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An Analysis of the Corporate Income Tax Policy of Less Developed Countries[*]

Paul L. Baker

University of Bath School of Management, BA2 7AY, Bath, United Kingdom

p.l.baker@bath.ac.uk

Abstract

Unlike developed countries, corporate tax rather than personal tax revenues are the greater source of public finance for less developed countries (LDCs). This paper analyses the corporate income tax policy for a large panel of LDCs over the period 1980 – 2006. The analysis shows that although the corporate tax rate has been decreasing in LDCs, corporate tax revenues have been increasing as a percentage of total tax revenues and GDP. Contrary to standard tax competition theory, there is also strong evidence that corporate income taxes in LDCs are increasing in the country's openness as measured by capital mobility. The analysis also shows that the corporate tax rate is increasing in the personal tax rate as income-shifting theory predicts. However this has not translated into increased corporate tax revenues. Of equal interest is the lack of evidence of a relationship between the LDC's government revenue needs and its corporate tax rate.

Keywords: corporate tax rates, corporate tax revenues, less developed countries.

JEL classification: H25, H87

I. Introduction

There is a large literature that analyses the corporate tax policy of developed countries. However, despite the stark contrast in tax structure, relatively little work has been done that is specific to the corporate tax policy of less developed countries (LDCs). In the extensive survey of the empirical tax competition literature by Leibrecht and Hochgatterer (2012), 83% of the papers include only developed countries in their sample and the remaining 17% use a mix of developed and LDCs. Therefore, this paper focuses on the corporate tax policy of LDCs by analysing the trends and determinants of the corporate tax rates and corporate tax revenues of 114 LDCs for a 27 year period.

By definition, the economies of developed countries as compared to that of developing or transitioning economies are different. One should not assume that the corporate tax policy of developed countries necessarily is or even should be the same for LDCs. The tax mix of the respective economies highlights this difference. The ratio[1] of the (averaged) personal tax revenue as a percentage of GDP to the (averaged) corporate tax revenue as a percentage of GDP for OECD countries is approximately 2.3:1. The same ratio[2] calculated for the sample of LDCs examined here is approximately 0.7:1. Relatively speaking, personal tax revenues are more important than corporate tax revenues for developed countries while the reverse holds true for LDCs: corporate tax revenues are more important than personal tax revenues. Furthermore, the corporate tax policy of LDCs has become increasingly topical. With the assumption of the presidency of the G8 by the United Kingdom in 2013, one of the key items it highlighted for its agenda was to advise developing countries on their tax policy so as to assist them in becoming financially self-sufficient, (BBC, 2013). To be able to provide this advice, an important step should be a better understanding of what the corporate tax policy of these countries is. The current empirical corporate tax policy literature does not yet sufficiently provide this understanding. Therefore, this paper extends the literature to LDCs. To gain context, a trend analysis is conducted to develop a series of stylised facts over the corporate tax rates and

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[1] As computed for the year 2010 based on the statistics available online from the OECD iLibrary.
[2] As computed for the year 2010 based on the data available online from the IMF's Government Finance Statistics (2013).

revenues of LDCs. Using regression analysis, the paper then investigates for the domestic and international determinants of the corporate tax rates of LDCs. Finally, the determinants of LDC corporate tax revenues are analysed through a series of regressions. The three analyses are done for a panel data set consisting of only LDCs for the years 1980 through to 2006.

This paper also compares and contrasts the resulting evidence for its sample of LDCs to that which has been previously reported for developed countries. Similar to the developed country evidence (Devereux, Griffith and Klemm, 2002), LDCs are experiencing the predicted decreasing trend in corporate tax rates. However, where a stable trend in corporate tax revenues has been reported for developed countries (Devereux, Griffith and Klemm, 2002) the evidence found here shows that corporate tax revenues have been increasing for LDCs both as a percentage of GDP and total tax revenues. In analysing the determinants this paper also finds – surprisingly - no evidence of a link between the revenue needs of an LDC government and the level of the corporate tax rates that it sets. This is similar to the lack of evidence of this relationship in developed countries (Slemrod[3], 2004). The analysis also finds the expected positive relationship between a country's personal tax rate and corporate tax rate where theory predicts that the latter is used to mitigate the incentive to shift personal income into a corporation. However, the magnitude of the effect for the sample of LDCs studied here is three times that reported for developed countries (Slemrod, 2004). Furthermore, this paper also finds strong evidence that the corporate tax rates of LDCs are increasing in their level of capital mobility. This is in direct contrast to a key prediction of the tax competition theory: capital mobility will put downward pressure on corporate tax rates. The analysis of corporate tax revenues also generates interesting results and highlights areas for future research. While this paper finds strong evidence for the expected positive relationship between the corporate tax rate / corporate profit rate / size of corporate sector determinants and a country's corporate tax revenues, there are issues in fitting the model

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[3] Slemrod (2004) uses an undisclosed number of developed and developing countries for its sample. Based on the number of observations reported and relative data availability of developed versus developing countries the results are expected to be strongly influenced by the developed countries in the sample. For ease of description these results are simply referred to as being for developed countries as opposed to a mixed sample.

to a sample of LDCs. In particular, there is a need to model and better control for the revenue mobilisation of LDCs. For all three of the analyses, further results are discussed in detail in the respective sections of the paper.

The paper proceeds as follows: Section 2 provides background material and an overview of the literature (theoretical and empirical). Section 3 outlines the data used for the three analyses conducted. In Section 4, a trend analysis is used to establish stylised facts over the corporate tax rates and revenues of LDCs. Section 5 and Section 6 investigate for the determinants of LDC corporate tax rates and revenues respectively. Section 7 concludes and highlights areas for future research.

II. Literature Overview

A brief overview of the literature is presented here for background and context. Four papers are also highlighted. Three papers - Devereux, Griffith and Klemm (2002), Slemrod (2004) and Clausing (2007) - serve as both motivation for the analyses as well as useful developed country benchmarks by which to compare and contrast the results from this paper's study of the corporate tax rates and revenues of LDCs. The fourth paper, Abbas and Klemm (2013), is the only other empirical analysis (to the best of my knowledge and at the time of writing this paper) that specifically analyses corporate tax in developing countries.

Standard tax competition theory[4] shows that with capital mobility "…each country will find it optimal to set its corporate tax rate to zero." (Gordon, 1986, pg.1095). Intuitively, as countries compete with each other to retain and attract investment, the prediction is of a 'race to the bottom' in corporate tax rates. Despite this strong theoretical result as well as the observed and empirical evidence of their decrease over time, substantial positive corporate tax rates are still the norm. Recognising this, a related literature models mechanisms that can counter and even offset the downward pressure on corporate income tax rates (e.g. Gordon, Mackie-Mason and Hubbard, 1995; Haufler and Wooten, 1999; Baldwin and Krugman, 2004).

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[4] See Fuest, Huber and Mintz (2005) and Wilson (1999) for surveys of the tax competition theory literature.

The tax competition theory literature generates a number of strong and testable predictions. Accordingly, there is a significant empirical tax competition literature. Leibrecht and Hochgatterer (2012) survey this literature and conclude that the empirical evidence supports the theory that international tax competition causes the observed decline in corporate tax rates[5]. Related empirical work tests for the effect of the counter-mechanisms to the downward pressure on corporate tax rates and generally supports the theory, (e.g. Gordon and Slemrod, 1998; Brülhart, Jametti and Schmidheiny, 2012). Evident from a review of the empirical literature is that it is largely focused on testing for the international determinants of corporate tax rates. This is as expected given that the theoretical tax competition literature is inherently international or at least cross-jurisdictional in perspective.

Recognising that the previous empirical tax literature is largely focussed on international / competitive mechanism(s) in explaining the observed decrease in cross-country corporate tax rates, Slemrod (2004) adds to the literature by also examining domestic determinants that contribute to the change in corporate tax rates over time. The argument is that, instead of or in addition to the international downward pressure on corporate tax rates, common trends in domestic characteristics may (also) be driving their decline. To analyse this Slemrod (2004) develops a theoretically informed empirical specification to test for both the international and domestic determinants of corporate tax rates. This is done for a data set of an undisclosed number of developed and developing countries for a panel made up of the years 1980, 1985, 1990 and 1995. It is this paper that is used as the departure and comparison point for the analysis of the domestic and international determinants of corporate tax rate policy in LDCs (Section 5).

A review of the empirical tax literature also shows that it largely revolves around the determination and effect of corporate tax rates. There is much less work on corporate tax revenues. Where the literature does directly investigate revenues the focus tends to be on either a trend analysis (e.g. Devereux, Griffith and Klemm, 2002) or the relationship between corporate tax rates, foreign direct investment and corporate

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[5] However, the authors suggest further research needs to be undertaken in order to produce a more convincing identification of tax competition being the cause of declining corporate tax rates as opposed to the alternative explanations of yardstick competition or common intellectual trends.

tax revenues (e.g. Gropp and Kostial, 2000). Recognising that tax rates are only one determinant of tax revenues, Clausing (2007) investigates the determinants of a country's corporate tax revenues. It does this by decomposing corporate tax revenue into its individual components – corporate tax rate, tax base, profit rate and amount of corporate activity – and testing the model for a panel of OECD countries over the years 1979 – 2002. In section 6, a version of the Clausing (2007) model is used to analyse the corporate tax revenues of LDCs.

To explain the corporate tax policy of competing developed countries with respect to attracting and retaining foreign investment, Devereux, Griffith and Klemm (2002) use a trend analysis of tax reforms to develop a series of stylised facts. They then compare and contrast these stylised facts to the tax competition theory literature to explain the observed trends. As their paper is centred on international tax competition toward attracting capital, it analyses trends in the statutory corporate tax rate, tax base, as well as the effective marginal and average corporate tax rates. They analyse data for 16 OECD countries over the period 1982 to 2001.The authors also analyse the trend in corporate tax revenues for 17 OECD countries over the period 1965 to 1999. The results from this paper are used as the developed country benchmark against which to compare the evidence found here for LDCs (Section 4).

A final observation from a review of the empirical tax literature is the small amount of work that has been done with respect to corporate income taxes in LDCs. Of the 30 papers surveyed by Leibrecht and Hochgatterer (2012), 25 of them include only developed countries in their datasets. An additional 4 of the papers use datasets of European countries, of which almost all of the included countries are developed. The remaining paper is Slemrod (2004) which uses a mixed sample of developed and developing countries. The exception to this observation is the recent Abbas and Klemm (2013) paper which investigates corporate income tax systems and their effect on corporate tax revenues and investment for a sample of emerging and developing economies. Analysing a panel of 50 LDCs over the period 1996 – 2007, the authors find that increasing corporate tax rates have a positive effect on revenues and a negative effect on investment (domestic and foreign). To further contribute to the literature I undertake a broader scope of analysis – than

considered in Abbas and Klemm (2013) - of the tax policy of less developed countries including: an analysis of the determinants of the corporate tax rate; additional determinants of corporate tax revenues; and a sample that includes a larger number of countries and years.

III. Data

In this paper, a less developed country is characterised as any economy that is clearly not a developed country. Therefore, LDCs include both developing and transitioning economies. Beginning with the list of countries contained within the World Tax Database, any country that is a member of the OECD as of 2013[6] is then removed. All countries that are listed as having tax haven status (Gravelle, 2013) are further excluded[7]. This leaves 114 countries as the sample of LDCs. The countries are listed in the Data Appendix. The data collected for these countries covers the years 1980 through to 2006[8]. The analysis has been cut-off as at 2006 so as to not let the subsequent financial crisis confound the results. Full details of the data, the sources it has been collected from and summary statistics (Table A1) are found in the Data Appendix.

The statutory corporate tax rate is one of the two key components to a country's corporate tax policy with the other being the tax base. Although it is insufficient in and of itself toward a complete description of a country's tax policy, the statutory tax rate is the more visible of the two components[9]. Therefore, the analysis of the corporate tax rate in this paper is of its measure as the central government statutory corporate tax rate. There are of course alternative measures, in particular the effective average and marginal tax rates. Such measures are well suited to analysing specific investment decisions of firms. See

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[6] Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

[7] There is no universally accepted definition of a tax haven. In addition to a low to zero tax rate, a narrow definition also includes the characterisation of bank secrecy and a lack of transparency (Gravelle 2013) which are outside the scope of this analysis.

[8] Due to the inconsistency in missing data across variables, countries and time, the actual number of available observations varies as a function of the regression specification.

[9] It is also the relevant metric with respect to the incentive for profit shifting by multinational enterprises.

Figure 1. Statutory Corporate Income Tax Rates (%)
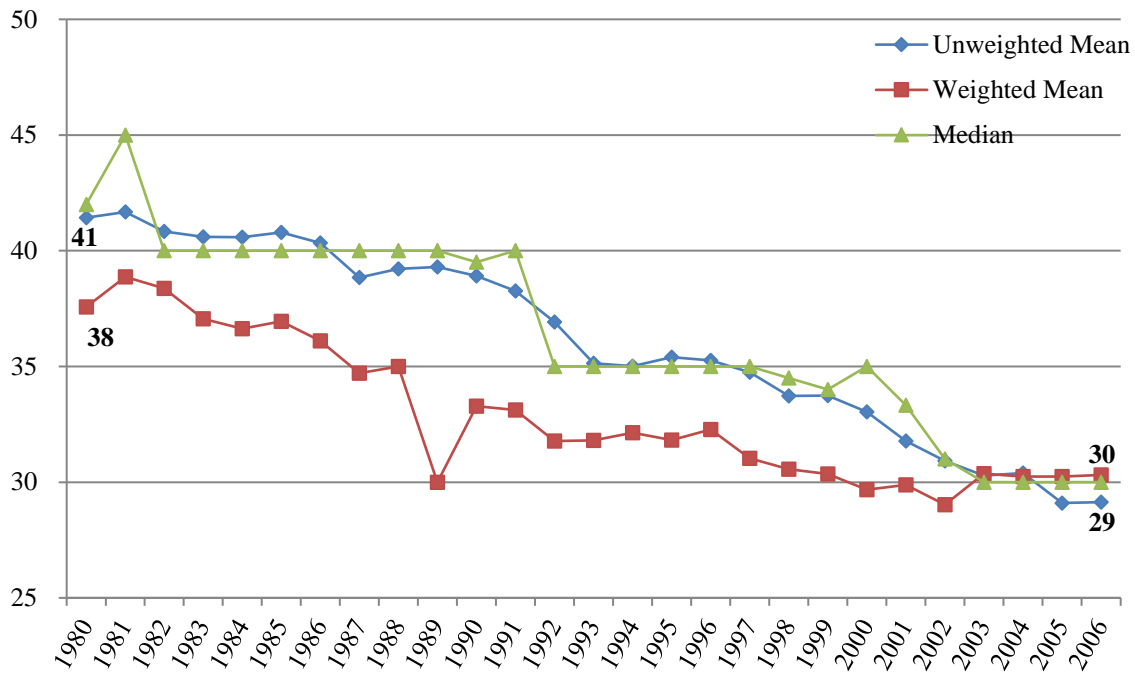
Notes: 1. Highest marginal corporate tax rate at the level of the Central Government. 2. Weighted Mean is averaged by GDP in constant 2000 USD. 3. The average number of countries by year is 65. Data availability fluctuates by country and by year. Missing values appear to be random.

Devereux, Griffith and Klemm, (2002) for an overview of alternative measures and their particular decision-relevance. However, effective measures require data on the tax base of countries. Such data is not presently widely available across LDCs for the years being considered here[10]. Furthermore, the Abbas and Klemm (2013) paper controls for the countries' tax base however, due to its lack of variation across time the tax base variable is never statistically significant and the point estimate is near zero.

IV. Trend Analysis of Corporate Tax Rates and Corporate Tax Revenues

Figure 1 reports the time series analysis of the mean (unweighted and weighted by GDP) and the median tax rates. The decrease in the tax rates is relatively constant over the time period. The weighted mean falls

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[10] Abbas and Klemm (2013) incorporate a measure of the tax base to compute effective tax rates for their sample. A similar approach here, based on the available data, would cause the sample to lose more than 60% of its observations.

Figure 2. Corporate Income Tax Revenue as a % of Total Tax Revenue
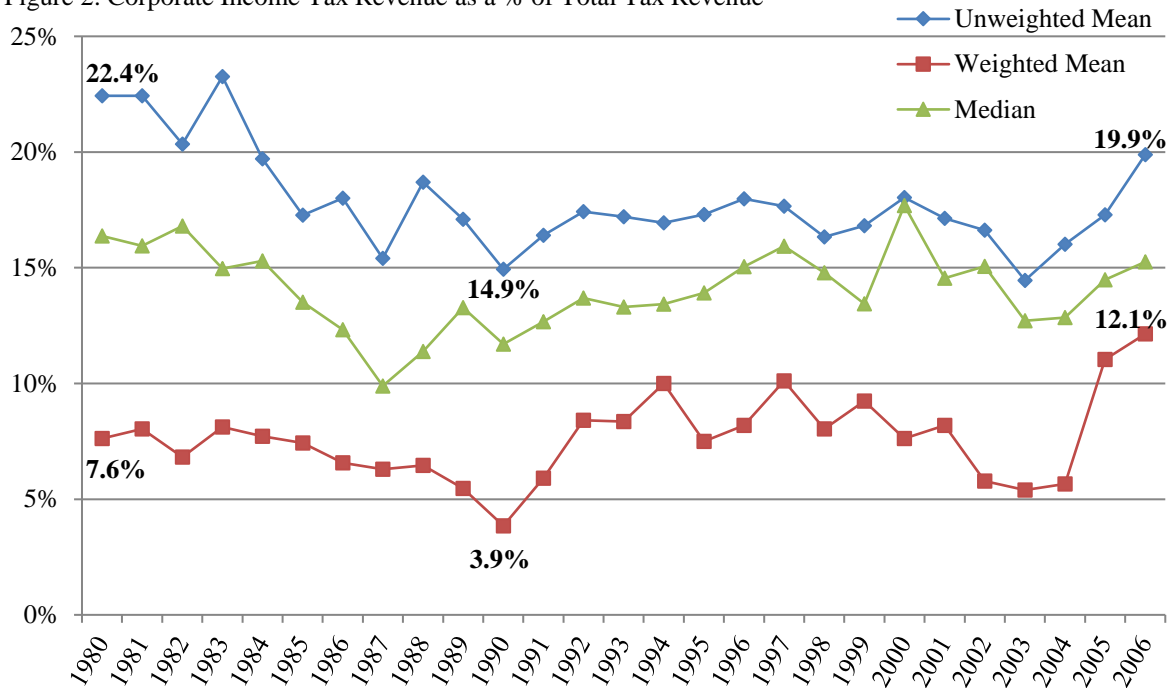
Notes: 1.Weighted Mean is averaged by GDP in constant 2000 USD. 2.The average number of countries by year is 30. Data availability for corporate tax and total tax revenues fluctuates by country and by year. Missing values appear to be random.

from 38% in 1980 to 30% in 2006. This trend in tax rates is the first stylised fact: *The statutory corporate tax rate for LDCs decreased over the period 1980 to 2006.*

The unweighted mean fell from 41% to 29% over the same period, indicating that smaller countries (as measured by GDP) have higher corporate tax rates and experienced a larger drop. A similar trend has been reported for developed countries where the unweighted mean fell from 48% in 1982 to 35% in 2001 (Devereux, Griffith and Klemm, 2002). However, other than the decreasing trend, the tax rates are not directly comparable as the Devereux, Griffith and Klemm (2002) analysis also includes local taxes and other charges in their measure.

The trend in corporate tax rates is not necessarily indicative of the trend in corporate tax revenues. In addition to the corporate tax rate, corporate tax revenues are a function of the tax base, the amount of corporate activity as well as its profitability. Clearly, what is also of interest to policymakers with respect to public finance is the amount of corporate tax revenues that the government receives.

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Figure 3. Corporate Income Tax Revenue as a % of GDP

Notes: 1.Weighted Mean is averaged by GDP in constant 2000 USD. 2.The average number of countries by year is 34. Data availability fluctuates by country and by year. Missing values appear to be random.
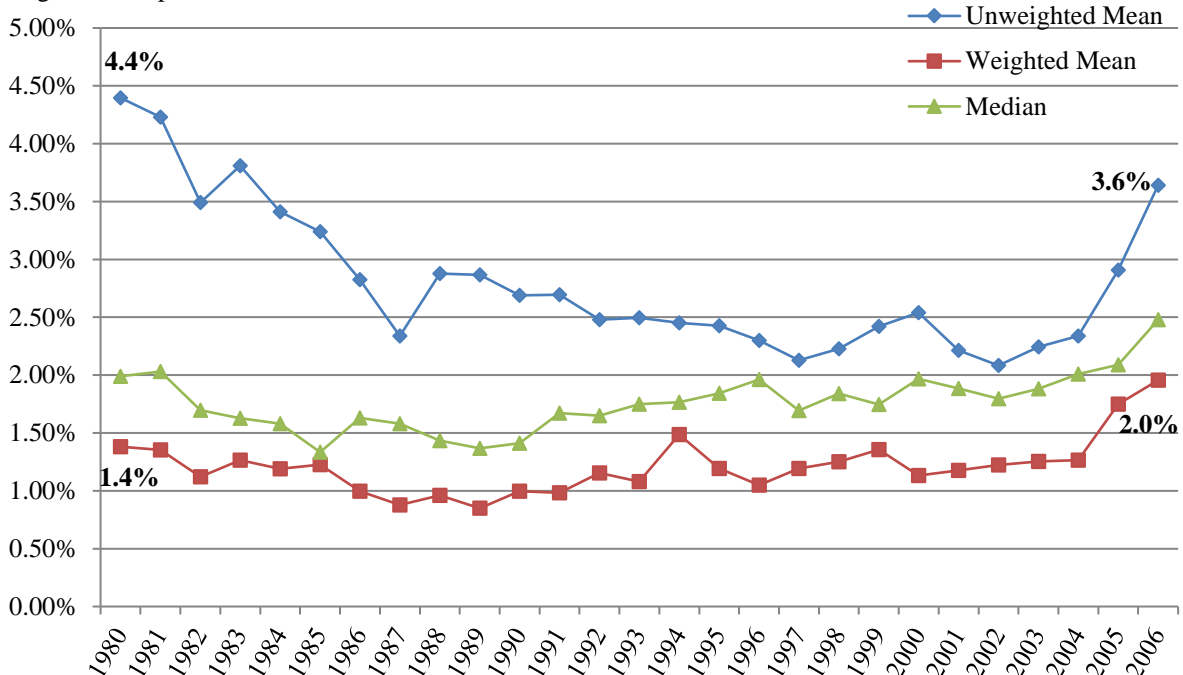
Figure 2 reports the trend analysis of corporate tax revenues as a percentage of total tax revenues. In addition to corporate and personal taxes on income, profits and capital gains, total tax revenue also includes payroll taxes, property taxes, goods and services taxes and taxes on other international trade and transactions. In contrast to the downward trend in corporate tax rates, the weighted mean broadly shows an upward trend in corporate tax revenues as a proportion of total tax revenues. In 1980, corporate tax revenues accounted for 7.6% of total tax revenue, which increased to 12.1% by 2006. This trend is summarised as the second stylised fact: *Corporate tax revenues for LDCs increased as a percentage of total tax revenue over the period 1980 to 2006.*

The unweighted mean indicates that there is again variation in LDC experience as a function of the size of the country. This trend shows that corporate tax revenues are even more important for smaller countries. Although the unweighted mean trend line consistently tracks that of the weighted mean, the unweighted mean trend line is also consistently well above that of the weighted mean trend line. However,

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the gap begins to close over the period. The proportion of corporate tax to total tax revenue is at its highest at the beginning of this period, 22.4% in 1980. The proportion then decreases to approximately 15% in 1990 before beginning to recover and end the period at 19.9% in 2006. As compared to the weighted mean trend line there is an almost 3:1 ratio in the respective proportions in 1980, which increases to approximately 3.9:1 by 1990, before significantly decreasing to 1.6:1 by 2006.

In contrast to LDCs, developed countries have experienced a decline in corporate tax revenues as a proportion of total tax revenues (Devereux, Griffith and Klemm, 2002): the weighted mean was approximately 10% in 1980 which then decreased to 8.5% in 1999 (the last year of the Devereux, Griffith and Klemm (2002) trend analysis of corporate tax revenues). Over the same period the weighted mean for LDCs has increased from 7.6% in 1980 to 9.2% in 1999.

Figure 3 also analyses the trend in corporate tax revenues where it is now scaled by GDP. This analysis has a similar story to that of corporate tax revenues when scaled by total tax revenues. The weighted mean trend line begins the period at 1.4 percentage points before increasing by approximately 40% to 2 percentage points in 2006. This trend results in a third stylised fact: *Corporate tax revenues for LDCs increased as a percentage of GDP over the period 1980 to 2006.*

The unweighted mean again shows that corporate tax revenues are of greater importance to smaller countries. While the unweighted mean broadly follows the same trend as the weighted mean, the magnitudes are greater and the changes in trend much more pronounced. The unweighted mean is at 4.4% in 1980 before hitting its low of approximately 2% in 1997. It then begins to recover and returns to 3.6% in 2006. In contrast, the weighted mean begins at 1.4% in 1980 and then falls to its low of 0.9% in 1987. It then reverses trend and recovers to end the period at its high of 2% in 2006. Therefore, smaller countries faced a greater decrease as well as a slower and delayed recovery in their corporate tax revenues as a percentage of GDP.

To again contrast this with the developed country experience, the ratio of corporate tax revenues to GDP for developed countries has remained broadly stable, (Devereux, Griffith and Klemm, 2002).

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Devereux, Griffith and Klemm (2002) report the weighted mean of corporate tax revenues to GDP as 3.3% in both 1980 and 1999 (Figure 12, pg. 471).

To conclude this section, the trend analysis shows that although LDCs have experienced a downward trend in their statutory corporate tax rates, they have also seen an increase in their corporate tax revenues both as a percentage of total tax revenues and GDP. Importantly, the interpretation of an increasing trend in corporate tax revenues is largely driven by the observations in the early 2000s. This is consistent with a surge in corporate profits in that same period (Abbas and Klemm, 2013). Additional insight is available from the sample data. Between the 1990s and 2000s the mean relative size of the corporate sector to the economy was essentially constant as both grew at the same cumulative average annual growth rates (3.6% in the 1990s; 6.7% for the corporate sector and 6.8% for GDP in the 2000s). However, the mean relative size of corporate profits to GDP increased by more than a quarter from 37% in the 1990s to 47% in the 2000s. This increase was more than enough to compensate corporate tax revenues for the drop in corporate tax rates. To illustrate for a $100 marginal increase in GDP: with a mean corporate tax rate in 1990 of 33% and a mean ratio of corporate profit to GDP at 31%, the average LDC earned $9.90 in corporate tax revenue. By the year 2006 the mean corporate tax rate decreased to 30% against a mean corporate profit to GDP ratio of 49%. The average LDC therefore earned $14.70 in corporate tax revenues for a $100 increase in GDP. However, based on the data one cannot tell how much of the increase in corporate profits was a function of a true increase in operating profitability or merely a function of profit-shifting into LDCs to take advantage of the lower corporate tax rates.

This trend analysis provides an important first step in the understanding of the corporate tax policy of LDCs. It allows for the observation of how the two key outcome variables – corporate tax rates and revenues – have been changing over time. However, it does not provide insight into the respective underlying determinants and components which are therefore, analysed over the next two sections.

V. Determinants of the Corporate Tax Rate in Less Developed Countries

Empirical Model

As discussed in section 3 this paper uses a country's central government statutory corporate tax rate ($CTRate_{it}$)[11] as its summary measure of the tax system and investigates for domestic and international determinants (Slemrod 2004) to explain it:

$$CTRate_{it} = \beta_0 + \beta_1 \, PTRate_{it} + \beta_2 \, Govt \, Expend_{it} + \beta_4 \, Telephone_{it} + \beta_5 \, Nat \, Res_{it} + \beta_6 \, Cap \, Mobil_{it}$$
$$+ \beta_7 \, Trade \, Vol_{it} + \beta_7 \, Population_{it} + \beta_8 \, Urban_{it} + \varepsilon_{it}$$

Both the Gordon, Mackie-Mason and Hubbard (1995) and Gordon and Slemrod (1998) papers investigate the idea that where a country's corporate tax rate is less than its personal tax rate, as that country's personal tax rate increases, so does the incentive to shift that income into a corporate entity. The incentive is complicated by whether or not the country uses an integrated system of tax and relatedly the value of the tax deferral to the taxpayer. However, ceteris paribus, the government's policy response to mitigate this income shifting is to increase the corporate tax rate. It is in this sense that the corporate tax rate serves as a backstop to the personal tax rate. The empirical implication is of a positive relationship between a country's corporate and personal tax rates. This is tested by including a covariate for the country's top marginal (central government only) personal income tax rate ($PTRate_{it}$).

A folk theorem among tax policymakers makes the point that as any given tax has its weakness and the marginal social cost of that weakness is increasing in the relative reliance of a government on that tax, it is better to use a variety of taxes to meet government revenue needs, (Slemrod, 2004). The immediate empirical expectation is that the corporate tax rate will be increasing in the government expenditure to GDP ratio ($Govt \, Expend_{it}$).

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[11] In addition to this dependent variable, Slemrod (2004) also uses the ratio of corporate tax revenues to GDP as a measure of a country's average corporate tax rate for a second dependent variable to which it applies the same model. Aside from the definitional concern that the base of this second measure is not corporate profits, this measure is alternatively used in studies that seek to explain corporate tax revenues, (as discussed in Section 6).

As business operating costs are expected to be decreasing in the level of a country's infrastructure, the argument is often made that the cost of providing that infrastructure should at least in part be passed on to business. Aside from user fees, which may be administratively costly to implement and collect, an obvious alternative is to recoup the cost of infrastructure via the corporate tax rate. In this sense, a portion of corporate taxes collected may be better thought of as a fee rather than a tax. To test for the expected positive relationship, a conventional proxy for the level of a country's infrastructure is included (*Telephone$_{it}$*): the number of telephone mainlines per 100 people, (see Egger, Pfaffermayr and Winner 2006).

Recognising that taxing economic rents should not distort investment decision-making at the margin, Slemrod (2004) includes the value of oil and natural gas reserves per capita as a covariate. The measure is intended to capture the level of extractive industry that a country has and can therefore tax as the extraction of natural resources is expected to include a significant amount of economic rent. To test for this, a covariate is used here that should more broadly measure the level of natural resources that a country has: ores, metals and fuel exports as a percentage of total merchandise exports (Ross, 2004), (*Nat Res$_{it}$*).

The empirical tax competition literature is driven by the theory that the more open a country's markets are, the greater the downward pressure on its corporate tax rates there will be. To test for this the ratio of the value of exports and imports to GDP[12] as a trade volume measure of the openness of the economy is used (*Trade Vol$_{it}$*). For a second measure, a composite index is included in the model that, among other items, measures the extent of capital controls, international capital market controls, and foreign ownership/investment restrictions that a country has in place, (Gwartney, Hall and Lawson, 2010). The index is increasing in the openness of a country's capital markets and therefore a negative relationship is expected between it and the country's corporate tax rate (*Cap Mobil$_{it}$*).

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[12] This is the same measure as used in the Slemrod (2004) model. Slemrod (2004) also includes the Sachs and Warner (1995) index of trade policy openness as an additional variable of interest.

The larger the size of a country's market, the more attractive it will be to foreign investors. Government can take advantage of market size desirability through increased corporate tax rates (Haufler and Wooten, 1999) and therefore, a covariate for the size of a country's population is included (*Population$_{it}$*).

The standard tax competition literature predicts an inverse relationship between capital mobility and corporate tax rates, a 'race to the bottom'. However, as shown in Baldwin and Krugman (2004) and recently empirically tested by Brülhart, Jametti and Schmidheiny (2012), agglomeration rents can counteract and even reverse this prediction as policymakers seek to take advantage of these rents through increased corporate tax rates. To test for this, a widely available conventional measure of cross-country agglomeration is used (e.g. see Brülhart and Sbergami, 2009) being the percentage of a country's total population living in urban agglomeration (*Urban$_{it}$*). Baldwin and Krugman (2004) also characterise the shape of agglomeration rents as a function of the country's trade costs, "agglomeration forces are strongest for intermediate trade costs, i.e. when trade costs are low enough to make agglomeration possible yet high enough to make it worthwhile", (Baldwin and Krugman, 2004, pg. 22). Accordingly, as an additional test, the model is supplemented with interaction terms between the measure of agglomeration and each of the two measures of a country's openness.

Empirical Analysis and Results

Table 1 reports the estimates from both the domestic (column (1)) and international specifications (columns (2) to (4)). The *F* Test and Breusch-Pagan LM Test strongly reject pooled OLS estimation in favour of fixed and random effects respectively. The Hausman and Robust Hausman tests strongly reject the null hypotheses of random individual effects. Therefore, the model is estimated using fixed effects. In all cases, time indicator variables are included (which are consistently jointly significant at the 5% level or less) and heteroskedasticity and cluster (by country) robust standard errors are used. The included table is the preferred level-level specification of the model. A log-level specification was investigated however, while it did not qualitatively change the conclusions of the analysis it significantly reduced the fit of the model

Table 1

Regressions to analyse the determinants of the Statutory Corporate Tax Rate of Less Developed Countries

Dependent Variable: CTRate

	Sign	Within Estimator			
		(1)	(2)	(3)	(4)
PTRate	+	0.192 ***	0.286 ***	0.335 ***	0.332 ***
		(0.063)	(0.058)	(0.059)	(0.063)
Govt Expend	+	0.080	-0.130	-0.110	-0.083
		(0.085)	(0.120)	(0.104)	(0.106)
Telephone	+	0.311 ***	0.249 **	0.235 **	0.233 **
		(0.109)	(0.113)	(0.108)	(0.110)
Nat Res	+	-0.003	-0.013	-0.026	-0.042
		(0.042)	(0.041)	(0.047)	(0.055)
Cap Mobil[‡]	-		0.871	1.393 **	1.371 ***
			(0.711)	(0.524)	(0.466)
Trade Vol	-		0.011	0.007	0.006
			(0.033)	(0.033)	(0.033)
Population ('00'000's)	+		-0.004 ***	-0.004 ***	-0.004 **
			(0.001)	(0.002)	(0.002)
Urban	+		0.329	0.260	0.239
			(0.259)	(0.229)	(0.225)
Constant		30.300 ***	14.399 ***	12.182 **	13.294 **
		(2.921)	(6.611)	(5.776)	(5.433)
Time Indicators		Yes	Yes	Yes	Yes
Country Fixed Effects		Yes	Yes	Yes	Yes
N		1022	713	667	641
R^2		0.37	0.44	0.44	0.43

Standard errors appear in parantheses. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Heteroskedasticity and cluster (by country) robust s.e.'s are used. Time indicators are jointly significant at the 5% level or less. The Hausman and Robust Hausman tests strongly reject the Random Effects model. 'Sign' indicates the theoretically-predicted sign of the determinant. ‡: Capital Mobility is measured at time 't' for column (2), time 't-2' for column (3) and time 't-3' for column (4).

and had the odd effect of varying the joint significance of the time indicators across the specifications. The

model specification was also investigated for nonlinearities in the covariates, which again either had no

qualitative effect or resulted in a poor fit of the model.

There is strong evidence in favour of the theory that the corporate tax rate acts as a backstop to the

personal tax rate. Across specifications, the coefficient on the personal tax rate covariate is positive and

statistically significant at conventional levels. The international covariates appear to be important in

mitigating omitted variable bias. Their inclusion has a significant effect on the magnitude of the point

estimate as compared to the domestic specification.

The results also include strong evidence of the corporate tax rate's role in recovering costs from business with respect to the country's provision of infrastructure. The evidence is of a consistently statistically significant positive effect across the estimates, although again the inclusion of the international determinants has a material effect on the point estimate.

With respect to the openness of countries and the related downward pressure that theory predicts this will have on a country's corporate tax rate, not only is the trade volume measure never statistically significant across any of the estimations, but the point estimate is also consistently close to zero. Furthermore, while the contemporaneous measure of capital mobility (column (2)) is also not statistically significant, the model is adjusted to follow Swank and Steinmo (2002) who investigate lagged values of their measure of capital openness due to a concern of identification. Any correlation between contemporaneous measures of changes in capital market openness and tax rates cannot be distinguished between the former causing the latter versus a single larger policy reform package that puts in place both changes simultaneously. Therefore, in regressions (3) and (4) the lagged value – by two and three years respectively - of the capital market openness index measure is used. Interestingly, this produces highly statistically significant evidence of a practically significant positive effect of capital market openness on the corporate tax rate. This is in direct contradiction to the theory and can be interpreted as greater capital mobility increasing the attractiveness of an LDC to investment which its government can use to support a higher corporate tax rate.

Also in contradiction to the theory that larger countries can capitalise on the size of their market through higher corporate tax rates is the highly statistically significant estimate of a negative effect of the size of the country (as measured by its population[13]) on the corporate tax rate. However, the magnitude of the effect is small.

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[13] The result is robust to using GDP as an alternative measure of the size of a country. The estimated marginal effect is -0.001 (p-value < 0.000) for every \$100,000,000 in GDP. A further specification to investigate for GDP per capita found that it does not have a statistically nor economically significant effect on the corporate tax rate. Results available by request to the author.

Of equal interest to the above is what the estimations do *not* find evidence of: a (positive) relationship between the government expenditure to GDP ratio and the corporate tax rate. This lack of evidence is also robust to the inclusion of controls for alternative sources of public finance: public debt and foreign aid scaled by GDP (results available by request). Furthermore, there is no evidence that the LDCs are taking advantage of taxing potential economic rents in either form of natural resource profits or agglomeration rents. In results not reported here (available by request), no evidence can be found of an agglomeration effect even when interacting it with capital mobility or trade volume.

To summarise the findings for LDCs the resulting evidence is now compared against that reported in Slemrod (2004) which serves as the developed country benchmark. Although both analyses find significant evidence of the expected positive relationship between the personal tax rate and the corporate tax rate, the effect for the sample of LDCs is significantly higher. A 1 point increase in the personal tax rate is correlated with a 0.3 point increase in the corporate tax rate as compared to an approximately 0.1 point increase in the comparable Slemrod (2004) specifications. Furthermore, where Slemrod (2004) interprets this estimate as evidence of the theory of the corporate tax rate acting as a backstop to the personal tax rate, caution should be exercised in assuming the same interpretation for a sample of LDCs. The observed reliance of LDCs on corporate taxes rather than personal taxes is typically attributed to corporations being easier to tax. The prominence of the underground economy in LDCs makes it more difficult to capture and tax personal incomes. Therefore, instead of the increase in the corporate tax rate serving to mitigate the shifting of personal income into corporate income in response to an increase in the personal tax rate, the increase in the corporate tax rate could be serving to compensate for the shifting of personal income to the underground economy in response to an increase in the personal tax rate.

Similar to Slemrod (2004) there is strong evidence that the cost of infrastructure is passed along to corporations in LDCs. However, the magnitude of the respective estimates are not directly comparable due

to the use of different measures of infrastructure[14]. Furthermore, there is also no evidence of a statistically significant relationship between the contemporaneous measure of capital mobility and the corporate tax rate. However, once this variable is lagged[15] there is strong evidence of a significant positive effect of capital mobility on the corporate tax rates of LDCs: a 1 unit increase in the index (from 1 to 10) of capital mobility is associated with an approximately 1.4 point increase in the corporate tax rate. This is in direct contradiction to the theory which predicts a negative relationship, as well as the estimated negative coefficients that Swank and Steinmo (2002) report for a sample of developed countries. With respect to the size of the country, the evidence for LDCs is of a statistically significant negative effect. Although this contradicts the theory, the magnitude of the estimate - an increase of 100,000 people is associated with a decrease in the corporate tax rate of 4/1000[ths] of a point - is small enough as to be practically insignificant. This is effectively consistent with Slemrod (2004) which does not find any evidence of the size of the country having an effect on the corporate tax rate.

Surprisingly and similar to that reported in Slemrod (2004), there is no evidence that an LDC's government revenue needs drive the corporate tax rate that it sets. Both analyses also do not find evidence of the expected positive relationship between economic profits and the level of the corporate tax rate. In extending this concept to agglomeration rents, there is also no evidence that LDC governments are responding to such rents via the corporate tax rate.

VI. Components of the Corporate Tax Revenues of Less Developed Countries
Empirical Model

The Clausing (2007) model is used to analyse the determinants of corporate tax revenues of LDCs. The model decomposes the impact that a change in the corporate tax rate will have on corporate tax revenues into its direct and indirect effects. The direct effect is clear. Ceteris paribus, a change in the corporate tax rate will have a corresponding effect on revenues. Three indirect effects capture the responses that firms

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[14] Slemrod (2004) uses per capita electricity usage. Due to data availability the telephone mainlines measure is used here.
[15] Slemrod (2004) does not investigate for lagged values of the country's capital mobility.

can have to changes in the corporate tax rate through the shifting of activity and / or income. The original

Clausing (2007) model analyses the ratio of corporate tax revenues to GDP to accommodate useful cross-

country comparisons and coefficient interpretation. This is the same ratio that is also often used in the

empirical tax literature as a measure of a country's average corporate tax rate (e.g. Slemrod, 2004). To

avoid confusion and clearly separate ideas, the model as implemented here instead works with the natural

log of corporate tax revenues. This specification equally allows for meaningful coefficient interpretations

in the form of (semi-) elasticities. This necessitates one change to the original Clausing (2007) model as

noted below.

Corporate tax revenues can be decomposed as follows (Clausing 2007, pg. 119):

$$Corporate\ Tax\ Revenue^{16} = T\ x\ f\ x\ \Pi\ x\ CS$$

where,

$$T = \frac{Taxes\ Due}{Tax\ Base}; \qquad f = \frac{Tax\ Base}{Corporate\ Profits}$$

$$\Pi = \frac{Corporate\ Profits}{Corporate\ Value\ Added}; \qquad CS^{16} = Corporate\ Value\ Added$$

Taking the derivative with respect to the corporate tax rate, the impact of a change in the corporate tax rate

on corporate tax revenues is decomposed into its direct and three indirect effects (Clausing 2007, pg. 119):

$$\frac{\partial Revenue}{\partial T} = f * \Pi * CS + T * \frac{\partial f}{\partial T} * \Pi * CS + T * f * \frac{\partial \Pi}{\partial T} * CS + T * f * \Pi * \frac{\partial CS}{\partial T}$$

The direct effect (first term) captures the change in corporate tax revenues to a change in the corporate tax

rate. A positive relationship is expected here. The second term captures an indirect effect. "f" represents

the ratio of taxable income to corporate reported income where the differences between the two are a

function of tax allowances, deductible expenses, and other adjustments in converting reported earnings into

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[16] Clausing (2007) scales Corporate Tax Revenue and Corporate Value Added by GDP

taxable earnings. Firms can respond to changes in the tax rate by shifting and/or re-characterising activity to that which enjoys preferential tax treatment, e.g. faster asset write-offs, cash refundable tax credits, etc. Proceeding to the second indirect effect, "Π" represents the rate of reported profits that firms earn relative to the amount of corporate activity they undertake, (i.e. the size of the corporate sector). Multinational firms have the ability to respond to changes in the tax rate by shifting reported profits outside of the country via intercompany transfer pricing. "CS" is the size of a country's corporate sector. Changes in a country's corporate tax rate can incentivise the re-characterisation of income between corporate and personal. Furthermore, such changes can prompt real responses from firms. An increased tax rate may reduce the level of activity that corporations undertake as some projects are no longer viable. Firms may also choose to shift activity out of the country to a lower tax jurisdiction. For all three indirect effects, a negative relationship is expected. Therefore, the net effect of a change in the tax rate on revenues is ambiguous. However, it is not expected that the inclusion of the tax rate variable will be able capture these subtleties when estimating the model (Clausing, 2007).

To take the LDC data to the model, the following base specification is estimated:

$$lnCtRevenue_{it} = \beta_0 + \beta_1 lnCtRate_{it} + \beta_2 lnProfitRate_{it} + \beta_3 lnCorpSect_{it} + \varepsilon_{it}$$

The same (central government only) statutory corporate tax rates analysed in section 5 are used here as the measure for the corporate tax rate covariate (*CtRate_{it}*). The profit rate (*ProfitRate_{it}*) is measured as the ratio of the corporate operating surplus to corporate gross value added with the latter also serving as the measure of the size of the corporate sector (Clausing, 2007). These measures are not perfect analogies to what needs to be captured here, however, they are widely available and should serve as reasonable proxies. As noted in section 3 and consistent with Clausing (2007) insufficient data prevents the inclusion of a measure for the tax base ("f"). This omission continues to be less of a concern than it first appears. As previously discussed, Abbas and Klemm (2013) include a measure to control for the tax base, however, due to its lack of variation across time it is never statistically significant and the point estimate is near zero.

The basic Clausing (2007) model[17] is further extended to investigate a number of additional hypotheses which are tested here for LDCs. Following Gordon, Mackie-Mason and Hubbard (1995) and Gordon and Slemrod (1998), a covariate is included for the difference between a country's personal and corporate tax rate to measure the effect that this expected income shifting incentive has on corporate tax revenue (*(PTR – CTR)ᵢₜ*). Further included is an interaction term between the capital mobility index and the corporate tax rate to test the effect that tax rates have on a country's revenues as a function of the level of openness of the economy (*(CapMobil x CtRate)ᵢₜ*). Tax competition theory shows that larger countries should be able to support higher tax rates and hence tax revenues (Haufler and Wooten, 1999). To test for this, the corporate tax rate is interacted with an indicator variable that equals one for a country that has a population greater than the sample average (in that year), and is zero otherwise ((*LrgePop x CtRate)ᵢₜ*).

The resulting empirical model to be estimated is as follows:

$$lnCtRevenue_{it} = \beta_0 + \beta_1 lnCtRate_{it} + \beta_2 lnProfitRate_{it} + \beta_3 lnCorpSect_{it} + \beta_4 (PTR - CTR)_{it}$$
$$+ \beta_5 (CapMobil \ x \ lnCtRate)_{it} + \beta_6 (LrgePop \ x \ lnCtRate)_{it} + \varepsilon_{it}$$

Empirical Analysis and Results

The F and Breusch-Pagan LM tests both strongly reject the null hypotheses of pooled OLS. The Hausman and Robust Hausman tests both reject use of random effects. Therefore, fixed effects is again the preferred estimator. Time indicators are jointly statistically significant at the 1% level and included across all specifications. Heteroskedasticity robust standard errors clustered by country are used.

As seen in Table 2, the elasticity of corporate tax revenues to corporate tax rates is positive, highly statistically significant but concernedly low. As per regression (1), ceteris paribus, a 1% increase in the

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[17] Clausing (2007) also tests for the effect that the type of international tax system a country uses has on its corporate tax revenues. Designating the exemption mechanism as the base case (foreign corporate income is exempt from domestic tax), indicator variables are used to capture the other two types of systems: whether the country uses a foreign tax credit mechanism (tax foreign corporate income and grant a tax credit for foreign taxes paid) or a mixed system (a mixture of the exemption mechanism and the foreign tax credit system). Not surprisingly, relative to exempting foreign corporate income from taxation, Clausing (2007) finds that using a foreign tax credit system has a positive effect on corporate tax revenues as does a mixed system with the former having a greater effect than the latter. As the corresponding data is not widely available both in terms of LDCs and years, these hypotheses are not investigated here.

corporate tax rate results in only a 0.4% increase in corporate tax revenues. Even with the accepted concern over the ability and efficiency of LDCs in collecting tax revenues, this estimate may be implausibly low[18]. The fixed effect estimate of the profit rate is more clear-cut. The estimated coefficient is of the correct sign, statistically significant and close to an expected 1%:1% relationship. Although the effect of the size of the corporate sector is statistically significant and positive, the point estimate is of 'too high' a magnitude.

In column (2) the extensions as discussed above are introduced (section 6). The loss of observations is significant (approx. 30%) and likely affecting the lack of precision / statistical significance of the resulting estimates. Therefore, in regression (3) the measure of the Profit Rate is exchanged for two proxies[19] - the GDP Growth Rate and the Unemployment Rate - and the size of the Corporate Sector for its proxy, GDP per Capita (Clausing, 2007). Furthermore, as the point estimate of the elasticity of the corporate tax revenues to the corporate tax rate is lower than appears plausible a control variable is introduced so as to capture the tax collection ability of a country's government. The ideal measure would be the World Bank's public sector management and institutions index from its Country Policy and Institutional Assessment database. This index specifically accommodates a measure of the efficiency of a country's revenue mobilisation. However, it is only available for the years 2005 onward. As a proxy an index is used that measures the quality of a country's legal institutions (Gwartney, Hall and Lawson, 2010) and which is relatively widely available for developed and less developed countries. Although the increase in observations is achieved, the fit of the model is unsatisfactory. In particular, although the proxy for the size of the corporate sector (GDP per Capita) is highly significant and of the correct sign, the corporate tax rate and the two proxies for the country's profit rate are not statistically significantly different from zero. A feasible model needs to be able to accommodate at least all three of the included

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[18] There is little data available with respect to cross-country comparisons on the tax gap, generally defined as the difference between the theoretical tax liability and the amount of tax actually collected. Relatively few countries actively measure it (OECD, 2008). The UK is an exception with an estimated average corporate tax gap of approximately 8% over the period 2006 – 2014 (HMRC, 2015). The LDC estimates are being intepreted here in comparison to the UK benchmark recognising the UK's explicit effort to combat this issue and the level of institutions at its disposal.

[19] Clausing (2007) argues that the GDP Growth Rate and Unemployment Rate proxy for 'cyclical variables that should influence the profitability of the corporate firms' (pg. 127).

Table 2

Regressions to analyse the components of Corporate Tax Revenues of Less Developed Countries

Dependent Variable: (ln) CTRevenue

	Within Estimator			
	(1)	(2)	(3)	(4)
(ln) CTRate	0.369 ***	0.356 **	0.350	0.935 ***
	(0.100)	(0.162)	(0.287)	(0.217)
(ln) Profit Rate	1.038 **	0.656		
	(0.508)	(0.492)		
(ln) Corp Sector	1.558 **	1.130 *		
	(0.609)	(0.608)		
(ln) GDP Growth			-0.017	0.005
			(0.023)	(0.022)
(ln) Unemploy			-0.261	-0.500 **
			(0.267)	(0.182)
GDP per Cap ('00's)			0.052 ***	0.061 ***
			(0.014)	(0.011)
PTR - CTR		0.008	-0.003	0.000
		(0.006)	(0.005)	(0.003)
Cap Mobility x (ln)CTRate		0.001	0.063	0.052 ***
		(0.026)	(0.019)	(0.018)
Large Pop x (ln)CTRate		-0.051	-0.483 ***	-1.207 ***
		(0.275)	(0.327)	(0.273)
Institute Quality			-0.071	-0.057
			(0.074)	(0.046)
Urban				0.265 ***
				(0.045)
Constant	1.036	2.243	5.260 ***	-1.093
	(1.756)	(1.998)	(1.172)	(1.021)
Time Indicators	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
N	220	159	277	232
R^2	0.60	0.64	0.51	0.71

Standard errors appear in parantheses. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Heteroskedasticity and cluster (by country) robust s.e.'s are used. Time indicators are jointly significant at the 1% level or less. The Hausman and Robust Hausman tests reject the Random Effects model.

key components (or their proxies) to corporate tax revenues: the corporate tax rate, the rate of profit and the size of the corporate sector. The proxy for a country's revenue mobilisation is also not statistically significant and has virtually no effect on the corporate tax rate point estimate.

Regression (4) is much more convincing[20]. It is the same as regression (3) with the addition of the Urban measure of agglomeration as a control variable. The intuition for its inclusion is that as a proxy for agglomeration rents it should also pick up the effect of corporate profit rates and in turn the size of the corporate sector: previous work (Baldwin and Krugman, 2004; Brülhart, Jametti and Schmidheiny, 2012) shows that the rate of profit should be increasing in agglomeration, and in turn, this should attract additional corporate activity. Although the magnitude of the effect is small – a 1% point increase in this measure of agglomeration is correlated with a 0.3% increase in a country's corporate tax revenues – it is highly statistically significant. It is also an important control to the fit of the model. The effect of corporate tax rates on corporate tax revenues has returned to being highly statistically significant. The magnitude of the coefficient at 0.9% would be very encouraging as it suggests that there is little lost in revenue collection from an increase in corporate tax rates. However, one would hesitate to take this at face value. Aside from the point estimate not being consistent with the three previous regressions ((1) to (3)), a convincing control for the efficiency of a country's revenue mobilisation is not available. The Institute Quality proxy continues to not be statistically significant. More positively, the proxies, Unemployment Rate and GDP per Capita, are of the correct sign and statistically significant. There are also interesting results with respect to the three additional hypotheses. The interaction term between a country's level of capital mobility and its corporate tax rate is positive and highly significant. This is consistent with the evidence of section 5. An LDC's corporate taxes are increasing in its openness as measured by its capital mobility. Furthermore, the point estimate for the interaction term between the size of a country and its corporate tax rate is negative. Ceteris paribus, larger countries are unable to support as high of a tax rate as smaller countries. An increase in the corporate tax rate for large countries has an estimated negative effect on corporate tax revenue. This finding is consistent with the evidence reported in Section 5 of an inverse relationship between a country's size and the corporate tax rate that it sets. Larger LDCs set lower corporate tax rates. Interestingly, this is the opposite

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[20] The results from regression (3) continue to be presented as they highlight the importance of including Urban as a control variable as well as the lack of an effect that Institute Quality has on the results.

to what theory predicts (Haufler and Wooten, 1999) and of the evidence reported in Clausing (2007) who finds that larger developed countries are able to support higher corporate tax rates. Finally, also in contrast to Clausing (2007) and the theory (Gordon, Mackie-Mason and Hubbard (1995) and Gordon and Slemrod (1998)), there is no evidence that the differential between the personal tax rate and the corporate tax rate results in additional corporate tax revenue for LDCs. This is consistent with the concern for LDCs that personal income is shifted into the underground economy and therefore, away from taxation (including corporate) altogether.

Applying the principle of the Clausing (2007) model to the LDC data generates both positive and interesting results. It also highlights challenges in fitting a model to the corporate tax revenues of LDCs. Strong evidence is found for the expected positive relationship between the corporate tax rate and revenues. However, the magnitude of the estimate is inconsistent across the specifications, ranging from (realistically) being too high (0.9) or too low (0.4)[18]. To address this, revenue mobilisation needs to be controlled for. However, as the available proxy - due to the lack of data for a direct measure across the years of the sample - the quality of a country's legal institutions does not work. Not only is the estimate not statistically significant, it has virtually no effect on the point estimate of the corporate tax rate[21]. The analysis also finds statistically significant evidence of the expected positive effect of the Profit Rate and the size of the Corporate Sector (and their proxies) on corporate tax revenues although the point estimates are not consistent in adhering to an expected 1%:1% relationship. Despite these issues, the analysis generates interesting results. The evidence continues to show (with respect to the evidence in section 5) a positive effect of an LDC's capital mobility and a negative effect from its size on LDC corporate tax revenues. Furthermore, while in section 5 there is strong evidence of the personal tax rate driving the corporate tax rate, no evidence is found of the differential having an impact on LDC corporate tax revenues.

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[21] Regression (4) has been estimated both with and without the variable Institutional Quality. The estimate for the Corporate Tax Rate is essentially unchanged.

VII. Conclusion

The previous empirical corporate income tax literature has focussed on the analysis of the corporate tax policy of developed countries. This is not necessarily intentional, but, rather likely a function of data availability. In order to extend these results to less developed countries one must assume that corporate tax policy is the same across developed and less developed countries. However, by definition, these economies are at different levels of development and this will influence corporate tax policy. This is immediately evident from the personal versus corporate tax mix. In developed countries personal taxes are a much more important source of tax revenue than corporate taxes. The exact reverse holds true for less developed countries. LDCs rely more on corporate taxes than personal taxes. Therefore, we have limited empirical evidence that is directly reflective of and relevant to corporate tax policy in LDCs. This paper aims to contribute to a larger research agenda that will extend our understanding of corporate income taxes to the case of LDCs.

Using a sample of 114 LDCs over the period 1980 to 2006, this paper finds that even though corporate tax rates have been decreasing, corporate tax revenues have been increasing both in their importance to total tax revenues and the economy as a whole. The analysis also shows the expected positive relationship between a country's corporate tax rates and personal tax rates. Furthermore, there is convincing evidence of infrastructure costs being passed along to corporations in LDCs. The corporate tax rate is increasing in the level of a country's infrastructure.

However, in contradiction to the standard tax competition theory, this paper finds significant evidence that LDC corporate tax rates and corporate tax revenues are *increasing* in its openness to the world as measured by its level of capital mobility. Also in contrast to theory, the corporate taxes of LDCs appear to be decreasing in market size. However, as a determinant of the corporate tax rate, the magnitude of the effect is small.

Just as interesting is what the analysis does not find evidence of. The corporate tax rate does not appear to be driven by the revenue needs of the country's government. There is no evidence that LDCs (are able to) capitalise on their location rents in setting their corporate tax rates. Furthermore, despite the robust

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evidence of a practically significant effect of the personal tax rate as a determinant of the corporate tax rate, it does not carry through to the LDC's corporate tax revenues. This may be suggestive of the conventional concern that taxation in LDCs drives economic activity to go 'underground'. As the personal tax rate increases, rather than shifting economic activity into a corporation (as theory predicts), the activity may shift to the underground economy by going unreported.

Although the results show the expected positive relationship between an LDC's corporate tax rate/corporate rate of profit/size of the corporate sector and its corporate tax revenues, the analysis highlights an area of needed further research: the efficiency of revenue mobilisation in LDCs. Optimal corporate tax policy is limited in its value if the tax is not collected.

Corporate income tax is clearly a particularly important tax policy area for LDCs. In order for us to be able to better advise LDC policymakers, a dedicated research agenda over corporate income taxes in LDCs is needed. This paper contributes to that agenda.

Data Appendix:

Cap Mobil. An index (1 to 10) of a country's capital mobility which is increasing in the country's openness. The data is from: Gwartney, J.D., Hall, J.C., Lawson, R. (2010). "Economic Freedom Dataset". *Economic Freedom of the World: 2010 Annual Report*. Fraser Institute. www.freetheworld.com.

Corp Sector. The size of the country's corporate sector/activity as measured by gross value added (the value of output less intermediate inputs) in constant 2000 USD. The data has been collected from the World Bank World Development Indicators (2010).

CTRate. The statutory corporate income tax rates (top marginal, central government only) have been collected from the World Tax Database (Ross School of Business, University of Michigan) and the World Bank World Development Indicators (2010).

CTRevenue. The country's total corporate tax revenue (central government only) in constant 2000 USD. The data has been collected from the World Tax Database (Ross School of Business, University of Michigan) and the International Monetary Fund's Government Finance Statistics online database.

GDP Growth. The annual GDP growth rate collected from the World Bank World Development Indicators (2010).

GDP per Cap. GDP per capita in constant 2000 USD has been collected from the World Bank World Development Indicators (2010).

Govt Expend. The general government final consumption expenditure as a percentage of GDP data has been collected from the World Bank World Development Indicators (2010).

Nat Res. A country's natural resource abundance as measured by a country's ores, metals and fuel exports as a percentage of total merchandise exports (Ross, 2004). This variable is constructed from data collected from the World Bank World Development Indicators (2010).

Institute Quality. An index (1 to 10) of the quality of a country's legal institutions. The data is from: Gwartney, J.D., Hall, J.C., Lawson, R. (2010). "Economic Freedom Dataset". *Economic Freedom of the World: 2010 Annual Report*. Fraser Institute. www.freetheworld.com.

Population. The country's total population data has been collected from the World Bank World Development Indicators (2010).

Profit Rate. The corporate rate of profit is estimated by the ratio of operating surplus (pre-interest, rent and other similar charges) to gross value added. The data has been collected from the UN Statistics Division and the World Bank World Development Indicators (2010) respectively.

PTRate. The statutory personal income tax rates (top marginal, central government only) have been collected from the World Tax Database (Ross School of Business, University of Michigan) and the World Bank World Development Indicators (2010).

PTR – CTR. The differential between a country's personal tax rate and corporate tax rate.

Telephone. Telephone lines per 100 people. The data has been collected from the World Bank World Development Indicators (2010).

Trade Vol. Trade as a percentage of GDP. The data has been collected from the World Bank World Development Indicators (2010).

Unemploy. The rate of unemployment. The data has been collected from the International Monetary Fund's World Economic Outlook database (2012).

Urban. The percentage of the total population that live in urban agglomerations of more than 1 million. The data has been collected from the World Bank World Development Indicators (2010).

Table A1
Summary Statistics

	Observations	Mean	Std Dev
CTRate	1,724	35.58	9.65
PTRate	1,455	35.85	19.20
Govt Expend	2,553	15.33	6.99
Telephone	2,882	6.69	8.61
Nat Res	1,677	30.48	31.67
Cap Mobil	1,910	5.73	1.38
Trade Vol	2,623	70.91	37.94
Population ('00'000's)	2,967	38.50	141.00
Urban	1,812	18.19	12.29
(ln) CTRevenue	921	6.04	2.92
(ln) CTRate	1,722	3.53	0.32
(ln) Profit Rate	445	-0.79	0.48
(ln) Corp Sector	1,982	1.80	1.78
(ln) GDP Growth	2,102	1.42	0.86
(ln) Unemploy	1,003	2.00	0.86
GDP per Cap ('00's)	2,640	23.53	43.59
PTR - CTR	1,405	0.74	18.46
Institute Quality	1,884	4.51	1.30

Less Developed Countries (LDCs):

Albania, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bhutan, Bolivia, Bophuthatswana, Botswana, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Rep, Chad, China, Colombia, Comoros, Democratic Republic of Congo, Republic of Congo, Cote d' Ivoire, Croatia, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, French Polynesia, Gabon, Gambia, Georgia, Ghana, Guam, Guatemala, Guinea, Guyana, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Kazakhstan, Kenya, Kuwait, Kyrgyz Republic, Latvia, Lesotho, Libya, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Mali, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, New Caledonia, Nicaragua, Niger, Nigeria, Oman, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Puerto Rico, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Solomon Islands, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Syria, Taiwan, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, Vietnam, Western Samoa, Yemen, Yugoslavia, Zambia, Zimbabwe.

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