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Economic sectoral effect on poverty in economic community of West African states (ECOWAS)

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Abstract

Poverty reduction is a challenge for achieving sustainable development goals, especially in developing countries. This article analyzes the economic sectoral effect on poverty in ECOWAS countries from 2000 to 2018. The income frontier is used to analyze the contribution of the different sectors to improving the population's standard of living. The results of the income frontier show that the agriculture, industry, and services sectors respectively contribute to improving the standard of living of the population in the ECOWAS zone. Secondly, the results show that, according to the different sectors of the economy, the capacity to generate high incomes is greater in the short term in ECOWAS countries. Furthermore, the estimates show that in both the short and long term, the industrial sector makes a greater contribution to increasing the countries' capacity to generate high incomes to improve the population's standard of living. The mean difference test also confirms that the population's standard of living increases more with the industrial sector. The policy aimed at improving the contributions of the industrial and agricultural sectors in the short term as is needed to improve economic growth and the standard of living of the population in ECOWAS countries.

1. Introduction

Eradicating poverty in all its forms is the first goal of sustainable development and drives development policies (World Bank, 2018). It represents a major challenge for all countries, particularly developing countries, which contain most of the poor. Development policies and programs make the fight against poverty a priority worldwide, especially in developing countries (Gamboa et al., 2020). Poverty levels vary from region to region and can be affected by many factors, including agriculture (Cateia et al., 2023). According to the World Bank, poverty has reduced with the Millennium Development Goals (MDGs) bringing the number of people living below the poverty line from $1.90 to 736 million, a drop of 1.1 billion people in the world in 2015 (World Bank, 2018). In sub-Saharan Africa, in 2015, the extreme poverty rate fell from 56.8% to 42.8% respectively from 1990 to 2012 (World Bank, 2018). This reduction is relatively small compared to South Asia, where the poverty rate fell from 81.7% in 1990 to 48.6% in 2015 for a poverty line of $3.20. This reduction is unevenly distributed across the different regions and countries of Africa. Despite this decline, the poverty rate remains high in Sub-Saharan Africa, particularly in ECOWAS.

On average, around 44.64% of the population of the ECOWAS lives on less than $1.90 a day, and over 70% on less than $3.20 per day, accompanied by an average GDP per capita of $940.82 over the period 2000 to 2018 (WDI, 2022). This disparity in poverty levels can be explained not only by several factors but also by the approach used to measure poverty. The monetary approach and the multidimensional approach are used in the literature to identify the poverty level. These two approaches oppose two schools of thought. Individual utility is used to measure individual well-being (Duclos et al., 2006). This utility is substituted for income in the analysis of individual well-being (Ravallion, 2016; Kyzyma, 2020). From this measure, poverty is defined as the lack of disposable income equivalent to the poverty line (Kyzyma, 2020). Furthermore, the multidimensional approach shows that the use of income is not sufficient to measure poverty because people may suffer several deprivations that affect their standard of living.

Using a single approach can lead to discrimination against other people in poverty reduction policies (Atkinson, 2019; Evans et al., 2020). Indeed, poverty is multidimensional; it measures the totality of deprivations and opportunities faced by people in society (Alkire et al. 2015). According to Sen (2001), poverty is the lack of capability to function in a society. All these approaches lead to different poverty levels and affect poverty reduction policies. As such, the use of credible measures in poverty analysis can be a means of drawing policymakers' attention to the effective improvement of household living conditions (Ravallion, 1998).

On the other hand, the monetary and multidimensional poverty approaches identify all the deprivations faced by individuals, but they do not show how available resources can be used to improve people's standard of living. Indeed, a lack of resources and inefficiency in the use of available resources can explain the poverty situation of some people (Chattopadhyay, 2014; Xie et al., 2020). Using a measure that takes into account the efficient combination of available resources in poverty analysis can show a less poverty level than conventional indicators in ECOWAS countries.

Notwithstanding these divergences in the poverty measures used in the literature, the different sectors of the economy can be a source of variation in the well-being of the population in ECOWAS. Agriculture is an important sector of the economy in ECOWAS. This sector employs a large labor force and it is the source of income for many people. In Nigeria, around 70% of labor is employed in the agricultural sector, contributing 23% to GDP in 2017 (CBN, 2018). Despite the opportunities offered by labor in this sector, poverty rates are higher in rural

areas in ECOWAS countries, with poverty incidence rising from 68.4% in 2008 to 70% in 2017 in rural Nigeria (OPHI, 2017). Improving the performance of different sectors of the economy can reduce poverty levels. Indeed, improving the performance of the agricultural sector has positive externalities on all other sectors of the economy and can help improve the living conditions of the population (Cateia et al., 2023). This improvement can boost overall production and economic growth, promote job creation, and improve income (Gollin et al., 2014; Tiberti et al., 2015).

The agricultural and industrial sectors are complementary as a country's economy moves towards industrialization (Lewis, 1954). However, the economies of the ECOWAS are less industrialized, which can influence poverty levels. Although the literature is interested in poverty measurement and the impact of certain economic sectors on poverty, less research analyzes the effect of different sectors of the economy on the country's capacity to generate income to improve the population's standard of living in ECOWAS countries. Contrary to Zong-naba et al. (2023), who analyze only the capacity of ECOWAS countries to generate income to improve the standard of living of the population, this article contributes to the literature by identifying the sectoral economic contribution to improve a country's capacity to generate income with the available resources to improve the population's standard of living in ECOWAS countries.

The rest of the article is structured as follows. Section 2 presents the literature review. Section 3 presents the methods and data used in the analyses. Section 4 analyzes the results. Finally, section 5 presents the conclusion.

2. Literature Review

Several theories underpin the identification of the poor in a country. Some poverty measurement indicators (Alkire and Santos, 2014) are based on Sen's (1976) capability approach, and other indicators, including Foster et al. (1984) are based on the economic approach to analyzing and identifying the poor in a country. According to Evans et al. (2020), variations in the conceptual approach and indicators used to measure poverty influence the poverty level, as some determinants are flows (income, consumption) that vary over time, and other variables come from subsidies (access to drinking water, sanitation, education). Despite the differences in the indicator used to measure poverty, the analysis of the population's well-being is carried out by identifying the determinants or factors that influence the poverty level, and not the influence of the different sectors of the economy on the country's capacity to improve population well-being with the available resources. The economic sectoral effect on poverty is explored by several researchers in the literature by identifying the relationship between the economic sector and poverty. However, these authors are not unanimous on this relationship.

2.1. Poverty and agricultural productivity

Several authors have examined the links between agriculture and poverty. These authors are unanimous on the agricultural sector's effect on poverty reduction. Cateia et al. (2024) use a dynamic computable general equilibrium model to analyze the agricultural productivity effect on structural transformation and poverty in Guinea-Bissau. The authors show that improved agricultural productivity promotes growth and sectoral development in Guinea-Bissau. In addition, the increase in real income and household consumption associated with the rise in productivity had positive long-term effects on the population well-being in Guinea-Bissau.

Similarly, in Nigeria, Gozuk et al. (2024) use the ARDL model with data from 1986 to 2023 to analyze the relationship between government expenditure in the agricultural sector and poverty reduction. In the short term, the authors find that government expenditure in the agricultural

sector has a positive effect on poverty reduction. However, in the long term, agricultural expenditure in the different branches of agriculture has not had the same effect on poverty reduction in Nigeria. Indeed, the authors observe that expenditure on crop and agricultural production has a positive and insignificant effect on poverty reduction in the long term, while public expenditure on fisheries and aquatic life has a negative and significant effect on poverty. The average poverty rate is used by the authors to relate public expenditure in the agricultural sector to poverty reduction.

Other authors show that agriculture's effect on poverty reduction is more important the than non-agricultural sector's effect. Indeed, Chandrarekha et al. (2024) show in their research on the impact of agricultural growth on poverty reduction in India that agriculture contributes to reducing poverty. The authors find that a 1% increase in agricultural GDP reduces poverty by 1.36%, while a 1% increase in non-agricultural GDP reduces poverty by only 0.8%. Similarly, Gulati et al. (2021) show in their research that poverty reduction is faster with increased agriculture and improved nutritional status.

2. 2. Poverty and trade

Much literature establishes the link between trade and poverty. However, this literature is not unanimous on the trade effect on poverty. Indeed, studies show that trade promotes poverty reduction (Afolabi and Ndamsa, 2024; Bartley et al., 2015). Trade openness is part of the logic of improving economic growth and resolving certain socio-economic problems, including poverty, inequality, and unemployment. According to Goff and Singh (2014), trade openness contributes to poverty reduction through higher labor prices. Empirically, Maluleke et al. (2024) use an ARDL model with data from 1990 to 2021 to analyze the relationship between trade openness and poverty in South Africa. They find that trade openness contributes to reducing poverty in the long term when the number of people living below the poverty line is used as a measure of poverty. On the other hand, the authors find that poverty levels are positively related to trade openness in both the long and short term when household consumption is used as a proxy for the poverty indicator. Similarly, Afolabi et al. (2024) analyze the impact of trade integration on poverty in the ECOWAS. They use the generalized least squares method on panel data and show that trade favors poverty reduction in ECOWAS countries when trade is made with the rest of the world. However, they show that bilateral trade within ECOWAS countries increases poverty significantly.

Following Afolabi et al. (2024), other empirical research finds that trade promotes poverty growth. Indeed, Mbah et al. (2022) use quarterly data estimated by the ARDL method to analyze the link between trade openness and the poverty rate in Nigeria. The authors find that, in the long and short term, trade openness favors an increase in the poverty rate in Nigeria. Similarly, Anetor et al. (2020) use panel data from 1990 to 2017 from 29 sub-Saharan African countries to analyze the impact of FDI, trade, and foreign aid on poverty reduction. They find that trade has a positive and significant effect on poverty, particularly in low-income countries. Also, Ezzat (2018) uses dynamic panel data to study the effect of trade openness on poverty and poverty intensity in the Middle East and North Africa. The author finds that trade openness has a positive effect on poverty and multidimensional poverty.

2.3. Poverty and Industrialization

Industrialization is crucial to sustainable growth and effective poverty reduction, especially in developing countries. Indeed, empirical analyses by Chidiebere (2020) show that industrial production and aggregate industrial employment contribute to reducing poverty in Nigeria. Similarly, Pham and Riedel (2019) use the two-stage least squares method on data from 2010 to 2016 in Vietnam to analyze the effect of sectoral growth on poverty reduction. They find that

the industrial and agricultural sectors contribute to reducing poverty in Vietnam in contrast to the service sector. They also find that agriculture contributes more to the reduction of poverty than the industrial and service sectors. The study by Warr and Wang (1999) in Taiwan shows that growth in the industrial sector contributes strongly to poverty reduction. According to the authors, this effect is verified even if Taiwan is in the first or second period of development as defined by the Kuznets curve.

2.4. Poverty and service

Similar to the effects of other sectors on poverty reduction, the results of empirical studies are mixed regarding the service's effects on poverty reduction. Rafi'I et al. (2021) used data from 38 districts in the 2012-2015 period to analyze the structural transformation process and its impact on poverty in East Java, Indonesia. The authors find that East Java experienced an immature structural transformation as the share of services grew faster than the share of industry in the economy. This growth in the service sector has also contributed to poverty reduction in East Java. Also, in the study by Uwitonze et al. (2016) on the development of the service sector and its determinants, they show that the service sector is seen as a development alternative driven by the manufacturing industry. Indeed, the authors use primary data collected from 241 companies and firms in 2011 and 2014 in Rwanda. They find that services promote the transition from a low-income to a middle-income state. In contrast, other studies find a negative relationship between services and economic growth or poverty. Pham et al. (2019) find in their study that the service sector contributes to increasing poverty in Vietnam. Furthermore, Raddatz (2006) finds in his study that the service sector is not an effective sector for helping the poor to improve their standard of living.

3. Method and Data

3.1. Econometric approach to the link between different sectors and poverty in ECOWAS

The aim of this study is to analyze the economy's sectoral contribution to countries' capacity to generate income to improve the population's standard of living in ECOWAS. Similar to Zong-naba et al. (2023), the stochastic frontier approach of Lai and Kumbhakar (2018) is used to analyze the variation in poverty levels from different sectors of the economy. The frontier approach introduced simultaneously by Aigner et al. (1977) and Meeusen et al. (1977) is used to construct an income frontier in order to measure the variation of this frontier across different sectors of the economy. According to Chattopadhyay (2014), the income frontier is defined as the maximum level of income a country can generate with available resources and a given technology. Indeed, this income level or income frontier can move according to the contribution of different sectors of the economy. The gap between each country's real income and the income frontier measures the degree of poverty, or a country's incapacity to generate maximum income from different sectors.

The frontier model of Lai and Kumbhakar (2018) enables a short- and long-term analysis of the poverty level of countries in the ECOWAS. It also takes into account unobservable heterogeneity between ECOWAS countries. Indeed, ECOWAS countries differ economically (e.g., currencies are different), geographically (climate, natural resources), and socially (different official languages). In addition, this model takes into account the endogeneity that may exist between the explanatory variables and the error term. According to Kumbhakar et al. (2017), the four-component stochastic frontier model is the best model because it encompasses many panel data stochastic frontier models and overcomes the shortcomings associated with earlier panel data frontier models.

The income frontier used to establish the relationship between the different sectors of the economy and poverty in ECOWAS is specified as follows:

$$Y_{it} = \beta_0 + X'_{it}\beta + \tau_i - \eta_i - u_{it} + \vartheta_{it} \tag{1}$$

with,

$$u_{it} = \sigma_u^2(w_{it}) = exp(\gamma^T w_{it}) \tag{2}$$

$$\eta_i = \sigma_\eta^2(z_i) = exp(\delta^T z_i) \tag{3}$$

Y_{it} is the logarithm of gross domestic product (GDP) for country i and time t ($i = 1, \dots, N; t = 1, \dots, T$), X_{it} is a vector of the logarithm of the input. β is the parameter to estimate; $\eta_i \geq 0$ measures long term poverty that is affected by persistent variables, $u_{it} \geq 0$ measures short term poverty that is influenced by variables that can be controlled over time, τ_i measures heterogeneities between countries in the ECOWAS, ϑ_{it} is white noise. Similar to Lai and Kumbhakar (2018), the distribution of the different terms is described as follows: $\tau_i \sim i.i.d. N(0, \sigma_\tau^2)$, $\vartheta_{it} \sim i.i.d. N(0, \sigma_\vartheta^2)$ and $\eta_i \sim i.i.d. N^+\left(0, \sigma_\eta^2(z_i)\right)$, $u_{it} \sim i.i.d. N^+\left(0, \sigma_{u_{it}}^2(w_{it})\right)$. Equation (1) is estimated according to different sectors of the economy, including the agricultural, industrial, and service sectors, and identifies the poverty level by each sector. The estimation allows us to identify the effects of the different sectors on short-term, long-term and global poverty.

3.2. Determining poverty levels by economic sector in ECOWAS countries

The level of poverty is determined according to the different sectors of the economy. The poverty indicator (PI) measures a country's capacity to generate maximum income to improve the population's standard of living. This income-generating capacity varies according to the different sectors of the economy. A country's capacity to generate income is calculated as the ratio between observed income in a period and potential income in the same period. It is calculated as follows:

$$PI_{it} = \frac{Y_{it}}{Y_{it}^*} = \frac{f(X_{it}, \beta)e^{(\mu_i - \eta_i - u_{it} + \vartheta_{it})}}{f(X_{it}, \beta)e^{(\mu_i + \vartheta_{it})}} = \exp\{-(\eta_i + u_{it})\} \tag{4}$$

$$0 \leq PI_{it} \leq 1$$

Y_{it}^*, the potential income and Y_{it} is the actual income. When PI_{it} goes towards one, a country's realized income level approaches the income frontier which reflects a low level of poverty. When PI_{it} goes towards zero, the country's realized income level moves away from the frontier implying a high level of poverty. When PI_{it} equals one (01) i.e. $\eta_i = 0$ and $u_{it} = 0$, real income is equal to potential income ($Y_{it} = Y_{it}^*$) this implies that the income generated by a country improves the well-being of all populations. As a result, the closer PI_{it} is to one, the closer real income is to the frontier, and the country is less poor (ceteris paribus). Thus, a country is poor when its incapacity to generate a high income relative to the frontier is great. The poverty indicators identified according to the different sectors of the economy are obtained as follows:

$PI_{it}^{ST} = E(e^{-u_{it}}|e_{i.})$ is the short-term poverty indicator; it measures the country's capacity to generate maximum income to improve the population's standard of living.

$PI_i^{LT} = E(e^{-\eta_i}|e_{i.})$ is the long-term poverty indicator; it measures a country's capacity to generate maximum income to improve the population's standard of living.

The global poverty indicator is the combination of these two indicators:

$$PI_{it}^G = PI_{it}^{ST} \times PI_i^{LT} \tag{4}$$

The two-stage estimation method of Lai and Kumbhakar (2018) is used to estimate the income frontier and poverty indicators following different sectors. This method takes into account the endogeneity that may exist between the different variables in the model to be estimated (Lai and Kumbhakar, 2018).

3.3. Data

The data used in this article comes from the World Development Indicator (WDI) for the 15 countries in the ECOWAS zone. These data cover the period from 2000 to 2018. GDP is used as a measure of income. It is used to analyze poverty levels across the income frontier. The independent variables that influence the income frontier are education and health. The dependency ratio, industrial added value as a percentage of GDP, agricultural added value as a percentage of GDP, and trade in services as a percentage of GDP are the variables that influence poverty in this article. The descriptive statistics of the variables are described in table (1).

Table 1: Descriptives statistics

Variable	Mean	Stand Deviation
GDP per capita	940.82	756.75
Education	6.49	0.57
Health	49.49	16.41
Dependency rate	88.46	10.74
Industry	19.40	6.61
Services	17.40	18.01
Agricultural	27.86	13.92

Source: Data from WDI and FAO, 2000 to 2018

4. Empirical results

4.1. Empirical result of income frontier by different sectors of the economy

Table 2 presents the results of the income frontier according to the different sectors of the economy. The income frontier is estimated by varying the sectors of the economy in the income equation to identify poverty levels. Estimates of income frontiers 1, 2, and 3 for the agricultural, industrial, and service sectors respectively show that the education variable has a negative and significant effect at the 5% and 1% levels respectively on the income of countries in ECOWAS. These effects are higher in the industrial and service sectors than in the agricultural sector. The result is unexpected, since, according to human capital theory, education contributes to economic growth. However, according to Benhabib et al. (1994), human capital has a positive effect on economic growth when it is channeled through technology; its effect is negative if it is used as a traditional factor that directly affects income.

The estimations result also shows that population health expenditure has a negative and significant effect at the 5% and 1% levels on the income frontier following the agriculture, industry, and services sectors respectively. The more health expenditure by the population increases, the more the income of ECOWAS countries decreases. This result can be explained by the fact that a decline in health has a negative impact on individual performance and reduces the time allocated to an activity. As a result, the income generated decreases, as part of this income is used for healthcare.

The agricultural, industrial, and service sectors each have a negative effect on a country's incapacity to generate high incomes, and therefore a positive effect on a country's capacity to generate high incomes to improve living standards in the short term. However, in the long term, the dependency ratio contributes to increasing the capacity of countries to generate high incomes to improve the standard of living of the population. The majority of the population in the ECOWAS is young. This youth constitutes a reserve for the next generation in the various sectors of the economy to promote economic growth.

Table 2 : Estimation Results

Variable	(1)	(2)	(3)
Income Frontier			
Constant	-3.95***	-3.16***	-4.036***
	(-14.60)	(-36.74)	(-15.60)
Ln(education)	-0.929**	-1.404***	-1.174***
	(-2.51)	(-3.90)	(-2.96)
Ln(health)	-0.179**	-0.241***	-0.248***
	(-2.49)	(-3.51)	(-3.27)
Time	0.061***	0.060***	0.061***
	(23.58)	(26.63)	(22.97)
Short term poverty determinant			
Agricultural	-0.021*		
	(1.70)		
Industry		-2.04	
		(-0.73)	
Service			-0.076**
			(-2.41)
Constant	-1.98***	2.72	-1.25***
	(-5.91)	(0.26)	(-3.17)
Long term poverty determinant			
Dependency rate	-1.187***	-1.11***	-1.229***
	(-11.48)	(-10.76)	(-10.80)
Constant	8.64***	9.55***	9.37***
	(237.73)	(258.04)	(250.15)
Sample size	285		

Source :Author

∗, ∗∗, ∗∗∗ are respectively the significance levels 10 %, 5 % et 1 %.

4.2. Indicator and poverty line results by economic sector

Table 3 summarizes the short-term poverty indicators for countries in the ECOWAS according to the agriculture, industry, and services sectors. The poverty line, which measures a country's minimum capacity to generate a high income to improve the population's standard of living, is

81.04%, 92.20%, and 80.29% respectively for the agricultural, industrial and service sectors. This poverty line is higher for the industrial sector than for the other sectors. This result shows that the industrial sector has an important contribution to countries' capacity to generate a higher income to improve the population's standard of living in ECOWAS. Following the industrial sector, the agricultural sector contributes more to the capacity of ECOWAS countries to generate higher incomes to improve the population's standard of living compared to the service sector.

Although the agricultural sector employs a large proportion of the population in the ECOWAS, the results show that the industrial sector contributes more to improving population's standard of living. This can be explained by the emergence of the industrial sector, including mining, oil, and agri-food industries, which employ skilled and unskilled labor and offer high and more stable incomes. In addition, insecurity has encouraged the population of some countries to move from rural areas to safer cities, forcing people to abandon farming and take up other activities in the cities, including the industrial sector. In addition to the abandonment of farming activities due to insecurity in some countries, the agricultural sector is exposed to climatic hazards and poor mechanization, leading to low and unstable incomes.

If we look at the individual indicators for each country compared with the different poverty lines, the results show that few countries are below the poverty line in the agricultural sector than in the industrial and services sectors. This result shows that at the individual level, several countries are increasing their capacity to generate high incomes with the agricultural sector in the short term, unlike the industrial and services sectors. The result of this individual analysis of the economic sectoral effect on poverty is similar to Cateia et al. (2024), who find that improving agricultural productivity contributes to economic growth and poverty reduction.

Table 3: Short-term poverty indicators and poverty line by different sectors

Pays	PI_agricultural	PI_industry	PI_service
Benin	0.8160	0.9991	0.7726
Burkina	0.8227	0.8925	0.7990
Cap-vert	0.8273	0.9995	0.9361
Côte d'Ivoire	0.7666	0.9990	0.7565
Gambia	0.7858	0.9993	0.7736
Guinea	0.8292	0.8551	0.8314
Guinea-Bissau	0.8268	0.8352	0.8049
Liberia	0.8348	0.9996	0.7936
Mali	0.8608	0.9875	0.9417
Nigeria	0.7777	0.9508	0.7490
Niger	0.8381	0.9441	0.7940
Senegal	0.8125	0.7641	0.7616
Sierra Leone	0.8484	0.9926	0.8038
Togo	0.8200	0.8715	0.8218
Ghana	0.6893	0.7387	0.7034
Poverty line	0.8104	0.9221	0.8029

Source: Author

The results of the estimates of the contribution of the various sectors of the economy to improving the standard of living of the population in ECOWAS over the long term are presented in Table 4. The results are similar to the short-term indicators, but with the industrial sector having a greater capacity to generate high incomes at the aggregate level. Indeed, the minimum capacity to generate higher incomes in ECOWAS countries is great in the industrial sector. This result implies that, in the long term, the industrial sector contributes more to improving the population's standard of living in ECOWAS. However, this contribution is relatively weaker in the long term than in the short term.

Individual analysis of indicators by country shows that more countries are below the poverty line in the industrial and service sectors than in the agricultural sector. At the country level, the agricultural sector contributes more to improving the population's standard living in ECOWAS. However, individual country indicators and poverty lines are lower in the long term than in the short term. This implies that the contribution of the different sectors to improving the countries' capacity to generate high incomes to improve the population's standard living is greater in the short term than in the long term. This result can be explained by the instability of institutions in many countries in ECOWAS caused by insecurity and instability of governments which can affect long term policy decisions for poverty reduction.

Table 4: Long-term poverty indicators and poverty line by sector

Country	PI_agricultural	PI_industry	PI_service
Benin	0.6443	0.7269	0.6371
Burkina	0.4810	0.5686	0.4690
Cap-vert	0.6532	0.7077	0.6674
Côte d'Ivoire	0.8046	0.8402	0.8157
Gambia	0.6430	0.5530	0.4069
Guinea	0.5141	0.5863	0.5188
Guinea-Bissau	0.4273	0.4727	0.4089
Liberia	0.4115	0.5231	0.3865
Mali	0.5071	0.5969	0.5334
Nigeria	0.7189	0.7688	0.7122
Niger	0.4168	0.5323	0.4069
Senegal	0.6942	0.7220	0.6920
Sierra Leone	0.3862	0.5038	0.3690
Togo	0.4679	0.5583	0.4751
Ghana	0.6056	0.6677	0.6206
Poverty line	0.5584	0.6219	0.5413

Source: Author

Table 5 shows the global poverty indicator for the various countries in the ECOWAS. This indicator is obtained by multiplying the short-term and long-term poverty indicators. The minimum capacity to generate higher incomes to improve the population's standard of living is greater in the industrial sector than in the agricultural and service sectors. On the other hand, with the global poverty indicator, individual analysis shows that few countries fall below the poverty line in the services sector.

The results vary from one indicator to another, which explains the heterogeneity of countries and the differential effect of economic sectors on improving the living conditions of the population in ECOWAS. Indeed, the contribution of sectors varies from one country to another, since countries do not have the same level of development in the various sectors of the economy.

Table 5: Global poverty indicators and thresholds by sector

Country	PI_agricultural	PI_industry	PI_service
Benin	0.5258	0.7269	0.4922
Burkina	0.3957	0.5075	0.3747
Cap-vert	0.5404	0.7077	0.6242
Côte d'Ivoire	0.6168	0.8402	0.6171
Gambia	0.3471	0.5530	0.3148
Guinea	0.4263	0.5014	0.4314
Guinea Bissau	0.3533	0.3948	0.3292
Liberia	0.3435	0.5231	0.3068
Mali	0.4365	0.5894	0.5024
Nigeria	0.5591	0.7310	0.5334
Niger	0.3493	0.5026	0.3231
Senegal	0.5641	0.5517	0.5270
Sierra Leone	0.3276	0.5001	0.2966
Togo	0.3837	0.4866	0.3904
Ghana	0.4174	0.4933	0.4366
Poverty line	0.4391	0.5740	0.4333

Source: Author

4.3. Mean difference test in poverty levels by economic sectors in the ECOWAS

The mean difference test is used on the poverty indicators according to the different sectors of the economy. The objective is to see that the difference in sectors' contribution to the improvement of the population's standard of living is significant. Table 6 shows the results of the test between the agricultural and industrial sectors. It shows that this difference is significant at the 1% level. This result confirms that in both the short and long term, the industrial sector contributes more to improving the living conditions of the population in the ECOWAS. This result shows that the capacity of countries to generate high incomes increases with the impact of the industrial sector in the ECOWAS in the short and long term.

Table 6 : Mean difference test

	Short-term		Long-term		Global	
Variable	Mean	Std error	Mean	Std error	Mean	Std error
IP_Industry	0.9221	0.0075	0.6219	0.0062	0.5740	0.0077
IP_Agricultural	0.8104	0.0056	0.5584	0.0075	0.4391	0.0063
Difference	0.1117***	0.0077	0.0769***	0.0017	0.1348***	0.0053

Source: Author

∗, ∗∗, ∗∗∗ are respectively the significance levels 10 %, 5 % et 1 %.

5. Conclusion

This article aimed to analyze the contributions of the various sectors of the economy to the capacity of countries to generate income to improve the standard of living of the population in ECOWAS. The stochastic frontier approach is used with panel data to achieve this objective. The results show that education and health expenditure have a negative effect on income in ECOWAS. The analysis of poverty indicators according to the different sectors' of the economic shows heterogeneous results. Moreover, the results show that the industrial sector is more likely to increase countries' capacity to generate high incomes to improve people's standard of living in the short-term, in the long-term and at the global level. However, analysis at the country level shows that the capacity of countries to generate high incomes increases with the agricultural sector. Finally, the results show that regardless of the sector of the economic used, countries' capacity to generate high incomes is greater in the short-term than in the long term. Mean difference tests also confirmed that, at the aggregate level, the industry sector contributes most to improving the standard of living of the population in ECOWAS.

Compared with the various poverty indicators, the capacity of ECOWAS countries to generate high incomes is greater in the short-term, depending on the effect of the various sectors of the economic. Based on the results obtained, the study recommends using different approaches to analyze poverty. The study also recommends short-term policies in the industrial and agricultural sectors to promote economic growth and improve living standards in ECOWAS. Further research can be carried out using survey data to analyze the capacity of the population to generate a high income to improve their living conditions.

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