	22.4
Chile	18.0	15.6	15.5	16.4	Peru		16.3	16.8	15.6
China		43.7	38.6	48.3	Poland	25.2	17.8	28.6	11.7
Colombia		21.0	17.9	23.9	Portugal	32.4	18.2	16.5	18.4
Costa Rica		16.8	16.0	17.7	Qatar		24.8	24.9	23.2
Croatia	20.0	14.1	14.6	14.4	Romania	16.8	15.0	29.1	9.6
Cyprus		26.7	16.8	31.5	Russia		25.9	35.1	15.6
Czech Rep.	27.1	13.6	15.5	11.7	Saudi Arabia		38.7	32.3	41.6
Denmark	28.6	16.1	14.9	16.9	Serbia		20.9	45.2	14.1
Dom. Rep.		6.6	6.6	6.6	Slovakia	22.6	15.3	10.4	12.4
Ecuador		11.4	10.7	12.8	Slovenia	26.0	15.2	20.9	15.4
Egypt		18.9	17.9	21.0	South Africa	36.6	22.8	18.0	23.7
Estonia	23.7	7.2	10.3	7.2	Spain	38.4	16.0	17.1	12.3
Finland	26.1	13.6	12.2	12.0	Sweden	26.8	31.0	26.7	31.6
France	36.2	25.9	24.0	28.7	Switzerland	23.5	11.3	9.4	12.1
Germany	39.7	10.4	11.4	11.0	Tunisia		16.6	14.4	22.0
Greece	30.9	19.3	14.4	25.6	Turkey		7.9	7.8	7.4
Guatemala		7.7	7.5	8.5	UK	29.1	19.5	17.4	18.4
Honduras		23.2	14.9	28.3	Ukraine		30.7	58.4	22.3
Hungary	19.7	11.9	12.8	11.8	USA	40.5	18.3	19.6	17.1
Iceland	22.5	17.9	16.1	22.2	Venezuela		16.7	24.0	17.6
India	35.8	13.8	14.0	13.6	Virgin Isl.		12.6	13.4	11.7
Iran		6.6	7.2	5.5	*Mean high-income*		16.5	16.3	16.2
Ireland	11.5	12.0	14.1	8.9	*Mean upper-middle*		17.5	20.0	16.7
Italy	37.9	18.4	16.9	19.5	*Mean lower-middle*		19.3	21.4	19.0
					Total		17.5	18.5	17.0

Note: Columns 2 and 7 show the average statutory corporate tax rates (CIT) between 1995-2014, Columns 3 and 8 the average effective corporate tax rates (ECTR) between 1995-2014, Columns 4 and 9 the ECTR in the first year where data is available, and Columns 5 and 10 the ECTR in the last year where data is available.

4.2 The impact of ECTR on private investment

Graph 1 shows a scatter plot of the ECTR and FDI inflows and the ECTR and PGFCF. Especially in the case of FDI inflows, the plot shows no clear correlation between the two variables. In the case of PGFCF, the linear adjustment suggests a slight negative relationship (i.e. higher ECTR lead to lower PGFCF); however, the distribution of the observations is quite disperse and does not reveal any clear pattern.

Graph 1: Correlation between ECTR and FDI inflows and PGFCF



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Next, we procced with the econometric exercise discussed above. In line with Graph 1, we do not find any evidence that lower ECTR foster FDI inflows. This finding is robust when no control variables are included in the regression (regression (1)), when one controls for GDP growth, GDP per capita and inflation (regression (2)), and when one additionally considers trade openness, government expenditure and the rule of law (regression (3)). Hence, our results add support to those studies that do not find a robust generalized significant negative effect of the tax burden on inward direct investment (like Buettner & Ruf, 2007; Hansson & Olofsdotter, 2012; Abbas & Klemm, 2013).

The main variables that seem to explain differences in FDI inflows are GDP growth, trade openness and the rule of law. This finding is in line with theory, and previous empirical

evidence, that higher (lower) growth rates influence positively (negatively) the expectations and confidence of firms, that the level of trade openness is important for their direct investment decisions, and that institutions are a key variable to make a country attractive for foreign firms.

Moreover, GDP per capita is weakly significant in regression (3); its negative impact might be explained by higher labor costs and lower capital returns of countries with a relatively high capital stock. In general, it is line with the empiric phenomena that developing countries accounted for a growing share of FDI inflows during the last two decades (UNCTAD, 2018).

Table 3: The impact of effective corporate tax rates on private investment

	FDI inflows (% of GDP)			***PGFCF (% of GDP)***		
	(1)	(2)	(3)	(4)	(5)	(6)
$Investment_{t-1}$	0.091	0.081	0.001	0.934***	0.698***	0.624***
	(0.09)	(0.07)	(0.10)	(0.08)	(0.10)	(0.11)
$ECTR_{t-1}$	0.113	0.074	0.140	-0.122*	-0.041	-0.054
	(0.22)	(0.16)	(0.18)	(0.06)	(0.05)	(0.05)
GDP growth		0.536*	0.469**		0.505***	0.417***
		(0.29)	(0.23)		(0.07)	(0.08)
GDP pc		0.978	-2.254*		-0.582	-1.464*
		(1.56)	(1.26)		(0.38)	(0.86)
Inflation		-0.032	-0.028		0.017	0.015
		(0.07)	(0.06)		(0.02)	(0.02)
Trade Open.			0.050**			0.001
			(0.02)			(0.01)
Gov. Expend.			-0.195			-0.117
			(0.33)			(0.15)
Rule of Law			2.920***			0.994
			(0.97)			(0.87)
No. Obs.	331	328	328	318	315	315
No. countries	72	71	71	70	68	68

Note: Robust standard errors in parenthesis. All regressions include an unreported constant, and the FDI regressions include an unreported dummy to control for the atypically high FDI flows to Luxembourg in the year 2011 (250% of GDP).

The results of the private gross fixed capital formation regressions are similar. While regression (4), shows weak evidence for a negative impact on ECTR on investment, this impact vanishes when the control variables are considered. That is to say, in line with the majority of previous cross-country studies, we do not find a robust significant effect of the corporate tax burden on PGFCF.

In line with the FDI regressions, GDP growth is highly significant to explain private fixed capital formation, whereas GDP per capita is negative and only weakly significant. Moreover, the lag of PGFCF is highly significant and positive, which implies that it is important to consider the persistence of investment spending when studying the drivers of private capital formation. Like the growth rate, this finding most likely is related to the animal spirits of firms.

4.3 Robustness check with other tax measures

To check the robustness of our results, we next corroborate if the main findings change when the widely used EATR and CIT data from Devereux (obtained from the CBT Tax Database*)* is considered instead of the ECTR. Unfortunately, the CBT Tax Database only covers OECD and G20 countries; therefore, this robustness check is limited to 25 countries that are nearly all located in the high-income category (see Appendix for the country list).

In the case of FDI inflows, we find that for the reduced sample size the sign of the ECTR variable becomes negative and significant at the 5%-level (Table 4, regression (1) and (4)). However, the EATR and the CIT measures have a positive sign, and the former is significant. This is to say, that standard tax measures do not reveal any evidence that the tax burden has a negative impact on direct investment inflows, while the contrary is true for our measure in the reduced sample size. The only other explanatory variable that is significant is the lag of FDI inflows (with the expected positive sign).

With regard to capital formation, the reduced sample size allows us to consider corporate gross fixed capital formation (instead of PGFCF). However, in line with the results from Table 3, Table 5 does not show any evidence that a reduction of the corporate tax burden fosters the physical formation of capital. On the contrary, as in the case of FDI inflows, the EATR and CIT have an unexpected positive sign. Hence, again corporate investment rather seems to be related with GDP growth, the persistence of investment, trade openness and the quality of institutions, than with the tax burden.

Table 4: The impact of distinct tax measures on FDI inflows to OECD countries

	(1)	(2)	(3)	(4)	(5)	(6)
FDI_{t-1}	0.427*	0.470**	0.464**	0.403*	0.350	0.393*
	(0.23)	(0.22)	(0.23)	(0.24)	(0.23)	(0.23)
$ECTR_{t-1}$	-0.449**			-0.601**		
	(0.21)			(0.25)		
$EATR_{t-1}$		0.236**			0.253*	
		(0.10)			(0.14)	
CIT_{t-1}			0.163*			0.107
			(0.08)			(0.07)
GDP growth				0.366	0.418	0.424
				(0.37)	(0.33)	(0.35)
GDP pc				5.410	5.671	3.977
				(5.90)	(5.08)	(4.43)
Inflation				0.503	0.544	0.420
				(0.51)	(0.48)	(0.44)
Trade Open.				-0.025	0.053	0.035
				(0.04)	(0.04)	(0.03)
Gov. Expend.				0.079	0.067	-0.046
				(0.58)	(0.56)	(0.50)
Rule of Law				-0.213	-1.731	-0.523
				(3.51)	(3.02)	(2.57)
No. Obs.	134	134	134	134	134	134
No. countries	25	25	25	25	25	25

Table 5: The impact of distinct tax measures on corporate GFKF in OECD countries

	(1)	(2)	(3)	(4)	(5)	(6)
$CGFKF_{t-1}$	0.345*	0.409**	0.323**	0.475***	0.483***	0.495***
	(0.20)	(0.20)	(0.15)	(0.09)	(0.07)	(0.08)
$ECTR_{t-1}$	-0.026			0.030		
	(0.11)			(0.05)		
$EATR_{t-1}$		0.085***			0.097**	
		(0.03)			(0.04)	
CIT_{t-1}			0.116***			0.070**
			(0.03)			(0.03)
GDP growth				0.231**	0.204**	0.205**
				(0.09)	(0.09)	(0.10)
GDP pc				-2.749*	-2.401	-2.440
				(1.44)	(1.64)	(1.58)
Inflation				0.071	0.097	0.078
				(0.14)	(0.13)	(0.13)
Trade Open.				0.009	0.016**	0.015**
				(0.01)	(0.01)	(0.01)
Gov. Expend.				-0.196*	-0.083	-0.140
				(0.11)	(0.11)	(0.12)
Rule of Law				2.548**	1.923*	2.163**
				(1.00)	(1.02)	(0.96)
No. Obs.	135	135	135	135	135	135
No. countries	26	26	26	26	26	26

5. Conclusions

This paper proposes a new backward-looking effective corporate tax measure that relies on national accounts profit and tax payment data of financial and non-financial corporations, and is applicable to a broad sample of developing and developed countries. The proposed measure shows that in most cases effective corporate tax rates are much lower than the statutory ones, that the effective corporate tax burden of countries is quite heterogeneous, and that it had different movements than statutory corporate tax rates. While most countries have substantially reduced their statutory corporate tax rates during the last two decades, the same is not generally visible for the proposed effective tax measure (especially in the case of high-income countries).

With regard to the impact of the tax burden on investment, our dynamic panel models do not show evidence that the effective corporate tax burden was an important determinant for FDI inflows or private gross fixed capital formation across developed and developing countries in the period 1995-2014. We do however find some evidence that lower effective corporate tax rates might attract FDI inflows to OECD countries; but, this finding is not robust when alternative tax measures are used that are standard in the literature.

That is to say, the results suggest that the conventional wisdom that lower corporate taxes foster private investment cannot be generalized across countries; probably because in the recent era of financialisation profits often are used for financial investment, mergers and acquisitions, debt reductions or share buy-backs instead of capital formation. Variables that are better predictors of private investment are economic growth, the persistence of investment spending, trade openness, and the quality of institutions.

This finding is important insofar as the lowering of taxes and the use of tax incentives can imply important costs for countries. Not only in terms of foregone revenue but also in terms of welfare costs through the inefficient allocation of capital. Hence, it seems important to study the potential impacts of corporate tax reforms and tax incentives on a case-by-case basis according to each country's current socio-economic environment.

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Appendix

A. Sample Country list

High Income

Aruba, Austria, Bahrain, Belgium, Chile, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Korea, Kuwait, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Qatar, Saudi Arabia, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, USA, Virgin Islands.

Upper-Middle Income

Argentina, Azerbaijan, Belarus, Brazil, Bulgaria, China, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Iran, Mexico, Peru, Romania, Russia, Serbia, South Africa, Turkey, Venezuela.

Lower-Middle Income

Armenia, Bolivia, Burkina Faso, Cameron, Cape Verde, Egypt, Guatemala, Honduras, India, Ivory Coast, Kyrgyzstan, Mongolia, Morocco, Nicaragua, Nigeria, Tunisia, Ukraine.

Reduced Sample Size

Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovenia, Slovakia, Spain, Switzerland, Sweden, UK, USA.