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Tax revenues and productive capacity in sub-Saharan Africa

Summary : Productive capacity refers to the ability of a country or region to produce goods and services efficiently and competitively. The objective of this paper is to analyze the contribution of tax revenues to the improvement of productive capacities in Sub-Saharan African countries. Since productive capacities are composed of multiple elements, the study specifically examined the influence of tax revenues on the productive capacity index. To achieve this, we specified a dynamic panel model estimated using the Generalized Method of Moments (GMM). The data used comes from the World Bank's World Development Indicator (WDI) and the United Nations Conference on Trade and Development (UNCTAD) over the period 2000-2018. The results indicate that tax revenues enhance the productive capacity index in Sub-Saharan African countries. The study then suggests favorable conditions for the efficient use of tax revenues to finance the development of basic infrastructure that facilitates industrial development.

Keywords: Tax revenues - Productive capacities - Sub-Saharan Africa.

Recettes fiscales et capacités productives en Afrique subsaharienne

Summary*: Les capacités productives se réfèrent à la capaicté d'un pays ou d'une region à produire des biens et services de façon efficace et competitive. L'objectif de ce papier est d'analyser la contribution des recettes fiscales à l'amélioration des capacités productives dans les pays de l'Afrique Subsaharienne. Les capacités productives étant la composante de plusieurs éléments, l'étude a précisément analysé l'influence des recettes fiscales sur l'indice des capacités productives. Pour cela nous avons spécifié un modèle de panel dynamique estimé au moyen du Méthode des Moments Généralisés (GMM). Les données utilisées proviennent de World Developpment Indicator (WDI) de la Banque Mondiale et de la Conférence des Nations Unies pour le Commerce et le Développement (CNUCED) sur la période 2000-2018. Les résultats montrent que les recettes fiscales améliorent l'indice des capacités productives dans les pays de l'Afrique Subsaharienne. L'étude suggère alors les conditions favorables à l'utilisation efficace des recettes fiscales afin de financer le développement des infrastructures de base qui facilitent le développement industriel.*

Mots-clés : *Recettes fiscales - Capacités productives - Afrique Subsaharienne.*

JEL Classification : H21 - H25 - D24.

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1. Introduction

In the age of globalization, industrial development remains a potent means to promote human well-being and the common interest, as envisaged in the Sustainable Development Goals (SDGs, 2016). To this end, the United Nations Industrial Development Organization (UNCTAD) intends to undertake activities to foster industrial development. These include the implementation of policies conducive to enhancing the trading capacities of businesses and sectors, and environmental and energy aspects falling within the framework of SDGs 7 and 8. UNCTAD also undertakes actions to reduce poverty through productive activities (linked to SDGs 1 and 3).

It is essential to recognize that many developing countries have demonstrated their ability to make significant progress in economic growth by strengthening their productive capacities, enabling them to lift a portion of the population out of poverty. In this regard, history shows that no country has succeeded in progressing towards development without devoting adequate investments to industrial and manufacturing sectors. The success of certain East Asian countries demonstrates that well-formulated and implemented industrial strategies can improve economic and social conditions (UNCTAD, 2021). This success primarily stemmed from establishing the necessary conditions for industrial activities to thrive. Therefore, it concerns financing infrastructure components of productive capacities.

Financing basic infrastructure for promoting sustainable economic development inevitably involves developing sectors, notably the industrial sector. Developing countries in sub-Saharan Africa could draw inspiration from Asian countries and developed nations that focused early on the development of the industrial sector. Establishing and developing manufacturing or industrial enterprises is thus a credible model that continues to prove its worth to this day. It would be interesting for Sub-Saharan African countries to lay sustainable foundations for industrialization and hence industrial development. For this, the financing sources for basic infrastructure cannot exclusively rely on external financing or borrowing. Africa needs to harness its own resources. In most Sub-Saharan African countries, some rely solely on tax revenues as the primary internal financing source. Other countries, apart from tax revenues, have mineral or natural resources for this funding.

However, the central question concerns the actual effect of tax revenues on the development of activity sectors. Besides their three functions defined by Musgrave (1959), Laffer (1977), and notably Barro (1990), suggest that tax revenues can hinder the growth of activity sectors once they exceed a certain threshold. Based on recent studies (Olaoye & al., 2019; Otwani & al., 2017; Akadakpo & Akogo, 2022; Aghion & al., 2016; etc.), it is evident that tax revenues; hence taxation, can sometimes have a negative or positive impact on businesses, considering certain factors and the business environment.

But regarding the role of taxation in financing basic conditions for economic activities development and thus industrialization, especially in developing countries, the question remains open. The role of taxation in financing productive capacities in developing countries has scarcely been debated in the literature. Productive capacities represent the

pre-takeoff and takeoff stages defined by Rostow (1980) to achieve industrialization. Developing productive capacities in these countries will thus lead to the maturity stage, characteristic of local industries competitiveness in the global market. This competitiveness will increase durable goods consumption, paving the way towards mass consumption and thus innovation and research and development.

Today, innovations and research and development are important drivers of the economy in developed countries. It would be interesting for developing countries like those in Sub-Saharan Africa to focus on developing their productive capacities to achieve sustainable economic development. The objective of this paper is therefore to analyze the importance of taxation in this process. We believe that taxation, through tax revenues, remains a credible financing source for productive capacities in Sub-Saharan African countries. To our knowledge, this study is the first to analyze the role of taxation in financing productive capacities in Sub-Saharan African countries. The conclusions drawn from this study are thus significant for empirical literature and serve as a basis for future studies.

The rest of this study is organized as follows: the first section delves into theoretical and empirical insights (literature review) on the relationship between taxation and productive capacities (through the link between its components); the second section presents the methodology used, the third section presents the results and discussions; and finally, the fourth section concludes the study.

2. Littérature review

This section is dedicated to the review of theoretical and empirical literature on the relationship between tax revenues and the components of the productive capacity index. The aim here is to synthesize the research that has demonstrated how fiscal measures can be used to enhance the productive capacity index. Since tax revenues are the result of these fiscal measures, this literature will allow us to analyze the influence of tax revenues on improving productive capacities.

2.1. Theoretical review

Taxation is a crucial tool for financing transport and energy infrastructure, playing a decisive role in economic growth and infrastructure development. According to economic theory, public infrastructure such as roads and energy networks are public goods that require appropriate public financing to maximize their utilization and impact on the economy (Aschauer, 1989). The theory of tax incentives suggests that governments can use fiscal measures to encourage private investments in infrastructure, thereby reducing the burden on public financing while stimulating economic growth (Barro, 1990).

Tax policies also influence the development of the private sector by altering investment incentives. The Laffer Curve posits that there is an optimal tax rate that maximizes tax revenues without discouraging investments (Laffer, 1974). Excessively high tax rates can indeed reduce companies profit margins and hinder their expansion, while tax incentives such as tax credits can encourage investment and job creation (Besley &

Seabright, 1999). Conversely, poorly designed tax policies can lead to economic distortions and market inefficiency.

Finally, the development of information and communication technologies (ICT) and human capital is also heavily influenced by taxation. Excessive taxes on ICT equipment can hinder the adoption of new technologies and slow economic growth (Katz and Callorda (2019). In contrast, tax incentives aimed at reducing the costs of these technologies can stimulate their adoption and enhance the competitiveness of economies (Koutroumpis et al., 2011). Moreover, human capital theory emphasizes the importance of investing in education and training to improve productivity, and favorable tax policies can play a key role in this process (Stork & Esselaar, 2018).

2.2. Empirical review

Empirical research confirms the importance of taxation in the development of transport and energy infrastructure. Calderon & Serven (2004) demonstrated that well-targeted public investments in infrastructure can stimulate economic growth by reducing transaction costs and improving market efficiency. Similarly, Botkin (2020) showed that tax incentives, such as tax credits, can encourage private investments in infrastructure, thereby increasing economic efficiency and competitiveness.

Regarding the private sector, studies by Zamil and Hossen (2012) indicate that targeted tax reductions can have a significant impact on corporate investment, particularly in emerging sectors like ICT. In a study, Katz and Callorda (2019) found that ICT-friendly taxation can stimulate investments in digital infrastructure, thereby enhancing connectivity and economic growth. Similarly, Klemm & Van Parys (2012) found that tax incentives can attract foreign direct investment, boosting the productivity and competitiveness of local companies.

In the field of ICT, research by Koutroumpis et al. (2011) and Stork and Esselaar (2018) emphasizes the importance of favorable tax policies in supporting the development of digital infrastructure. Excessive taxation can limit access to advanced technologies, while tax incentives can encourage their widespread adoption and use, thereby stimulating economic development. Additionally, studies by Fuller-Love (2006) show that well-designed tax policies can help mitigate negative externalities such as congestion and pollution by encouraging businesses and individuals to adopt more sustainable practices.

Furthermore, the work of Bjertnæs (2019a, 2023) indicates that taxation can also play a key role in promoting human capital. Tax incentives for education and training can encourage investment in human capital, thereby increasing productivity and long-term economic development. Targeted tax policies can also help reduce inequalities by facilitating access to education and improving employment prospects for vulnerable populations.

These empirical studies clearly show that the components of productive capacities can be enhanced through tax measures. Since tax revenues are the outcome of tax measures, we can assert from these theoretical and empirical findings that tax revenues contribute

to the improvement of productive capacity indices, particularly in Sub-Saharan African countries.

3. Methodological framework and estimation technique

This section focuses on the presentation of the theoretical and empirical model of the study, the description of the data sources used, and the analysis of the descriptive statistics of the variables.

3.1. Theoretical Analysis Model

To determine the contribution of taxation to improving the productive capacity of countries, we refer to the endogenous growth model, specifically Barro (1990) model, which incorporates public spending as endogenous and a source of financing for production and economic growth. It is based on the premise that the government provides directly productive public goods that contribute to the macroeconomic production function. The basic model is as follows:

$$Y = AK^{1-\alpha}G^{\alpha} \quad (1)$$

The provision of public goods increases the productivity of private capital and incentivizes investment; an increase in public spending enhances growth, at least up to a certain point.

The following hypotheses are formulated:

It is assumed that the production function has two inputs: capital and productive public spending.

$$Y = AK(t)^{1-\alpha}G(t)^{\alpha} \quad (2)$$

α represents the elasticity of production with respect to public capital,

The government taxes the economy income at a rate such that public revenue is determined by:

$$G(t) = \tau.Y(t) \quad (3)$$

with τ representing the tax rate,

To simplify, we assume that the population growth rate (n) is zero.

$$\frac{DL(t)}{L(t)} = n = 0 \quad (4)$$

The representative agent seeks to maximize an intertemporal consumption function of the form

$$U = \int_0^{+\infty} e^{-\rho t} \frac{C(t)^{1-\sigma}-1}{1-\sigma} dt \quad (5)$$

If we consider that a portion of the income is captured by the government, then the representative agent has only a portion $1 - \tau$ available for investment and consumption. Thus, the dynamic equation for capital accumulation is given by :

$$DK(t) = (1-\tau)Y(t) - C(t) \quad (6)$$

Investment per capita is thus the portion of post-tax income not allocated to consumption. The optimization problem yields the following result :

$$\frac{DC(t)}{C(t)} = \frac{1}{\sigma}((1-\tau)Pmk - \rho) \quad (7)$$

In this model, Barro (1990) starts with these four assumptions to introduce a government sector into the growth model, which finances its public expenditures through an average income tax. He considers public expenditures as necessary production inputs for the private sector. The provision of public goods increases the productivity of private capital and encourages investment. An increase in these expenditures enhances growth and development in economic sectors, thereby boosting production growth. We retain that in the following equation :

$$Y = AK(t)^{1-\alpha}G(t)^{\alpha} \quad (8)$$

- Y represents Gross Domestic Product (GDP) or total output,
- A is a measure of technology,
- K represents the stock of physical capital,
- G represents public expenditures, which are assumed to be represented by tax revenues,
- α is the elasticity of production of public capital and t is time variable.

This model allows for a dynamic analysis of production growth in relation to increased public expenditures, represented here by tax revenues.

Therefore, this theoretical model is well-suited to the focus of our study, with the primary objective being to analyze the influence of taxation or tax revenues on the improvement of productive capacities in Sub-Saharan African countries.

3.2. Model specification and estimation technique

3.2.1. Model specification

Our reference model is the endogenous growth model of Barro (1990), which incorporates public expenditure as a source of funding for public and private investments and as a source of funding for production growth. The basic model is as follows:

$$Y = AK^{1-\alpha}G^{\alpha} \quad (9)$$

By incorporating individual and time dynamics, this equation becomes:

$$Y_{it} = AK_{it}^{1-\alpha}G_{it}^{\alpha} \quad (10)$$

t represents the time dimension (period t) and i represents the individual (country). Y_{it} therefore, represents the production of a country i in period t.

By linearizing equation (10), we obtain the following equation (11):

$$LogY_{it} = LogA + (1-\alpha)LogK_{it} + \alpha LogG_{it} \quad (11)$$

This equation shows that:

$$LogY = F(LogA, LogK, LogG) \quad (12)$$

Let assume that $Y = CP$, where CP represents productive capacities and G represents tax revenues. Our empirical model stems from this equation (12) and takes the following form:

$$CP_{it} = \beta_0 + \beta_1 CP_{it-1} + \beta_2 Fis_{it} + \beta_j X_{jit} + \mu_i + \vartheta_t + v_{it} \quad (13)$$

In this model, CP represents the productive capacities representing the dependent variable; Fis represents tax revenues; X is a vector of explanatory variables that we have added to the base model; $\mu_i$is the country fixed effect; ϑ_t is the time fixed effect, and v_{it} is the error term with a zero mean and constant variance by assumption.

The specified equation (13) is thus a dynamic panel. Its choice is inspired by (Guadagno, 2012) and is justified by the fact that the current level of productive capacities or industrial development of developing and developed countries is influenced by its previous level. Furthermore, productive capacities are captured by an index called the Productive Capacities Index (PCI). The vector of variables X consists of a variable related to physical capital called financial development (*DF*), trade openness, and foreign direct investment (*IDE*). The model to be estimated is therefore presented as follows:

$$PCI_{it} = \beta_0 + \beta_1 PCI_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (14)$$

Finally, the index of productive capacities consists of eight elements. Each of the models to be estimated related to these components is presented as follows:

$$Energie_{it} = \beta_0 + \beta_1 Energie_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (15)$$

$$Caphumain_{it} = \beta_0 + \beta_1 Caphumain_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (16)$$

$$TIC_{it} = \beta_0 + \beta_1 TIC_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (17)$$

$$Institutions_{it} = \beta_0 + \beta_1 Institutions_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (18)$$

$$Capfinancier_{it} = \beta_0 + \beta_1 Capfinancier_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (19)$$

$$Sectprivé_{it} = \beta_0 + \beta_1 Sectprivé_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (20)$$

$$Changstruturel_{it} = \beta_0 + \beta_1 Changstruturel_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (21)$$

$$Transports_{it} = \beta_0 + \beta_1 Transports_{it-1} + \beta_2 Fis_{it} + \beta_3 DF_{it} + \beta_4 Ouv_{it} + \beta_5 IDE_{it} + \mu_i + \vartheta_t + v_{it} \quad (22)$$

3.2.2. Estimation technique

As mentioned above, the specified empirical model to determine the contribution of taxation to the productive capacities of countries in Sub-Saharan Africa is a dynamic panel model.

A dynamic panel model is one in which one or more lags of the dependent variable appear as explanatory variables. Unlike standard econometric techniques like Ordinary Least Squares (OLS), Dynamic Panel Generalized Method of Moments (GMM) techniques are required to obtain unbiased estimates of such a model due to the presence of the lagged dependent variable "on the right-hand side of the equation." OLS estimations result in biased estimates. The GMM method relies on the orthogonality conditions between lagged variables and the error term, both in first differences and in levels. When the dynamic model is expressed in first differences, the instruments are in levels, and vice versa.

In the model to be estimated, the validity of the chosen instruments can be confirmed or refuted through Hansen and Sargan tests. There are two variants of the GMM estimator in dynamic panel data: the Difference GMM estimator and the System GMM estimator.

The Arellano-Bond Difference GMM estimator (1991) involves taking the first difference of the equation to be estimated for each period to eliminate individual-specific effects. The endogenous variable is then instrumented by its lagged values from 2 periods and more. However, this method does not allow for identifying the effect of time-invariant factors.

Blundell and Bond (1998) have shown through Monte Carlo simulations that the System GMM estimator outperforms the Difference GMM estimator because the latter produces biased results in finite samples when the instruments are weak. Thus, the Blundell-Bond System GMM estimator (1998) eliminates specific effects (firms/countries) while using appropriate levels of lagged values for all potentially endogenous variables as instruments.

In this study, we opt for the System GMM estimator to ensure the robustness of our results (Blundell and Bond, 1998; Johnston and Dinardo, 2006).

3.3. Data and Descriptive Statistics

3.3.1. Data sources

The data used in this study are sourced from two main databases: the World Development Indicators (WDI) and the United Nations Industrial Development Organization (UNCTAD). Our sample comprises 42 countries in Sub-Saharan Africa. The data cover the period from 2000 to 2018, considering the availability of data on the productive capacity index.

3.3.2. Descriptive Statistics

The analysis of the descriptive statistics of the variables shows that the index of productive capacities averages 22.96% in Sub-Saharan Africa. The countries of the Economic Community of Central African States (ECCAS) present the lowest average value (20.81%); with a maximum value of 26.72%, they also have the lowest minimum value (12.57%) in the sample. The highest value of the index of productive capacities is obtained in the countries of the Southern African Development Community (SADC); this value is 37.38%; significantly higher than the maximum value in the sample (31.11%). This indicates that countries in this region have the most conducive conditions for business development and the establishment of industries. They fulfill the most conditions for the development of the industrial sector. In this community, the minimum value of the index is 17.25%. In the Economic Community of West African States (ECOWAS), the index of productive capacities averages 21.72%; close to the sample average. It is also observed that the average value of the index in the member countries of the Common Market for Eastern and Southern Africa (COMESA) is 22.52%, which is slightly below the sample average for the period 2000-2018. Descriptive statistics of the variables used are presented in Table 1.

Table 1 : Descriptive statistics of the variables used

Variable	Obs	Means	Std.Err.	Min	Max
PCI	798	22.9646	4.371878	12.57652	37.3891
PCI(CEDEAO)	266	21.72018	3.230766	13.31935	31.11466
PCI(SADC)	266	25.62534	5.15901	17.25253	37.3891
PCI(COMESA)	114	22.52611	2.350814	16.62387	27.40505
PCI(CEEAC)	152	20.81495	3.424052	12.57652	26.7282
Tax revenues	356	15.9799	7.66481	4.098501	39.9876
DF	775	18,19116	16,97767	1,52e-06	104.8486
Trade openness	642	0.3258811	0.3316683	0.0000322	1.732023
FDI	629	-5.89e+08	1.31e+09	-1.20e+10	5.39e+09
Human Capital	798	34.05349	6.499563	18.66143	51.06296
Natural Capital	798	57.28494	8.507637	14.60774	96.68579
Energy	798	19.4452	6.31821	5.606929	59.21154
Transportation	798	12.24175	5.774547	4.002406	49.27331
ICT	798	4.858231	2.433703	2.756884	17.13541
Institutions	798	42.29215	12.93029	17.16477	74.95433
Private sector	798	70.28868	8.375632	38.18732	87.84133
Changement structurel	798	14.2962	4.075387	0.9556979	27.59154

Source: Authors based on data from UNCTAD, 2022; WDI, 2023

4. Presentation and Discussion of results

4.1. Presentation of estimation results for all considered countries

The estimation results presented in Table 2 show that the probability associated with AR (1) is less than 5%, and the one associated with AR (2) is more than 5%. Therefore, we can accept the presence of an AR (1) effect for the residuals and the absence of an AR (2) effect. This is in line with the model validity assumptions. Furthermore, the Sargan or Hansen test validates the choice of instruments. The probability associated with the Fisher test shows that the explanatory variables are globally significant.

Indeed, the estimation results related to the productive capacity index show that, in addition to the lagged variable of the productive capacity index, which is significantly positive at 1%, all the explanatory variables are significant. These include tax revenues (Fis), significantly positive at 1%; financial development (DF), significantly positive at 1%; foreign direct investments (FDI), significantly positive at 1%; and trade openness (Ouv), significantly positive at 5%. To analyze the effect of each of these variables on the components of productive capacities, we estimate on each of these variables.

Thus, when analyzing the effect of tax revenues on each component of productive capacities, the estimation results show that tax revenues have a significant and positive influence on transport, information and communication technologies, and notably the private sector and structural change. However, they are not favorable to human capital, institutions, and the energy sector. It is observed that the positive effect of these four components dominates in this case, which justifies the positive sign obtained in the case of the productive capacity index. These results show that investments financed by tax revenues can contribute to improving the overall productivity of the economy. This can notably be achieved through the financing of the components of productive capacities. Although tax revenues have a positive effect on productive capacities, it is important to emphasize the need for prudent fiscal management to avoid over-taxation or the misallocation of public resources.

Effective fiscal management is essential to maximize the contribution of tax revenues to improving economic productivity. In some Sub-Saharan African countries, the main source of financing for public expenditures is tax revenue, as these countries do not have mineral or natural resources. Poor management or poor policy in the mobilization and management of these revenues would have detrimental effects on the implementation of the prerequisites for economic or industrial development. Productive capacities, being the set of factors or conditions or infrastructures favorables for attracting the establishment and development of enterprises or industries, are engines of growth and development. Thus, when countries fail to finance these infrastructures, they hinder their productive capacities, which is not conducive to the development of the industrial sector.

Table 2: Presentation of Estimation Results

Variables	**The components of the productive capacities index**								
	Human Capital	Natural Capital	Energy	Transportation	ICT	Institutions	Private sector	Structural Change	PCI
PCI (-1)	1.018*** (0.013)	1.186*** (0.406)	0.862*** (0.020)	0.468*** (0.059)	0.962*** (0.026)	0.632*** (0.062)	1.101*** (0.017)	1.209*** (0.054)	0.782*** (0.024)
Tax revenues	-0.000 (0.001)	-0.000 (0.002)	0.006** (0.003)	0.023*** (0.005)	0.003 (0.005)	0.001 (0.001)	0.270** (0.104)	0.010*** (0.003)	0.146*** (0.014)
DF	-0.000** (0.000)	-0.001*** (0.000)	-0.004*** (0.001)	-0.005* (0.002)	0.003 (0.002)	-0.000 (0.000)	0.311*** (0.206)	0.004*** (0.000)	0.046*** (0.013)
IDE	-0.001*** (0.000)	0.002* (0.001)	0.006*** (0.001)	0.002 (0.001)	-0.011*** (0.002)	-0.000 (0.000)	0.83e3*** (0.24e-3)	-0.002* (0.001)	0.036* (0.017)
Ouv	0.003 (0.013)	0.022 (0.017)	-0.046* (0.023)	-0.124** (0.052)	-0.023 (0.049)	0.022 (0.028)	-0.035*** (0.009)	-0.159*** (0.029)	1.176*** (0.167)
Constant	-0.028 (0.040)	-0.712*** (0.136)	0.405*** (0.091)	1.056 (0.150)	-0.027 (0.049)	1.393*** (0.244)	0.434*** (0.074)	0.554*** (0.106)	2.553*** (0.485)
AR(1)	0.005	0.055	0.059	0.002	0.018	0.009	0.008	0.011	0.002
AR(2)	0.901	0.388	0.531	0.253	0.532	0.536	0.285	0.480	0.717
Sargan	0.015	0.418	0.650	0.140	0.559	0.110	0.742	0.496	0.381
Hansen	0.138	0.621	0,514	0,424	0.618	0.229	0.123	0.481	0.258
Nber of obs	301	301	301	301	301	301	301	301	301
Nber of countries	26	26	26	26	26	26	26	26	26
Nber of instruments	20	20	20	20	20	20	20	20	20
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
***significant at 1%, **significant at 5%, *significant at 10%; standard errors are in parentheses.									

Furthermore, the estimation results reveal a positive relationship between investments and the productive capacity index. This result is consistent with economic intuition. A high level of investment can lead to an increase in productive capacities by providing funds for the acquisition of new equipment, workforce training, etc. Policies aimed at encouraging investment can therefore be considered essential for strengthening productive capacities and stimulating economic growth. There may also be feedback effects between investment and productive capacities. A higher level of productive capacities can stimulate investment by creating a favorable business environment and increasing profit opportunities.

Regarding the effect of FDI on the productive capacity index, the estimates reveal a positive effect. This result suggests that foreign investments contribute to strengthening the productive capacities of Sub-Saharan African countries. FDIs can facilitate the transfer of technology and know-how, which can improve the productive capacities of local businesses. Foreign companies can introduce more efficient production practices, advanced technologies, and high-quality standards that benefit the entire country economy. It is possible that FDI and domestic investment reinforce each other, creating complementary effects that stimulate productive capacities.

A positive relationship between FDI and productive capacities also underscores the importance of an attractive and conducive business environment for investment. Policies aimed at improving the business climate, reducing barriers to foreign investment, and strengthening legal security can promote the increase of FDIs and, consequently, productive capacities.

4.2. Presentation of estimation results by region

It is worth noting that the system Generalized Method of Moments (SGMM), although widely used in panel data estimations, has limitations when applied to small samples. Specifically, SGMM estimates tend to be biased and inefficient due to the proliferation of instruments and the strict exogeneity assumptions, which undermine the precision and robustness of the results (Bun & Windmeijer, 2010). Conversely, the dynamic Ordinary Least Squares (DOLS) method is better suited to small samples. It addresses endogeneity and simultaneity biases by incorporating lagged and differenced explanatory variables, thus yielding more precise and robust estimates. Compared to other panel data estimation methods, DOLS stands out for its reliability in small sample contexts while accounting for dynamic relationships between variables. Therefore, we employ the dynamic Ordinary Least Squares (DOLS) method to verify the robustness of our findings across regions. This study focuses on the following regions: the Economic Community of West African States (ECOWAS), the Southern African Development Community (SADC), the Economic Community of Central African States (ECCAS), and the Common Market for Eastern and Southern Africa (COMESA). The econometric estimations reveal that tax revenues have a positive and significant effect on productive capacities in each of these regions. This effect is more pronounced in ECOWAS, where variations in tax revenues lead to a greater improvement in productive capacities compared to SADC and ECCAS. On average, productive capacities in ECOWAS are 21.72%, slightly below the

average in Sub-Saharan Africa (22.96%). In contrast, productive capacities in the Southern African Development Community (SADC) average 25.62%.

These findings confirm that Sub-Saharan African states can effectively leverage tax revenues to enhance their productive performance. Table 3 presents the estimation results obtained using the DOLS method for each of the regions studied. The results highlight the importance of tax revenues and financial development in strengthening productive capacities. In ECOWAS, tax revenues have a strong impact (0.307), indicating that effective mobilization of public resources can significantly improve productive capacities. This finding is supported by examples of fiscal policies that fund infrastructure and public services essential for growth. In ECCAS, financial development plays a crucial role (0.346), surpassing other regions in its contribution to productive capacities. This dynamic underscores the need for a strong financial system to channel resources into key sectors. Together, these two factors emerge as strategic levers to accelerate economic development in these regions.

However, the effect of foreign direct investment (FDI) and trade openness varies considerably across regions. In ECOWAS, FDI has a significant negative impact (-0.121), suggesting that these flows concentrate on sectors poorly integrated into the local economy, such as natural resource extraction. In contrast, in the SADC region, FDI positively contributes to productive capacities (0.156), reflecting better integration of these investments into local and regional value chains. Regarding trade openness, its impact is negative in ECOWAS (-2.645) and ECCAS (-5.018), where it seems to exacerbate dependency on imports at the expense of local production. In contrast, in the SADC region, trade openness has a significant positive effect (3.153), illustrating a beneficial commercial integration, likely due to favorable policies and a more competitive economic structure.

These regional disparities highlight structural and institutional differences that influence economic policies. While ECOWAS benefits from a strong fiscal impact, its productive capacities remain slightly below the Sub-Saharan average, which may indicate inefficiencies in the allocation of public resources. In contrast, SADC, with a favorable combination of FDI and trade openness, appears better suited to the dynamics of globalization. These findings emphasize the importance of adopting region-specific approaches, promoting tailored fiscal reforms, directing FDI towards strategic sectors, and regulating trade openness to maximize its benefits while minimizing its negative effects.

Table 3: Estimation results of the model by region by DOLS

Productive Capacities Index (PCI)			
Variables	CEDEAO	CEEAC	SADC
Tax revenues	0.307*** (0.117)	0.280*** (0.880)	0.199*** (0.042)
Financial development	0.124*** (0.027)	0.346*** (0.048)	0.097*** (0.015)
IDE	-0.121** (0.051)	0.064 (0.043)	0.156*** (0.046)
Trade oponess	-2.645*** (0.990)	-5.018*** (1.607)	3.153*** 0.881
Constant	1.520*** 1.113	1.648*** (0.617)	1.627*** (0.608)
R2	0.615	0.938	0.653
R2 Ajusted	0.600	0.929	0.644
Nber of obs	105	32	156
***significant at 1%, **significant at 5%, *significant at 10%; standard errors are in parentheses**.**			

4.3. Discussion

The examination of the relationship between tax revenues and productive capacities in Sub-Saharan Africa reveals an overall positive impact. This result highlights the importance of taxation in the allocation of resources for economic development. Economic development results from several sectors of activity, including the industrial sector, and the financing of the basic conditions for the development of industrial activities. Our results align with Musgrave (1959), who argued that tax revenues are essential for financing infrastructure and public services. This is also the case with studies by Barro (1990), who concluded that public expenditures funded by tax revenues can stimulate economic growth by improving infrastructure and increasing productive capacities. In 1998, Rodrik found that in more open economies, higher tax revenues allow for the financing of public investments necessary to improve productive capacities, even in the presence of international competition. In developing countries, Tanzi and Zee (2000) found that (equitable) tax revenues can provide the necessary funds for public investments, which contribute to improving the productive capacities of countries.

Focusing on recent studies, our results are consistent with those of Besley & Persson (2013), who found that tax revenues contribute to improving productive capacities in Africa. A UNCTAD report (2023) confirms that increasing tax revenues strengthens productive capacities in developing countries, emphasizing the importance of fiscal policies to support economic development. Yin & al. (2023) concludes a positive link between environmental taxes and productive capacities, which together improve environmental outcomes while supporting sustainable economic development.

However, policymakers should enhance fiscal outcomes, particularly by combating tax evasion, to increase the revenues available for public investments. It is also necessary to allocate a portion of tax revenues to basic infrastructure such as transportation, energy, and ICT to strengthen productive capacities. Using tax revenues to finance education and training can increase human capital, a key factor in productive capacities. Finally, encouraging policies that support emerging industries through tax incentives and R&D subsidies can stimulate productive capacities.

5. Conclusion

The aim of this study was to assess the contribution of fiscal revenues to the improvement of productive capacities in Sub-Saharan African countries. Productive capacities encompass eight components that form the composite index of productive capacities. These components include human capital, natural capital, financial capital, energy, transportation, ICT, institutions, the private sector, and structural change. The results of the study demonstrate that fiscal revenues enhance the productive capacities of Sub-Saharan African countries. Furthermore, these results notably show that fiscal revenues are conducive to structural changes and the development of the private sector in these countries.

To improve productive capacities in Sub-Saharan African countries, it is necessary to develop and implement fiscal policies conducive to increasing fiscal revenues and effectively directing these revenues towards financing basic infrastructure. This infrastructure supports the development of productive sectors, which are crucial for industrial development.

This study analyzed the relationship between taxation and productive capacities of countries, focusing on fiscal revenues as a key determinant. However, it has the limitation of not considering other sources of financing for productive capacities. Future research could explore the effects of the interaction between different sources of financing on the productive capacities of Sub-Saharan African countries.

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