FACULTY OF LAW, ECONOMICS AND FINANCE

CREA
Discussion
Paper
2017-18

Economics

Center for Research in Economics and Management
University of Luxembourg

Corporate Effective Tax Rate in Sub-Saharan Africa: Evidence from Formal Companies of Mali

available online : http://wwwfr.uni.lu/recherche/fdef/crea/publications2/discussion_papers

Luisito Bertinelli, CREA, Université du Luxembourg
Arnaud Bourgain, CREA, Université du Luxembourg
Abdoul Karim Diamoutene, University of Social Sciences and Management of Bamako, Mali

October, 2017

For editorial correspondence, please contact: crea@uni.lu
University of Luxembourg
Faculty of Law, Economics and Finance
162A, avenue de la Faïencerie
L-1511 Luxembourg

Corporate Effective Tax Rate in Sub-Saharan Africa: Evidence from Formal Companies of Mali.

Luisito Bertinelli[1], Arnaud Bourgain[1] and Abdoul Karim Diamoutene[2]

October 2017

Abstract: This paper analyses the tax burden borne by a large number of Malian companies (3 474) representing the totality of the formal sector of this country. By exploiting individual firm information collected from financial statements and balance sheets, we highlight determinants of effective tax rates such as firm's size, industry, location or other corporate attributes. Our study is in line with the surge for more transparency in national fiscal practices.

Keywords: Effective Tax Rate; Corporate income Tax; Taxation in Sub-Saharan Africa; Tax exemption.

JEL classification: H25, O17, O55

1. Introduction

In Sub-Saharan Africa (SSA), tax mobilization and in particular direct tax ratios remain dramatically low. This has been recognized as a major caveat to economic development, as the lack of domestic resources hampers productive investments. The objective of this study is to scrutinize the determinants of one particular, but most prominent fiscal instrument, namely the corporate income tax. In particular, we analyse the tax burden borne by a large number of Malian companies (3 474) representing the universe of the formal sector. By exploiting information collected from financial statements and balance sheets, we aim to contribute to the analysis of corporate taxation and its determinants in low income countries of Sub-Saharan Africa. To the best of our knowledge, studies on microdata are next to inexistent, probably because of the scarcity of reliable and available data.

Even though the share of the formal sector is extremely modest in total employment and total added value, it accounts for a very large proportion of the domestic resource mobilization. Recent theoretical as well as empirical contributions have highlighted the key role of the formal sector in the tax mobilization in Sub-Saharan Africa. Auriol and Walters

[1] CREA, University of Luxembourg; 162a, avenue de la Faïencerie, L-1511, Luxembourg.
E-mails: luisito.bertinelli@uni.lu; arnaud.bourgain@uni.lu.
[2] University of Social Sciences and Management of Bamako, Mali.

(2005) model the dualism of taxation base in developing countries. They show that barriers to entry in the formal sector allow the government to raise revenue on this sector with relatively low administrative cost. In this way, the large size of the informal sector could be explained by a public policy characterized by entry barriers and concentration of the taxation on formal sector. Stiglitz (2010) also pinpoints the inefficiency of some tax policies applied to the formal sector in low income countries when the importance of their informal sector is not taken into account.

Recent empirical papers (Gupta, 2007; Botlhole et al. 2012; Thomas and Treviño, 2013; Bertinelli and Bourgain 2016 among others) show that the share of the formal sector in SSA economies is a significant determinant of tax mobilization.[3] Keen and Mansour (2010) discuss the challenge facing the corporate taxation in Africa in a context of globalization. They note that too little attention has been devoted on the issue of tax competition in SSA. In recent years, the decrease in the average statutory Corporate Income Tax (CIT) rate has been substantial but partially cushioned by a broadening of the CIT base. The authors however consider that "the core CIT challenge that SSA faces is in stemming, and reversing, the proliferation of incentives whose effectiveness is, at best, unclear" (p. 587). Tax exemptions could be a policy instrument to encourage investment and innovation. However, the multiple exemptions, which characterize the corporate tax system of developing countries, are commonly criticized. For instance, Tanzi and Zee (2001) highlight the distortions generated by exemptions: deadweight effect, incentive for tax avoidance, attraction of short term projects, lack of transparency… Moore (2013) and Balh (2014) note that exemption practices in low income countries have clearly a political motivation. On this point, the G-20 Development Working Group (2011) considers as a priority and a first step the publicizing of tax expenditures (revenue cost of preferential tax treatments).

These issues strongly justify a detailed inquiry on corporate income taxation in SSA, especially on micro-data. Such an analysis is fundamental to highlight determinants of effective tax rates such as firm's size, industry, location or other corporate attributes identified by the tax and accounting literature.

Mali is an interesting SSA country, characterized by a low income, high informal sector, and low tax base. Its tax revenue ratio to GDP is around 15%, about the average of other SSA countries (in 2013). According to a recent IMF report on Malian tax policy (Rota-Graziosi et al., 2014), the revenue structure is similar to that observed in other low income countries, and especially in SSA. Custom revenues continue to decline; VAT receipts are low and direct taxation does not fully play its role in the revenue mobilization. As a member of UEMOA (West African Economic and Monetary Union), the Malian government complies with regional directives on taxation. The rate of corporate income tax is 30% (35% before 2011), associated with a presumptive turnover tax. The very small firms are subject to a "synthetic tax" based on turnover. Interestingly, in recent years, the Malian tax administration has

[3] More precisely, these authors test the impact of informal sector share or the share of agriculture on tax mobilization in SSA.

provided some figures about tax expenditures.[4] In 2014, 452 special derogations have been identified, which represented 24% of total tax revenue and 4% of GDP; and VAT exemptions alone represent two thirds of the total.

In this study we identify the main drivers of the effective tax rates at the firm level. We show that effective tax rates are relatively constant across regions and sectors, but the size of the firm plays a crucial role in determining the taxation level of firms. This result is robust to various proxy measures of size. Lastly, we cannot identify an optimal size that would minimize or maximize the effective tax rate.

This paper is organized as follows. Section 2 discusses the concept of effective tax rate and reviews its main determinants. Section 3 describes the data used and the research method. Descriptive statistics are presented in section 4 and section 5 reports the econometric results.

2. Effective tax rate and its determinants

Our study focuses on the average effective tax rate (ETR) as a measure of the tax burden in a retrospective sense and applies it to microdata. This *ex post* indicator is defined as the ratio of corporate tax expenses to a pre-tax income observed at the firm level.[5] The tax and accounting literature has produced a proliferation of ETR ratios, using different measures of income on the denominator; see in particular Fullerton (1984), Omer et al.(1991), Callihan (1994), Plesko (2003) Dwenger and Steiner (2012). While a number of variants exist, the fundamental principle is that the denominator should be a measure of the economic profit before taxation, focused on the company's ability to generate earnings from current operations. The aim is not to mimic the exact taxable base to verify tax payment. In this regard, the EBIT (Earnings before interests and tax) indicator is often used as a measure of earnings ignoring tax burden and financial structure (debt service requirement).

By construction, ETR and corporate statutory tax rate (STR) are not equal. The difference between ETR and STR, in addition to financial incomes and expenses, should include tax reduction, exemptions, favorite rate, special deduction, various exceptions, and other forms of incentives. This explains why the ETR is so interesting not only for tax policy analysts, but also for investors and other business actors.

In order to present the different expected determinants of the ETR, we refer mainly to the tax and accounting empirical literature. These papers however do never focus on SSA or more generally developing countries, but rather on developed and sometimes emerging economies. Many of them use data from listed companies or from referenced firms in large

[4] Direction Générale des Impôts du Mali, Cellule de Politiques Fiscales, Situation des dépenses fiscales 2014, www.dgi.finances.gov.ml

[5] The term of "effective" is also used in the sense of measuring the tax burden on new investment, but *ex ante*.

international databases, and thus, unlike the present study, do not rely on the universe of formal firms in a country.

Firm size and ETRs

Firm size is the main variable of interest in empirical work on corporate ETR for both advanced economies and emerging countries. The expected relationship between size and ETR is however ambiguous. In his seminal paper, Zimmerman (1983) argues that larger firms incur a "political cost" due to their higher visibility. They are more exposed to the government scrutiny and face therefore higher tax levies and tax audits. This logic is in line with the theoretical model of Auriol and Walters (2005) who consider that the formal sector in developing countries is in the grip of the government. Conversely, the relationship between size and ETR would be negative if we consider that large firms have greater scope for tax planning (Richardson and Lanis, 2007). In the same vein, large firms can be able to manipulate the political process in their favor to benefit from exemptions and advantages. This argument may be particularly relevant for SSA countries, with weaker institutional controls.

In the absence of studies highlighting specific results for SSA, we can refer to the empirical results on emerging economies. Based on a panel of about 200 Malaysian firms listed at the Stock Exchange, Derashid and Zhang (2003) find a negative and significant relationship between size and several measures of ETR. In a study applied on Chinese firms, Lin and Cao (2007) consider that the listed companies take advantage of their size and political influence on local government to lobby for tax preference. The authors obtain a negative coefficient, but non-significant. In a more recent paper, Fernandez-Rodriguez et al. (2014) analyze the size effect on ETRs of four emerging economies. In line with the government control hypothesis, the authors obtain a positive and significant coefficient in Brazil and China. In Russia, the relationship is opposite, suggesting a greater lobbying or a greater fiscal planning by larger firms. The coefficient is not significant for India.

For African countries, but not in terms of ETRs analysis, Gauthier and Gersovitz (1997); Gauthier and Reinikka (2006) investigate corporate tax exemptions respectively in Cameroon and in Uganda. In both cases, their result put forward the fact that larger firms benefit disproportionately from higher tax exemptions.

Sectoral effects on ETRs

Since various kinds of tax exemptions impact directly the effective corporate taxation, one may suspect specific sectoral effects to be at work. As in the size effect, strategic or dominant companies in specific industries can influence the political process in their favor. Furthermore, sectoral effects may be the result of an explicit industrial policy adopted by governments aiming at diversifying their economies. In one of very few studies on this sectoral effect, Derashid and Zhang (2003) bring to light two strategic sectors in the diversification policy of the Malaysian government that pay less effective taxes than firms in

other sectors. In the SSA context, marked by a low diversification of the economies, we will investigate the specific tax situation of firms in strategic sectors, like the manufacturing and the mining sectors.

Financial variables of the firm and ETRs

Profitability of firms is an important potential determinant of ETR. In principle, with a statutory tax rate proportional to the revenue, the profitability could be neutral on ETR. In reality, a majority of authors expect a positive relationship between profitability and ETR. (Wilkie, 1988; Richardson and Lanis, 2007). One of the reasons given is the persistence of profit and thus profitable firms pay taxes every year (Fernandez-Rodriguez 2014). However, it is quite common to obtain negative and significant coefficient for profitability (Derashid and Zhang, 2003, for Malaysia). Again, various types of exemptions and deductions can explain this sign reversion.

The expected effects of financial variables concerning the structure of assets and liabilities are less ambiguous. Firms' financing structure affects mechanically its ETR because interest expenditures are tax deductible. A higher level of *leverage*, generally measured by the ratio of total debt to total assets, implies a lower ETR. As almost all empirical studies obtain such a negative and significant relationship, leverage is considered as an appropriate control variable to explain ETRs.

In the same vein, *asset mix* variables may influence ETR. Companies with a larger proportion of tangible fixed assets should have a lower ETR. Indeed, firms that are more capital intensive can benefit more from depreciation and depreciation deductibility, as foreseen in financial accounting standards. Referring to empirical studies applied to emerging economies, the coefficient for capital intensity is generally negative (Derashid and Zhang, 2003) but not always statistically significant (Liu and Caos, 2007; Fernández-Rodríguez et al. 2014).

3. Data, variables definition and empirical method

Data

The individual firm data used in this analysis is gathered from income statements and balance sheets provided by the National Institute of Statistics (INSTAT) of Mali, in an anonymized form. This data set contains a total of 3474 firms for the year 2011. In contrast to most other ETR empirical analysis, our database is not limited to listed companies, but includes the whole universe of formal firms reporting their accounting information to INSTAT. We have cross-checked the accuracy of our data, by comparing the sum of corporate tax payed by all the firms of the database and the aggregate amount of corporate income tax provided by the Ministry of Finance, and recorded by a recent IMF report (Rota-Graziosi et al. 2014), and found very similar results. Thus, we can confidently exclude

sampling errors. Similarly to other countries, the size distribution of firms is quite skewed to the right, but unlike developed and emerging economies, the share of the informal sector is much larger in the Malian case.

A cross-section analysis is chosen mainly for technical reasons. The anonymous credentials do not allow us to build a panel of firms across several years. We will rely on the year 2011 data. While 2011 is not the most recent year available, it is the year preceding the very serious political crisis and armed conflict of 2012 and 2013. Since then, the country is experiencing an international military intervention, which can have a very disruptive impact on tax revenue observations.

In accordance with the existing literature, we excluded firms from the finance and insurance industry due to their special financial characteristics. Furthermore, to avoid serious distortions, we also excluded firms declaring losses or negative ETRs. Firms whose effective tax rate exceeds one are also eliminated. In the end, we are left with 2381 observations, which is unprecedented in any study on ETR in developing economy.

Measuring Effective Tax Rate

Our dependent variable is the effective tax rate *(ETR)*. Several definitions for ETR appear in the literature (reviews by Callihan 1994; Fullerton 1984; Graham et al. 2012; Plesko 2003). For the numerator, the most traditional indicator is the corporate income tax expense. However, the sum of other various taxes could represent a substantial tax burden for companies. We therefore take into account these additional tax burdens in extended definitions of the ETR (which we refer to as ETR2 and ETR3). They include notably: property taxes, franchise taxes, apprenticeship tax, registration tax, registration fees, tax on company cars, and other indirect taxes…

For the denominator, various profit measures can be considered. Given our data availability constraints, we mainly focus on the Earnings Before Income Tax (EBIT). This denominator is adjusted when we consider the other taxes that are included in the charges. In the measure of tax expenses, we were not able to take into account the deferred tax expenses. However, we can obtain (balance sheet item) the “loss carry forward”. In this way, the profit can be corrected because firms’ past losses can reduce their tax liability for subsequent years.

Three different ETR measures are calculated. ETR1 is the standard ratio: Corporate income tax / earnings before interest and tax (EBIT). In ETR2, loss carry forward reduces the EBIT: Corporate income tax / (EBIT – loss carry forward). And ETR3 includes the other various taxes both in the numerator and in the denominator: (Corporate income tax + other various taxes) / (EBIT+ other various taxes).

Firm-specific variables

Our firm-specific variables are common in empirical papers related to the study of effective tax rates.

Following previous empirical work, the *firm size (SIZE)* variable is measured as the logarithm of the firm's total assets. Since our sample includes a large amount of small and very small enterprises with very low assets levels, we also use the indicator *total sales (SALES)*, in logarithm, as a proxy measure of size.

To take into account the firms' asset mix, *capital intensity (FIXED ASSETS)* is defined as the tangible fixed assets divided by total assets.

Financial leverage (LEVERAGE) is included to proxy for firms' capital structure, and is measured as the total financial debts divided by total assets.

As profitability/performance measure, we conventionally use the *Return On Assets ratio (ROA)* computed as pre-tax income divided by total assets. For robustness of our measures, we also calculated another profitability indicator based on information collected from financial statements defined as the pre-tax income to total sales *(ROA proxy)*.

Industry effects are the dummy variables denoting different sectors in the sample. The sectors are: agri-food industries, manufacture of textiles, clothing and leather work; other industrial activities, incl. mining; electricity, gas and water; construction; commercial activity; repair; accommodation and restoration activities; transport and communications; real estate and business services activities; education; health activities and social action; collective or personal activities.

For most of our observations, a *location* indicator is available. This information allows us to sort each firm by "commune" of Bamako or by city. The aim is to control if a location in a modern or central area of Bamako affects the ETR.

Empirical method and implementation

In the sequel, we regress the following reduced form specification:

$$ETR = \alpha + \delta \cdot Size + X\beta + I_r + I_s + \varepsilon \quad (1)$$

where *0≤ETR≤1* is the effective tax rate as defined above, Size refers to the *log* of total assets (or alternatively to the *log* of turnover), *X* are a number of control variables, I_r and I_s are indicator variables for regions and sectors, and ε is the disturbance term.

Our dependent variable, ETR, is measured as a ratio bounded between zero and one. Hence, standard linear models do not provide an accurate measure of the effects of the independent variables on ETR throughout the entire distribution of the respective

independent variables. The relationship must be bounded, otherwise ETR are eventually predicted to be greater than one, or smaller than zero.

We will therefore rely on a fractional response estimator that fits models on continuous zero-to-one data using logit regression.[6] Generalized linear models, using maximum likelihood are implemented in order to take account of exactly zero and one outcomes on the dependent variable.

In the present case, we rely Papke and Wooldridge (1996)'s fractional logit model, which allows us to take account of 0 and 1's, and has been shown to be appropriate for continuous dependent variables. More specifically, we model *y*:

$$E(y/X) = g\{X\beta\} \quad (2)$$

where *y∈(0,1)* is measuring ETR, *X* is a set of explanatory variables. *g(.)* is a known function, also referred to as the link function, satisfying *0≤g(.)≤1*. Following Papke and Wooldridge (1996), we use the logistic transformation *g(.)=exp(.)/[1+exp(.)]*, which will map the predicted values of *y* to the *(0,1)* interval. We rely on robust standard errors to take account of a possibly misspecified distribution family, and provide valid estimators of the asymptotic variance of β resulting from the maximization of the Bernoulli *log*-likelihood. The stochastic error term ε, which will capture unobserved explanatory factors, as well as measurement errors in our data.

4. Descriptive analysis

We use a dataset containing data on balance sheet and statements of profit and loss from the national statistics institute of Mali (INSTAT). This dataset is not a random subset, but includes virtually the universe of Malian firms in the formal sector, which is supposed to represent about 55-60% percent of total economic activity in Mali (Schneider et al 2010). Besides standard accounting information, each entry lists the location and the sector of activity of each firm.

In Table 1, descriptive information of the variables of interest is provided. The complete dataset consists of 3469 observations for the year 2011. We drop observations when there was mis-and unreported information, negative values of tax payments and/or net operating surplus, and firms in the financial activities sector. This leaves us with a sample of 2381 firms.

In the top panel of Table 1, we highlight descriptive information according to a sectoral breakdown. Firms are strongly concentrated in the commercial sectors, followed by real estate and business activities, which together represent about 75 percent of our sample.

[6] We indeed did not use a simple logit transformation, as this would drop all our 0 and 1 observations from the sample.

The electricity, gas and water sector strongly stands out with its disproportionately large firms (in terms of median of Assets and Turnover). Note however that it only represents two firms, and for the econometric analysis, we will use the *log* of the size proxy to avoid an outlier problem. Note also that this sector has by far the highest indebtedness, resulting from large energy generation projects, such as dams.

In the lower panel of Table 1, information on the variables of interest is broken down according to the location of the firms. A twelve-unit division is displayed, representing the districts ("Communes") of Bamako and other Malian cities. Bamako 3 and 4 can be associated with the central business district. Interestingly, no particular feature in terms of the variables of interest emerges from the central business district, compared to the rest of Bamako, and the whole of Mali.

Lastly, the dependent variable, the effective tax rate (ETR), is relatively stable through sectors and districts, and on average 29 percent, which is quite close to the 30 percent of the official corporate income tax rate in Mali until 2012. By construction, ETR1 is lower or equal to ETR2, as we take account of losses carried forward on the denominator of the latter measure. Note that by doing so, we restrict our sample, as further firms are dropped from the sample due to a negative ETR. This is why ETR2 appears lower than ETR1 in some cases in Table 1. Interestingly also, the median firm is relatively small (i.e. 82 mio CFA, which would be about €120,000 or $140,000), and the firm size distribution strongly skewed rightward (skewness: 17.38 ; kurtosis: 338.11).

5. Econometric results

Baseline regressions are shown in Table 2. The table displays variants of equation (1), using the three definitions of the effective tax rate, from the standard, more restrictive definition (ETR1) to the wider definition (ETR2 and ETR3), entailing a wider range of various taxes beyond standard corporate taxes.

Our main variable of interest, Size (measured as the *log* of total assets), displays a negative and significant coefficient in columns 1 and 2. As developed earlier, the size of firms may have two opposing effects. On one side, larger firms might have a harder time passing unnoticed to tax authorities and are more captive to tax collection; on the other side, larger firms (i) might be better tooled to engineer fiscal instruments optimizing their taxation, and (ii) and may benefit from the proximity to public authorities. Given the structural nature of our specification, we cannot disentangle these two effects. The resultant of these opposing effects points however to a dominant effect of the latter one, pointing to degressive rates for larger firms.

The same is not true for ETR3, which encompasses a large set of taxes, and which especially hampers smaller firms, and whose capacity to engineer tax optimization instruments is

much more limited. Furthermore, some of the taxes that appear in ETR3 may not be negotiable, unlike corporate income taxes.

The remaining control variables display the expected sign or are insignificant. The coefficient of return on assets (ROA) is always negative and significant, pointing towards degressive tax expenditures according to profitability. Profitable firms seem to be able to deploy better tax avoidance instruments. This is true in the three specifications of Table 2. It is also worth noting that profitability is not a proxy of the size a firms (correlation coefficient between ROA and any of the size proxies applied in this paper is lower than 0.1 and non-significant).

Similarly to previous studies, we do unearth a negative relation between indebtedness (measured by leverage) and ETR: more indebted firms pay less taxes, as tax codes allow firms to deduct interest payments from income before taxation.

Lastly, no significant impact of fixed assets emerges from our results. Sectoral fixed effects, though partly significant, are usually small in magnitude, which is consistent with the homogeneity in our variables of interest following the sectoral breakdown presented in Table 1. Furthermore, we have to keep in mind, that a majority of sectors account for 50 firms or less, and therefore sectoral dummies should be interpreted with caution.

In Table 3, the size - taxation nexus is investigated further, by breaking down our sample into different size categories. The purpose of slicing our sample is to explore to what extend smaller firms pay higher effective tax rates. In columns 1 and 2, firms are divided according to whether their turnover is lower or exceeds 30 mio CFA (about €46,000 or $51,000). This corresponds to the threshold value set by the fiscal authorities up to 2014, below which firms could pay a synthetic tax instead of the corporate income tax. Unlike the latter tax, the synthetic tax is less subject to various fiscal engineering tools. This indeed transpires also in the estimated coefficient of the impact of size, which is insignificant for small firms, but strong in magnitude and statistically significant for larger firms.

In columns 3 to 6, firms are ordered in smaller bins, corresponding to the quartiles of the turnover amount. The sample in the first quartile roughly corresponds to the column 1 sample, and results are indeed consistent. In the three other quartiles, the size effect is always high in magnitude and strong in statistical significance, although smaller in the latter column. This might actually be attributable to the fact that the last quartile entails more heterogeneous firms in terms of size (the coefficient of variation is 20 times larger in the last quartile, compared to the two previous ones).

In Table 4, we explore a number of further robustness checks. In columns 1 and 2, we explore possible non-linearities between size and taxation. We are unable to highlight an inverted U-shaped curve in the first column, when using a degree 2 polynomial for size. However, more profitable firms (i.e. with a higher ROA) have a higher size fiscal premium (column 2), which is put forward by interacting our size variable with ROA. In the two next columns, we investigate the importance of the commercial sector in driving our results, by

running separate regression only on commercial firms, or only on all firms not in the commercial sector. Results are consistent, but stronger in magnitude and significance for the commercial sector. Finally, in the two last columns, we explore alternative measures for ROA (i.e. we replace assets by turnover on the denominator) and for size (i.e. we use the *log* of turnover rather than the *log* of assets). Results remain qualitatively the same in both cases.

6. Conclusion

In recent periods, there has been a surge for more transparency in national fiscal practices (e.g. International recommendations to identify, quantify and make more transparent tax expenditures, G-20 development 2011; Exchange of information for tax purposes…). Our study is in line with these developments. Relying on a unique database of all formal firms in Mali, we have explored the potential determinants of the effective tax rate, focussing in particular on the relation between size of firms and taxation. We have highlighted that larger firms do benefit from lower effective tax rates, and this result is robust to various proxies of size, and is even reinforced for profit making firms.

In terms of external validity, we have to take our results with precaution, as (i) we focus on one particular case, namely Mali, even if this country is representative for other SSA countries; furthermore (ii) our data represents only one particular cross section for the year 2011, and therefore does not allow us to tackle dynamic aspects of taxation, nor various confounding, possibly unobservable, factors, which might bias our results. Despite these reservations, our analysis provides a number of lessons to understand the enforcement of tax policies, and in particular tax reliefs and exemptions, in SSA countries.

Table 1: Descriptive statistics, by sector

by Sector	# firms	Assets	Turnover	ETR1	ETR2*	ETR3	Leverage	ROA	Fix Assets
		(mio CFA; median)				(mean)			
Agri-food industries	50	87.8	92.66	0.14	0.13	0.23	0.12	0.16	0.44
manufacture of textiles, clothing and leather work	3	2840	1995.35	0.06	0.00	0.22	0.25	0.04	0.48
other industrial activities, incl. mining	81	453	461.49	0.23	0.22	0.37	0.11	0.17	0.31
electricity, gas and water	2	143000	50414.20	0.03	0.00	0.10	0.74	0.02	0.74
construction	190	32.3	119.84	0.29	0.29	0.41	0.09	0.33	0.32
commercial activity	1174	19.4	80.99	0.31	0.32	0.41	0.05	0.28	0.21
repair	8	18.2	54.02	0.25	0.23	0.35	0.07	0.50	0.09
accommodation and restoration activities	29	72.3	59.68	0.17	0.14	0.28	0.11	0.20	0.52
transport and communications	90	35.3	93.63	0.24	0.23	0.37	0.16	0.70	0.30
real estate and business services activities	611	21.4	75.01	0.30	0.30	0.41	0.08	0.28	0.30
education	98	38.6	48.94	0.24	0.24	0.36	0.17	0.15	0.58
health activities and social action	42	17.8	50.17	0.26	0.24	0.36	0.15	0.24	0.44
collective or personal activities	3	129	158.73	0.02	0.00	0.12	0.00	0.04	0.61
by Region									
Bamako 1	186	29.6	87.95	0.28	0.29	0.38	0.11	0.21	0.25
Bamako 2	384	19.8	68.57	0.29	0.30	0.39	0.10	0.40	0.26
Bamako 3	263	20.9	74.65	0.31	0.31	0.41	0.07	0.31	0.28
Bamako 4	332	29.4	89.08	0.30	0.31	0.41	0.08	0.20	0.29
Bamako 5	229	22.6	84.43	0.29	0.29	0.41	0.05	0.21	0.25
Bamako 6	347	24.6	91.69	0.28	0.28	0.39	0.07	0.16	0.28
Bamako non defined	255	33.3	108.02	0.28	0.27	0.41	0.06	0.26	0.26
Kayes	67	38.4	101.95	0.26	0.25	0.35	0.15	0.38	0.25
Koulikoro	117	19.6	72.17	0.28	0.27	0.40	0.06	0.18	0.29
Mopti	48	10.4	37.96	0.33	0.35	0.41	0.07	0.44	0.55
Sikasso	26	41.6	234.55	0.32	0.31	0.44	0.05	0.23	0.18
Ségou	127	15.3	59.43	0.30	0.31	0.36	0.07	0.73	0.31
All	**2381**	**23.3**	**82.08**	**0.29**	**0.29**	**0.40**	**0.08**	**0.28**	**0.28**

ETR1: CIT / EBIT; **ETR2**: CIT / (EBIT - loss carried forward); **ETR3**: (CIT + other taxes) / (EBIT + other taxes); **Size**: total assets in mio CFA; **Sales**: turnover in mio CFA; **Leverage**: total financial debt/total assets; **ROA**: pre-tax income/Assets; **Fixed Assets**: (lands + buildings + Installations and fittings + materials + transport equipment)/total assets.
NB: details of the split up of Bamako in 6 different areas are provided in the Appendix, Table A1.
*: To compute ETR2, the sample is slightly restricted (2113 observations) because observations with negative value of ETR2 are dropped.

Table 2: Baseline econometric results

	ETR1 (1)	ETR2 (2)	ETR3 (3)
Size	-0.048***	-0.047***	0.023***
	(0.010)	(0.010)	(0.009)
Leverage	-0.199**	-0.397***	-0.169**
	(0.083)	(0.113)	(0.073)
ROA	-0.091**	-0.089*	-0.143***
	(0.041)	(0.045)	(0.045)
Fixed Assets	-0.016	-0.020	-0.041
	(0.091)	(0.093)	(0.109)
Dummy variables:			
manufacture of textiles, clothing and leather work	-0.677	-12.235***	-0.198
	(0.957)	(0.734)	(0.212)
other industrial activities, incl. mining	0.653***	0.730***	0.618***
	(0.207)	(0.221)	(0.191)
electricity, gas and water	-1.337*	-11.850***	-1.085***
	(0.747)	(1.027)	(0.291)
construction	0.900***	0.964***	0.840***
	(0.190)	(0.199)	(0.174)
commercial activity	0.974***	1.046***	0.838***
	(0.185)	(0.194)	(0.168)
repair	0.668**	0.654	0.628*
	(0.319)	(0.405)	(0.368)
accommodation and restoration activities	0.216	0.086	0.284
	(0.263)	(0.308)	(0.262)
transport and communications	0.674***	0.726***	0.697***
	(0.211)	(0.228)	(0.195)
real estate and business services activities	0.896***	1.003***	0.858***
	(0.186)	(0.195)	(0.170)
education	0.647***	0.732***	0.655***
	(0.199)	(0.213)	(0.184)
health activities and social action	0.757***	0.732***	0.685***
	(0.240)	(0.249)	(0.229)
collective or personal activities	-2.319***	-12.445***	-0.854**
	(0.866)	(0.733)	(0.346)
Constant	-0.945***	-1.010***	-1.653***
	(0.269)	(0.287)	(0.263)
Location dum.	*yes*	*yes*	*yes*
# observations	2,381	2,113	2,381
aic	0.865	0.872	0.970
bic	-17967	-15645	-17856

Coefficients obtained from fractional logit estimator; Standard errors in brackets; *** p-value <0.01, **p-value <0.05, *p-value<0.1; aic: Akaike information criterion [-2·model log(likelihood) + 2·#of predictors], bic: Bayesian information criterion [-2·model log(likelihood) + log(#of observations · #of predictors)];
ETR1: CIT / EBIT; **ETR2**: CIT / (EBIT - loss carried forward); **ETR3**: (CIT + other taxes) / (EBIT + other taxes); **Size**: Log(total assets); **Leverage**: total financial debt/total assets; **ROA**: pre-tax income/Assets; **Fixed Assets**: (lands + buildings + Installations and fittings + materials + transport equipment)/total assets; **Sales**: Log(turnover).

Table 3: Small vs large firms

	ETR1 (1)	ETR1 (2)	ETR1 (3)	ETR1 (4)	ETR1 (5)	ETR1 (6)
	Turnover < >30mioCFA		quartiles			
Size	-0.041	-0.060***	-0.045	-0.181***	-0.146***	-0.051**
	(0.029)	(0.013)	(0.029)	(0.035)	(0.033)	(0.023)
ROA	-0.019	-0.138**	-0.029	-0.333***	-0.135*	-0.405**
	(0.066)	(0.065)	(0.066)	(0.128)	(0.077)	(0.194)
Leverage	-0.137*	-0.348***	-0.109	-0.226	-0.137	-0.546***
	(0.082)	(0.113)	(0.069)	(0.179)	(0.205)	(0.192)
Fixed Assets	0.120	-0.078	-0.164*	0.186**	-0.336***	-0.210
	(0.125)	(0.128)	(0.092)	(0.090)	(0.120)	(0.195)
Constant	-0.663	-0.787**	-0.441	1.636**	0.479	-0.984
	(0.628)	(0.334)	(0.634)	(0.702)	(0.763)	(0.634)
Location dum.	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Sector dum.	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
# observations	616	1765	596	595	595	595
aic	0.930	0.867	0.927	0.928	0.915	0.910
bic	-3731	-12727	-3593	-3571	-3553	-3532

Coefficients obtained from fractional logit estimator; Standard errors in brackets; *** p-value <0.01, **p-value <0.05, *p-value<0.1; aic: Akaike information criterion [-2·model log(likelihood) + 2·#of predictors], bic: Bayesian information criterion [-2·model log(likelihood) + log(#of observations · #of predictors)];

ETR1: CIT / EBIT; **ETR2**: CIT / (EBIT - loss carried forward); **ETR3**: (CIT + other taxes) / (EBIT + other taxes); **Size**: Log(total assets); **Leverage**: total financial debt/total assets; **ROA**: pre-tax income/Assets; **Fixed Assets**: (lands + buildings + Installations and fittings + materials + transport equipment)/total assets; **Sales**: Log(turnover).

Table 4: Robustness checks

	dep. var.: ETR1					
	(1) non-linear size impact	(2) size - ROA interaction	(3) excluding commercial sector	(4) only commercial sector	(5) alternative ROA measure	(6) alternative measure to size
Size	-0.013	-0.045***	-0.059***	-0.030**	-0.035***	
	(0.105)	(0.009)	(0.013)	(0.013)	(0.009)	
$Size^2$	-0.001					
	(0.003)					
Sales						-0.020*
						(0.011)
ROA	-0.090**	1.325***	-0.068*	-0.165***		-0.076**
	(0.042)	(0.336)	(0.038)	(0.058)		(0.032)
Size x ROA		-0.110***				
		(0.026)				
ROA proxy					-1.829***	
					(0.477)	
Leverage	-0.197**	-0.200**	-0.137	-0.390***	-0.205**	-0.213**
	(0.083)	(0.082)	(0.086)	(0.090)	(0.085)	(0.093)
Fixed Assets	-0.015	-0.055	-0.032	0.062	-0.044	0.005
	(0.090)	(0.082)	(0.164)	(0.084)	(0.077)	(0.084)
Constant	-1.254	-0.929***	-0.709**	-0.256	-1.060***	-1.469***
	(0.956)	(0.261)	(0.338)	(0.226)	(0.259)	(0.289)
Location dum.	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Sector dum.	*yes*	*yes*	*yes*	*no*	*yes*	*yes*
# observations	2,381	2,381	1,207	1,174	2,381	2,381
aic	0.866	0.862	0.863	0.889	0.860	0.866
bic	-17960	-17967	-8175	-8059	-17978	-17963

Coefficients obtained from fractional logit estimator; Standard errors in brackets; *** p-value <0.01, **p-value <0.05, *p-value<0.1; aic: Akaike information criterion [-2·model log(likelihood) + 2·#of predictors], bic: Bayesian information criterion [-2·model log(likelihood) + log(#of observations · #of predictors)]; **ETR1**: CIT / EBIT; **Size**: Log(total assets); **Leverage**: total financial debt/total assets; **ROA**: pre-tax income/Assets; **Fixed Assets**: (lands + buildings + Installations and fittings + materials + transport equipment)/total assets; **Sales**: Log(turnover).

Appendix

Table A1: divide of areas of Bamako in 6 different districts

Bamako 1	Bamako 2	Bamako 3	Bamako 4	Bamako 5	Bamako 6
Babouillabougou	Bagadadji	Badialan1	Djicôrôni-para	Badalabougou	Sénou
Bacôni	Baribougou	Badialan2	Hamdallaye	Bakôdjicôrôni	Zone-Aéroportuaire
Boulkassoumbougou	Bougouba	Badialan3	Kalabambougou	Daoudabougou	Magnambougou
Djélibougou	Bozola	Bamako-coura	Lafiabougou	Garantibougou	Niamakoro
Djoumanzana	Hyppodrome	Base	Lassa	Kalaban-coura	Sogoninko
Korofina-nord	Médina-coura	Base-A	Sébénikoro	Quartier-mali	Banakabougou
Korofina-sud	Missira	Centre-Commercial	Talikô	Quartier-Sema	Faladié
Sikôrôni	Niaréla	Dar-Salam		Sabalibougou	DIANEGUELA
Sotuba	Quinzambougou	Dravéla		Quartier-Sema2	Sokorodji
	T.S.F.	Kodabougou		Torokôrôbougou	Yirimadio
	Zone industrielle	Koulouba			Missabougou
		Niamyirambougou			
		N'tomikôrôbougou			
		Ouôlôfôbougou			
		Ouôlôfôbougou-bolibana			
		Point-G			
		Quartier-du-fleuve			
		Sogonafing			
		Marché Dibida			
		Bolibana			

Source: http://bamako.ml/communes.php

7. References

Auriol E., Warlters M. (2005), Taxation base in developing countries, *Journal of Public Economics*, 89, 625–646.

Bahl R., 2014, A retrospective on taxation in developing countries: Will the weakest link be strengthened?, in: Bird R.M. and Martinez-Vasquez J. (eds.), *Taxation and Development: The weakest link?*, Edward Elgar Publishing, 2014.

Bertinelli L., Bourgain A., 2016, Tax Mobilization in Sub-Saharan Africa: The Impact of Tax and Business Law Reforms, *Economics Bulletin*, Vol. 36, Issue 3, p. 1805-1810.

Botlhole T., Asafu-Adjaye J., Carmignani F., 2012, Natural resource abundance, institutions and tax revenue mobilization in Sub-Saharan Africa, *South African Journal of Economics*, Vol. 80:2.

Callihan D.S. 1994, Corporate Effective Tax Rates: A Synthesis of the Literature, *Journal of Accounting Literature* 13, no. 1: 1–43.

Derashid C, Zhang H., 2003, Effective tax rates and the "industrial policy" hypothesis: evidence from Malaysia, *Journal of International Accounting, Auditing and Taxation* 12, 45–62.

Dwenger N., Steiner V., 2012, Effective Profit Taxation and the Elasticity of the Corporate Income Tax Base: Evidence from German Corporate Tax Return Data, *National Tax Journal*, March 2012, 65 (1), 117–150.

Emran S., Stiglitz J.E., 2005, On selective indirect tax reform in developing countries, *Journal of Public Economics* 89, 599–623.

Fernández-Rodríguez E., Martínez-Arias A., 2014, Determinants of the Effective Tax Rate in the BRIC Countries, *Emerging Markets Finance & Trade*, Vol. 50, Supplement 3, pp. 214–228.

Feeny S., Gillman M., Harris M.N., 2006, Econometric Accounting of the Australian Corporate Tax Rates: A Firm Panel Example, *Accounting Research Journal* 19, no. 1: 64–73.

Fullerton D., 1984, Which Effective Tax Rate? *National Tax Journal* 37, no. 1: 23–41.

G-20 Development Working Group, 2011, *Supporting the Development of More Effective Tax Systems*, Report by the IMF, OECD, UN and World Bank.

Gauthier B., Gersovitz M., 1997. Revenue erosion through exemption and evasion in Cameroon, 1993. *Journal of Public Economics* 64, 407–424.

Gauthier B., Reinikka R., 2006, Shifting Tax Burdens through Exemptions and Evasion: an Empirical Investigation of Uganda, *Journal of African Economies,* Vol. 15, 3, 373–398.

Gupta A.S., 2007, Determinants of Tax Revenue Efforts in Developing Countries, *IMF Working Paper*, WP/07/184.

Keen M., Mansour M., 2010, Revenue Mobilisation in Sub-Saharan Africa: Challenges from Globalisation II – Corporate Taxation, *Development Policy Review*, 28(5), 573-596.

Liu X., Caos S., 2007, Determinants of Corporate Effective Tax Rates Evidence from Listed Companies in China, *The Chinese Economy*, vol. 40, no. 6, 49–67.

Moore M., 2013, Obstacles to Increasing Tax Revenues in Low Income Countries, Working Paper 15, International Centre for Tax and Development (ICTD).

Papke, L. E., Wooldridge J., 1996, Econometric methods for fractional response variables with an application to 401(k) plan participation rates, *Journal of Applied Econometrics* 11: 619–632.

Plesko G.A. 2003, An Evaluation of Alternative Measures of Corporate Tax Rates, *Journal of Accounting and Economics* 35, no. 2: 201–226.

Ribeiro A., Cerqueira A., Brandão E., 2015, The Determinants of Effective Tax Rates: Firms' Characteristics and Corporate Governance, FEP Working Paper n°567, University of Porto, dec.

Richardson G., Lanis R., 2007, Determinants of the Variability in Corporate Effective Tax Rates and Tax Reform: Evidence from Australia, *Journal of Accounting and Public Policy* 26, no. 6: 689–704.

Rota-Graziosi G., Geourjon A-M, Ménard G., 2014, Mali : Politique fiscale (diagnostic), Rapport d'assistance, FMI, septembre.

Schneider F., Buehn A., Montenegro Cl. E., 2010, New Estimates for the Shadow Economies all over the World, *International Economic Journal*, 24: 4, 443-461.

Stiglitz J., 2010, Development-Oriented Tax Policy, in *Taxation in Developing Countries: Six Case Studies and Policy Implications*, ed. by Roger H. Gordon, (New York: Columbia University Press), p. 11–36.

Tanzi V., Zee H.H., 2001, Tax Policy for Developing Countries, Economic Issues 27, International Monetary Fund.

Thomas A., Treviño J.P., 2013, Resource Dependence and Fiscal Effort in Sub-Saharan Africa, IMF Working Paper, WP/13/188.

Wilkie P. J., 1988, Corporate average effective tax rates and inferences about relative tax preferences, *The Journal of the American Taxation Association*, 10, 75–88.

Zimmerman J.L., 1983, Taxes and Firm Size, *Journal of Accounting and Economics* 5, no. 1: 119–149.