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Taxation and Income Inequality in Sub-Saharan Africa

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Abstract

In this paper, we examine which tax indicator among the weight of tax revenue and the tax structure reduces income inequalities in SSA. We use a model estimated in panel data using fixed effect ordinary least squares over the period 1992-2017. The model is inspired by the work of Martinez-Vazquez et al. (2012) and Dao and Godbout (2014). Our results reveal that the weight of tax revenue is more important in reducing income inequality in SSA than the tax structure used to collect the revenue. The analysis also shows significant heterogeneous results conditioned by corruption. The results appear to be robust to an alternative estimation technique.

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1. Introduction

Sub-Saharan Africa (SSA) has been experiencing high income inequality for several years. Indeed, the World Bank statistics (2019) indicate that the Gini index is around 42.3 on average. Also, except for Latin America and the Caribbean, SSA is the most unequal region in the world (FMI, 2015). To address income inequality, many studies have highlighted the role of taxation (Stiglitz, 2012; Saez, 2017; Alavuotunki et *al*. 2018; Cimenelli et *al*. 2018). For these studies, collecting more tax revenue allows governments to provide more public services to its citizens such as education, health and social transfers. Taxation thus appears to be an imperative in the fight against income inequality. Although the economic literature is unanimous on the fact that taxation is an instrument to fight against income inequality, the results differ depending on the choice of tax instrument. Two fiscal instruments are being debated upon. On one hand, some authors believe that the tax revenues collected are beneficial in reducing income inequality (Dao and Godbout, 2014; Martorano, 2018). According to these authors, tax revenues are used to finance policies against income inequality through the provision of public goods and services. Some other studies, on the other hand, agree that the tax structure, that is, how tax revenues are collected, is the only tax instrument that contributes in reducing income inequality (Martinez-Vazquez et *al*. 2012).

The divergence on the effects of taxation on income inequality can also be highlighted through stylized facts. At least two lessons can be drawn from the analysis of the relation between taxation and income inequality in SSA. The first lesson is on the mobilization of tax revenues. Between 1990 and 2017, SSA recorded an increase in tax revenue of 2.36% of GDP. This global statistic hides disparities between countries. For example, oil-exporting countries achieved an average level of tax revenue of 27% between 1990 and 2016 compared to 18% for other countries in the same period. In fragile states, the average level was below 15% of GDP. Despite this improvement in the mobilization of tax revenues, it appears that it is still insufficient compared to other regions of the world. Indeed, two elements can better justify this insufficient level of tax revenue. Firstly, the World Bank statistics show that tax revenues represent 18.58% of GDP in SSA compared to 22.8% and 34.3% respectively for Latin America and the Caribbean and OECD countries in 2017.

Secondly, Jacquemot and Raffinot (2018) confirm the good performance of tax revenues in Africa which in 2017 amounted to over 310 billion of dollars. However, if this performance in the mobilization of tax revenues is encouraging, Jacquemot and Raffinot (2018) find following Schmidt-Traub (2015) that these tax revenues are insufficient. Indeed, the financing needs related to the achievement of the SDGs in Africa amount to more than 1 trillion of dollars per year, one third of the income of all the African countries. The second lesson that emerges is the contrast between tax revenue mobilization and income inequality. Indeed, some countries, such as Zambia and South Africa recorded an average growth rate of tax revenue mobilization of 5%. However, income inequalities in these countries are not declining and remain high. This is also the case in

countries such as Namibia, Botswana, or the Seychelles, which recorded 2% growth rate in tax revenue mobilization but still have high income inequalities.

The purpose of this article is to verify which of the two tax indicators i.e. the weight of tax revenue and the tax structure, reduces income inequalities in SSA. Our analysis contributes to the existing literature in several aspects. First, it shows the polysemous nature of tax indicators. Indeed, the consideration of different indicators makes it possible to grasp their complexity and better formulate policies to reduce inequalities. Then, it stands out from this work by highlighting the heterogeneous nature of the effects of taxation mainly explained by institutional matter. Second, the paper incorporates an indicator that measures redistribution. This indicator is the difference between Gini on market income and post-fiscal income. This indicator is more straightforward to interpret than the other ones. Also, it clearly gives information about the real state of inequality. Third, the study contributes to the literature by focusing on the case of SSA. Indeed, to the best of our knowledge, there is no such study in the specific case of SSA. This choice is relevant insofar as income inequalities in SSA are among the highest in the world and reducing these inequalities is a development imperative for Africa. The rest of the paper is organized as follows. Section II describes the literature review. Section III presents the methodological strategy. Section IV presents and analyses the results. Finally, section V concludes.

2. Literature Review

The theoretical and empirical literature agree that taxation is an instrument in the fight against income inequalities. However, the divergence of results can be observed at the level of the tax instrument likely to reduce income inequalities. Some authors believe that it is the tax volume that contributes to the reduction of income inequalities. Others, however, highlight the role of the tax structure. At the theoretical level, the effect of taxation on income inequality is based on the modern theory of optimal taxation developed by Mirrlees (1971). According to this theory, the primary distribution of income is likely to be changed by utilizing tax levies and transfers. In addition, confronted with the use of indirect taxation and direct taxation to reduce income inequality, Mirrlees (1971) advocated the choice of direct taxation. Indeed, Mirrlees (1971) demonstrates that the fight against income inequality could be achieved only with direct income tax because it guarantees a greater and necessary fiscal mobilization to execute the transfers. However, Saez (2004) relativized this approach by showing that the choice of direct taxation is not systematically effective in reducing income inequality. According to this author, direct taxation is no more relevant when labour taxation is based solely on income. To this end, on one hand it recommends that in the short term, the fight against income inequality should be carried out through indirect taxation. On the other hand, it suggests that direct taxation should be implemented in the long run to combat income inequality. Stiglitz (2012) finds more mitigated results. He suggests that, to fight against income inequality, progressive taxation should be introduced. This progressive taxation according to Stiglitz (2012) is illustrated by the transformation of corporate taxes so that they are more progressive and more impermeable. Overall, the theoretical literature

highlights the tax structure as an instrument in the fight against income inequalities. It considers that the elements of the tax structure, indirect and direct taxes, better contribute to the reduction of income inequalities. However, the empirical literature seems more nuanced and led to contradictory results.

There are two conflicting trends regarding the tax component that can reduce income inequality. According to the first trend, it is the tax structure (that is, the way tax revenues are collected) that leads to the reduction of income inequalities. For example, Martinez-Vazquez et *al*. (2012) attest that progressive personal income tax and corporate income tax reduce income inequality. They also note that general consumption taxes, excise duties and custom duties have a negative impact on the distribution of income. These results are consistent with the work of Bastagli et *al*. (2012). Similarly, Woo et *al*. (2013) analysed the effects of fiscal policies on income inequality in a panel of advanced and emerging market economies over the last three decades, complemented by a case study of selected consolidation episodes. They Show that fiscal consolidations are likely to raise inequality through various channels including their effects on unemployment. Spending-based consolidations tend to worse inequality more significantly, relative to tax-based consolidations. The composition of austerity measures also matters. Progressive taxation and targeted social benefits and subsidies introduced in the context of a broader decline in spending can help offset some of the adverse distributional impact of consolidation.

The second trend is that tax revenues are much more important in reducing income inequality than the tax structure. In this vein, Dao and Godbout (2014), in a sample of OECD countries, point out that the level of tax revenue collected is more important than the tax structure that governments use to collect it. They also add that collecting more tax revenues allows governments to provide more public services and transfers to their citizens. The work of Martorano (2018) also went in the same direction. Indeed, it has shown that the effect of the tax structure on income inequality is limited and therefore, suggests more mobilization of tax revenues to reduce income inequality. To our knowledge, there are no studies that have assessed which of the fiscal instruments reduces income inequalities in the specific case of SSA. Also, the heterogeneous nature of the effects of taxation has not been considered in the existing articles. The consideration of these various shortcomings constitutes the objective and the originality of this article.

3. Methodological Strategy

3.1. Empirical Model

Following Martinez-Vazquez et *al*. (2012) and Dao and Godbout (2014), we verify which of tax indicators i.e, tax revenue and tax structure reduces income inequality. The empirical model can be specified as follows:

$$I_{it} = \alpha X_{it} + \gamma F_{it} + \delta_i + \varepsilon_{it} \quad (1)$$

For i =1, …34 and t= 1992…2017.

Where I_{it} measures the level of income inequality for country *i* at year *t*. It's obtained by calculating the difference between Gini on market income and post-fiscal income. δ_i denotes country-fixed effects. ε_{it} is a vector of error terms, which are assumed to be serially uncorrelated. F_{it} indicates the tax variables. We use four measures to capture taxation: tax revenues as a percentage of GDP (tax revenues), the ratio of income taxes to total revenues (imp), direct taxes, and indirect taxes. X_{it} is a vector of control variables. The control variables include: Income per capita (GDP), natural resources (NRs), trade openness (Open), inflation (CPI), credit to the private sector (CPS) and public expenditure on social transfers (ExST).

Income per capita explains the market size and the level of purchasing goods which is captured by the logarithm of per capita GDP and its squared term to capture a potential Kuznets curve hypothesis. Under this hypothesis, inequality is expected to exhibit an inverted U-curve as an economy develops. In the initial stage of development, the structural transformation that implies shifts from agriculture to industry and services and adoption of new technologies benefits only a small segment of the population, leading to a rise in inequalities. Over time, a larger share of the population, and eventually the majority, finds employment in the high-income sector, leading to a decline in income inequality. The variable natural resources is captured by the ratio of the rent of natural resources to GDP. Indeed, Buccellato and Alessandrini (2009) show that the dependence on natural resources increases income inequality. However, Fum and Hodler (2010) questioned this result by demonstrating that natural resources widen income inequalities in ethnically polarized societies but reduce them in ethnically homogeneous societies. Concerning the variable openness, many studies have evaluated its relationship with income inequality. This variable is captured by the sum of exports and imports over GDP and is a proxy for globalization. There is no consensus in the literature concerning the sign of the relationship between openness and income inequality. Some authors such as François and Nelson (2003) find that openness reduces income inequality. However, Mahesh (2016) shows that openness accentuates income inequality. Concerning inflation, it's measured by the consumer price index (Cpi). Many studies found that, inflation negatively affects income inequality. It's the case of Erosa and Ventura (2002). Also, Albanesi (2007), explored the hypothesis that the correlation between inflation and income inequality is the outcome of a distributional conflict underlying the determination of government policies.

About credit to the private sector, it's measured by domestic credit to private sector in % of GDP. Some authors found that, credit to the private sector plays a critical role in the fight against inequality. It's the case Claessens and Perotti (2007). In addition, Galor and Zeira (1993) and Corak (2013) have also underlined the importance of credit to the private sector in the fight against income inequalities. For these authors, in a context where the credit market is imperfect, low-

income households cannot have access to credit. This difficulty in accessing credit limits the investment of these households in the field of education. Under such conditions only high-income households have easier access to education. Thus, credit to the private sector plays a decisive role in reducing inequalities. The last control variable is public expenditure on social transfers (ExST) measured by the ratio of total expenditure on cash transfers as a percentage of GDP. Some works has shown that high public spending on social transfers is associated with lower income inequality. For example, Agostino et *al*. (2019) found that a 1% increase in the share of social transfers reduces income inequality by one-half of a percentage point.

3.2. Estimation Technique

The estimation technique used in this study is the Fixed Effect Ordinary Least Squares method. The main benefit of fixed effects estimations is that the potential sources of biases in the estimations are limited in comparison to classical OLS models. We propose an alternative technique of estimation for robustness test. This robustness test is performed by estimating with instrumental variables. The choice of this technique is mainly motivated by the suspected endogeneity problems. Indeed, as demonstrated by Dao and Godbout (2014), there is an endogeneity between taxation and income inequalities. For example, a government might have to change its tax structure precisely because of pre-existing income inequalities.

3.2.1. Data

The data set consists of cross-country observations for 34 Sub-Saharan African countries over the period 1992-2017. The data used for this study comes from three sources. The first source is the World income inequality database (WIID), which collects information on income inequality for developed, developing, and transition countries. The second source is the World development indicator (WDI) which provides information on control and interest variables. The third source is The International Country Risk Guide (ICRG) which provides data on corruption index.

4. Presentation and analysis of results

The results of our estimation are reported in table 1. In this table, the first, second, third and fourth column describes respectively the results of different taxation indicators notably: tax revenues (Model 1), the ratio of income taxes to total revenues (Model 2), direct taxes (Model 3) and indirect taxes (Model 4). The results deserve several comments.

Table 1: Estimated coefficient of the fixed-effect Ordinary Least Square model

	Model 1	Model 2	Model 3	Model 4	Model 5
NRs	-0. 031***	-0.002	-0. 019***	-0.023***	-0.031
	(0.00)	(0.11)	(0.00)	(0.00)	(0.25)
CPI	-0. 08***	-0.015	-0. 022**	-0.04**	0.013
	(0.00)	(0.43)	(0.03)	(0.02)	(0.69)
Open	0. 004**	0.017***	0.005**	0.005**	0.002***
	(0.00)	(0.00)	(0.02)	(0.04)	(0.00)
CPS	0. 011	0.007**	0. 005*	0.002	0.017***
	(0.25)	(0.02)	(0.07)	(0.27)	(0.00)
GDP	0. 003	0.005	0. 02	0.01	0. 003
	(0.27)	(0.24)	(0.11)	(0.11)	(0.26)
ExST	-0.56**	-0.22***	-0. 71*	-0.91**	-0.63***
	(0.05)	(0.00)	(0.07)	(0.04)	(0.00)
Taxe revenues	-0.052**	-0.042**	-0.053*	-0.089**	-0.076**
	(0.05)	(0.03)	(0.09)	(0.02)	(0.04)
Imp		0.031			0.021
		(0.42)			(0.32)
Direct taxes			0.012**		0.031
			(0.02)		(0.32)
Indirect taxes				0.031***	0.024
				(0.00)	(0.87)
R^2 ajusted	0.57	0.59	0.57	0. 57	0.58

*Note: ***, **, * denotes statistical significance at 1%; 5% and 10%.*

The empirical estimation on Table 1 reveals two main results; firstly, it emerges that, the tax revenue or tax weight (tax revenue as a percentage of GDP) is the only tax indicator that reduces income inequality in SSA. In other words, the increase in tax volume of 1% reduces income inequality by 0.052% in SSA. This result is consistent with the literature, since the fight against income inequality is achieved through the provision of public services, transfers, and public infrastructure. Our results reveal that the main transmission channel through which taxation affects income inequality is the channel of spending on social transfers. Indeed, our results show that when social transfers increase by 1%, income inequality in SSA decreases by 0.56%. This result corroborates with those of Agostino et *al* (2019) and Sanchez and Perez-Corral (2018) who showed that social transfer spending is an effective instrument to fight income inequality in OECD countries. This result thus implies that as the volume of taxation increases, this induces an increase in social transfers that will alter the purchasing power of households and consequently decrease income inequality.

Secondly, direct and indirect taxes do not seem to be instruments for combating income inequality in SSA. This result corroborates the work of Martinez-Vasquez et *al*. (2012) which demonstrated

that the tax structure is less effective against income inequality. To verify the relevance of our results, we introduced in the same regression all tax variables (model 5). Our analysis confirm that tax revenue is the only tax variable with a negative and significant sign. In other words, the tax revenue is the only tax variable that contributes in reducing income inequality, unlike the variables related to the tax structure in SSA. Both results are consistent with the work of Dao and Godbout (2014), who found that the weight of tax revenues in an economy is much more important in reducing income inequality than the characteristics of the tax structure used to collect them.

However, the results differ depending on whether countries have high or low level of corruption. Indeed, we have estimated the interaction between the tax revenue and corruption on income inequality. Our results indicate that in countries with high level of corruption, tax revenue does not systematically reduce income inequality. This is because the amounts allocated to social transfers are reduced and invested in non-productive sectors. On the other hand, it appears that in countries with low level of corruption, the volume of tax revenue significantly reduces income inequality. This is because these countries have sufficient resources to finance public services. These results are reported in appendices 1 and 2. This result corroborates the work of Mauro et *al.* (2019). They found that corruption can have a profoundly detrimental effect on public finances as governments collect less in tax revenue and overpay for goods and services or investment projects.

Concerning the control variables, trade openness, credit to the private sector and income per capita have a positive effect on income inequality in SSA; in other words, they contribute in widening the income gap between households. These results are significant and consistent with several empirical studies. For instance, Mahesh (2016) found that an increase in trade as percentage of GDP has in fact resulted in worsening income distribution in the concerned countries. This result is predictable as imports do not promote employment opportunities but constitute a large consumption market. Similarly, this result reflects the fact that even the expansion of exports is not enough to reduce income inequality as these exports require advanced technology and adequate infrastructure. With respect to credit to the private sector, the positive result reflects the idea that the loans granted are directed towards a minority of wealthy households, eligible for these credits. In other words, access to credit would be conditioned by a certain level of income and regulatory requirement, of which only the wealthiest can provide. Regarding income per capita, our results show that economic growth is not consistently associated with lower income inequality. This finding corroborates the work of Piketty (2015) and Stiglitz (2015) who challenged Kuznets's (1955) theory that economic growth reduces income inequality. When it comes to natural resources, our results show that natural resources contribute in reducing income inequality in SSA. This result contrasts those of Buccellato and Alessandrini (2009). It is explained by the fact that, by generating significant resources, natural resources give States the opportunity to provide public goods and services that eventually contribute to the reduction of inequalities.

Robustness analysis were conducted to address a potential endogeneity bias between taxation and income inequality. Indeed, a high level of income inequality encourages public authorities to increase the mobilization of tax revenues. Thus, permitting all things being equal, transfers to

vulnerable strata. Similarly, for public authorities to make an investment decision in sectors likely to reduce income inequality, they will consider the previous levels of these inequalities. The use of the Two stage least squares technique involves the choice of instruments. The choice of instruments is inspired by the work of Dao and Godbout (2014). For example, we use two demographic indicators: the employment rate and the proportion of the working age population. This choice is motivated by the fact that tax revenues are collected, among other things, from taxes on income and wages. Note that the higher the employment rate, the higher the revenues. Likewise, a large labour force is a potential source of substantial tax revenue mobilization. The computing of the correlation coefficients between the tax volume (the tax variable is most likely to suffer from an endogeneity bias) and the employment rate on one hand and the working age population on the other hand gives values of 0.71 and 0.53 respectively. The results of this robustness analysis (Table 2) confirm those of our baseline analysis.

Table 2: Estimated coefficient of the Two Stage Least Square model

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
NRs	-0. 05**	-0.012	-0. 009***	-0.07*	-0.009
	(0.02)	(0.32)	(0.00)	(0.09)	(0.51)
CPI	-0. 34***	-0.024	-0. 005**	-0.021	0.011
	(0.00)	(0.63)	(0.03)	(0.00)	(0.77)
Open	0. 012**	0.005***	0.004**	0.021**	0.013***
	(0.04)	(0.00)	(0.05)	(0.03)	(0.00)
CPS	0. 021	0.022***	0. 018*	0.012	0.01***
	(0.17)	(0.00)	(0.06)	(0.31)	(0.00)
GDP	0. 11	0.017	0. 009	0.13	0. 008
	(0.25)	(0.53)	(0.38)	(0.44)	(0.26)
ExST	-0.011*	-0.032*	-0. 004**	-0.061***	-0.053*
	(0.08)	(0.07)	(0.01)	(0.00)	(0.09)
Tax revenues	-0.025***	-0.09	-0.028**	-0.023**	-0.011*
	(0.00)	(0.31)	(0.03)	(0.05)	(0.08)
Imp		0.005			0.006
		(0.35)			(0.37)
Direct taxes			0.077***		0.055
			(0.00)		(0.77)
Indirect taxes				0.007***	0.0018
				(0.00)	(0.61)
Sargan test	102.3	104.1	102.2	103.1	101.1
P-Value	0.46	0.37	0.41	0.53	0.48
Basmann test	0.08	0.73	0.09	0.09	0.09
P-value	0.55	0.39	0.75	0.65	0.65
R^2	0.60	0.60	0.60	0. 60	0.60
R^2 ajusted	0.58	0.57	0.57	0. 57	0. 58

*Note: ***, **, * denotes statistical significance at 1%; 5% and 10%. The results on this table use the employment rate and the proportion of working age the population as instruments of tax volume.*

5. Conclusion

The paper analysed which tax indicator among the weight of tax revenue and the tax structure reduces income inequality in SSA. Our sample consist of 34 SSA countries over the period 1992-2017 in panel data. Our empirical strategy is based on the fixed effect Ordinary Least Square technique and the robustness of the results was tested by the two stage least squares technique with instrumental variables. Following the empirical investigation, the results showed that the tax revenue is the only tax indicator that reduces income inequality in SSA. This result is consistent and it's in line with the literature since the fight against income inequality is mainly the result of public spending and transfers. Consequently, an increase in the mobilization of tax revenues leads to an increase in public spending. Our results suggest several recommendations. The first recommendation calls on the authorities of SSA countries as well as non-State institutions to strengthen the mobilization of tax revenues. While the current volume of tax revenues seems to be effective in addressing income inequality, it seems logical that States should broaden the tax base for a greater mobilization of other forms of taxation. The second recommendation calls on the authorities to review the nominal tax rates and promote the expansion of the tax base. One of the findings in SSA is the poor mobilization of tax revenue.

Although our results show that tax revenue mobilization is much more important in reducing income inequality than the tax structure, it is still apparent that tax revenues in SSA remain low compared to tax revenues in developed countries. The main challenge for SSA countries in this regard is to maximize revenue by changing their tax base. Unlike the present study, future studies could explore the non-linear effect of tax revenue on income inequality in SSA. These studies could determine the level of tax revenue that would maximize the reduction of income inequalities in SSA. Such an approach is relevant for at least two reasons. First, some countries in SSA show an increase in tax revenues without decreasing income inequalities. The problem of the level of tax revenue could therefore explain such a paradox. Secondly, such a non-linear approach will make it possible to identify the different possibilities states have to modify their tax base to maximize revenue.

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APPENDICES

Table 1: Interaction between corruption and Tax revenues on inequality in countries with high level of corruption in SSA

	fixed-effect Ordinary Least Square method	Two Stage Least Square method
Corr*Taxes_R_{it}	-0.076	-0.033
	(0.23)	(0.17)
Fixed Effect	Yes	No

Notes: Corr*Taxes_R_{it} is the interaction between control of corruption and tax revenues

Table 2: Interaction between corruption and Tax revenues on income inequality in countries with low level of corruption in SSA

	fixed-effect Ordinary Least Square method	Two Stage Least Square method
Corr*Taxes_R_{it}	-0.018**	-0.026*
	(0.03)	(0.08)
Fixed Effect	Yes	No

*Note: ***, **, * denotes statistical significance at 1%; 5% and 10%.*

Table 3: Descriptive statistics

Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Gini on market income	823	44.67	7.62	33.1	62.5
Gini post fiscal income	823	41.10	6.69	28.3	59.5
Redistribution	823	5.42	2.26	5	10.1
Income per capita	823	10.32	17.08	-6.23	141.64
Natural resources	795	0.94	1.622	0	4.16
Inflation	790	5.9	2.37	4.41	42.77
Openness	796	71.77	50.48	11.08	185.73
Credit to private sector	787	16.92	20.99	3.73	160.12
Expenditure on social transfers	803	7.13	5.89	6.74	15.32
Corruption	819	2.25	0.89	1	4
Direct Taxes	817	110.52	384.01	0.87	5677
Indirect Taxes	817	139.84	386.79	1.60	4537
Income taxes to total revenues	817	35.86	19.68	10.81	95.67
Tax revenues	817	13.88	11.4	6.8	29.31