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Impact of non-oil sectors on GDP/capita in selected African countries: evidence from panel analysis

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Abstract

Purpose – The purpose of this paper is to investigate the impact or contribution of non-oil sectors on economic growth (GDP/capita) of some selected African countries using panel data analysis.

Design/methodology/approach – The paper focused on secondary data for the period 1991–2019 for macro parameters, including agriculture, industry, export and service, and GDP/capita received from World Development Indicators (WDI). Panel unit root tests like Levin, Lin and Chu test and Im, Pesaran and Shin test, Johansen co-integration test, Granger causality test and an error correction model were also applied to the data for analysis.

Findings – The study reveals no causality from agriculture to economic growth, which implies most of the African countries (used in this study) have neglected agriculture as a source of economic growth. The industry independent variable was of no effect on these countries' economic growth, whereas the findings reveal that industry has causality on economic growth. Economic growth has no causality on the industry, which means the industry is not contributing to economic growth. The study also shows no causality from export and service to economic growth, but a causality runs from economic growth to export and service.

Originality/value – The paper examines the contribution of the non-oil sectors to economic growth in selected African countries.

Keywords Agriculture, Economic growth, Export and service, Industry, Non-oil sector, Panel data

Paper type Research paper

1. Introduction

The non-oil sector prospect and challenges have been on the front burner of academia, policymakers and industry alike (Raimi and Yusuf, 2020). The discovery of oil and subsequent overdependency on it by some nations have had constrained the growth of the non-oil sector (Norouzi *et al.*, 2020; Raimi and Yusuf, 2020). The non-oil sector, including key ones such as agriculture and export industry, has the potential that will benefit the majority of the people in selected twenty-five countries, namely Angola, Benin, Burkina Faso, Congo Republic, Algeria, Egypt, Kenya, Morocco, Malawi, Niger, Sudan, Togo, Tanzania, Uganda, Zimbabwe, Zambia, Nigeria, Ghana, South Africa, Mali, Kenya, Ethiopia, Côte d'Ivoire, Gabon and Botswana. With the rising population and increasing unemployment, inequality, inflation and urbanisation, the need to diversify the economy and promote opportunities for all is even more imperative (Sulla and Zikhali, 2018; Raimi and Yusuf, 2020). Scholars have argued that non-oil sectors have the capacity to bring more people out of poverty and provide employment and decent livelihoods (Ogwang *et al.*, 2019). The debate on the causality between economic growth and non-oil sectors remains inconclusive.

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There have been many arguments on the relationship between some key sectors such as agriculture and export on economic growth in both developed and less developed economies. Some past studies have shown that agriculture and export have significant impacts on economic growth across the globe. (Kang, 2015) argued that the export of goods and services brings direct foreign exchange, resulting in importing foreign goods. This importation constantly stimulates a country's capacity to produce in the long run. Still, the less developed economies are greatly affected when it comes to producing capital goods due to inadequate industries and facilities. It is also a believed fact that when export and services have positive effects on economic growth, the country's exporting is believed to have experience growth, which is called export-led growth (Zayone *et al.*, 2020). Many studies have revealed that export-led growth always brings about enhanced productivity as export and service stimulate a country's production by expanding or increasing its market base (Sunde, 2017). Also, export and services are significant ways of foreign exchange required to finance intermediate and capital imports. However, contrary to what findings revealed about other developing regions, this is not so in African developing countries, as export and services have not led to substantial economic growth in the region. Notably, the exportation of primary minerals or commodities has been, over the years, connected with negative or non-beneficiary trade (García-Rodríguez *et al.*, 2015; Harvey *et al.*, 2010).

There has been a general argument over the years on whether agriculture contributes to economic growth in developing countries across Africa. Agriculture is known to everyone as the engine or bedrock for economic growth in most developing countries in Africa due to vast land availability. Still, the recent diversification from this to other sectors has made this questionable. For example, in a country like Nigeria, before and even in the post–Independence era, the economy was mainly dependent on agriculture. Then, it contributed over 90% of the country's GDP and foreign exchange before the discovery of oil in the country in the early 1970s, which was used for commercial purposes. Agriculture provided little income to low-income earners in the country then. Recently, some studies show that agriculture contributes little to most African countries' economic growth (Awokuse and Xie, 2015), unlike two or three decades ago where it contributed significantly to the continent's development.

This current study attempts to empirically investigate the contributions of critical sectors like agriculture, industry and export and service on economic growth. The objective is to ascertain whether or not these variables are of utmost importance to economic growth in the selected African countries because no country thrives consistently without sustainable agriculture and industry. Panel unit root-like Levin, Lin and Chu test will be used to test the stationarity conditions of the variables, the Johansen's co-integration test will be used to test the long-run relationships among the variables and Granger causality test (an error correction model) will be used to test the direction of the relationships.

2. Literature review

Government spending on the agricultural sector and health sector in Africa cannot be quantified as this was done to promote economic growth in the region. Investments of continents like Asia and America in their agricultural sector, education sector and security sector produce positive growth and impact their economy in a more beneficial way. But despite all these spendings by the African government, there seems to be no positive impact on the economy except in the health sector, which was statistically significant (Ayeomoni and Aladejana, 2016). Growth in the agricultural sector has helped in poverty alleviation in rural areas. Some scholars have attempted to connect agricultural sector growth to economic growth in these continents, with results indicating that the contributory input of the agricultural sector to economic growth is meagre compared to before (Epaphra and Mwakalasya, 2017; Moussa, 2018).

Since its inception, the agricultural sector has been known to be the economy's bedrock in most developing countries across Africa, as it helped reduce the rate of unemployment and provided decent lives to the people in the rural areas. Even during the financial and economic crisis, the sector still survives, being the economic growth stimulator. Izuchukwu (2011), in his study on the contribution of the agricultural sector on the Nigerian economic development, where he used paned data analysis to examine the impact of the agricultural sector on the Nigerian economy, showed a positive causal relationship exists between gross domestic product (GDP) and domestic savings. In a similar study, Enu (2014) discovered that the agricultural sector has a significant impact on Ghana's economic growth. It has been the bedrock of growth and certainly contributes to the overall growth of the economy (Dethier and Effenberger, 2012; Izuchukwu, 2011). It has also been found that higher productivity in the agricultural sector will generate increment in its contribution to the economy and fund other sectors (Sertoğlu *et al.*, 2017; Gardner, 2005; Tiffin and Irz, 2006; Izuchukwu, 2011).

Haven said earlier that export and services are major ways of foreign exchange required to finance intermediate and capital imports. One of the important inputs always considers increasing productivity factors (Mancusi *et al.*, 2018). Export and services do enable a country to identify or discover their areas of strength and comparative advantage, thereby forcing them to withdraw their effort from these less productive sectors to higher productive export and services sectors (Naudé *et al.*, 2010; Mancusi *et al.*, 2018). The extent to which export and services impact the economy may vary with the type of goods they export and the services they engage in. Karamelikli *et al.* (2017) and Beny and Cook (2009), based on their studies, found that a positive correlation exists between the exportation of natural resources and the economic growth of African countries. Due to the lack of infrastructural equipment and technology to transform most of these raw exporting goods to finished forms and the nonavailability of skilled labour, countries in sub-Saharan Africa export primary commodities (Wanda, 2017). However, in sub-Saharan Africa, the export and services sector has not really produced substantial or noticeable economic growth compared with other developing regions. More particularly, African concentration on the exportation of primary commodities has not been beneficial to the continent, although it has greatly enriched their buyers (García-Rodríguez *et al.*, 2015).

Zayone *et al.* (2020), in his recently published study on "Effects of Agricultural, Manufacturing, and Mineral Exports on Angola's Economic Growth" where the autoregressive distributed lag test (ARDL) was carried out, found out that exports from the three sectors – manufacturing, mineral and non-mineral – have contributed to Angola's economic growth in the long-run; in contrast, non-manufacturing sector (agricultural and mineral) exports only produced a short-run impact on the country's economic growth. This simply indicates that despite the abundance of non-manufacturing minerals in this country, it has not impacted its economic growth in the long run. Instead, income generated from the sales of these minerals is spent on short-term goals. There are rich countries that have abundant natural resources and have strategically managed and benefitted from them and have had long-run impacts on their economy. For example, Norway and Botswana created appropriate policies and institutions to diversify their economy. Also, the United Arab Emirates (UAE) is a typical example of a country where wealth earned from its natural resources has had long-run impact on the economy growth because of its investment in infrastructures like airports, roads, tourism, construction and improving their industry sector (Elwerfelli, and Benhin, 2018).

2.1 Theoretical framework

Numerous theoretical hypothesis or theories validated with sound econometrics methods have been used to explain the relationship between economic growth and socio-economic

variables like unemployment, inflation, external debts and foreign exchange in developing countries. To fully comprehend the impact of agriculture, industry and export and services, this study employs the theory of production possibility curve and Hirschman's theory of unbalanced growth (Hirschman, 1958). Production possibility curve is known to be a graphical representation of all the goods and services an economy can produce. It is a curve that shows the overall output of an economy at a specific period of time after making use of all resources (Okwori *et al.*, 2015). A well-managed agricultural sector and export of goods in any of these developing countries will positively impact the economy in the long run, generate increment in its contribution to the economy and fund other sectors (Sertoğlu *et al.*, 2017). When an economy fails to take advantage of all its resources fully, it will directly produce a lower production possibility curve that could have harmful effects on its inhabitants. Hirschman's theory of unbalanced growth is a theory that explains the uneven distribution of resources in developing countries. It has some specific characteristics common to these developing countries, such as poor economic growth rate, low technological advancement, inequality or uneven distribution of wealth among its citizens and insufficient infrastructure to fully harness all its resources (Osuagwu, 2020). Thus, this unbalanced economic theory is helpful for these countries in order to help them channel available scarce resources to the area where they are urgently needed or to strategic income-generating sectors. Investment in any sector should be based on overall contribution to national income, prospective advantage and economic importance rather than investing in all the sectors at the same time. Agriculture and export and services have been major sources of income for these countries, and they still have the potential for producing more incomes if well harnessed. The proceeds or gains from these two sectors can be used to develop their` industrial sector and other important sectors.

3. Methodology overview

Model estimation was done based on the panel co-integration method, which is a recent approach in econometrics. We obtained data that combine the independent variables (agriculture, industry and export and service) and dependent variable (GDP/capita) for developing countries from 1991 to 2019. Panel data is a method that integrate time-series data and cross-section data to determine the time and space effectively. The present study employs panel unit root testing procedures, followed by co-integration and causality testing, to capture the dynamic nexus between independent and dependent variables. The empirical analysis of this study is divided into three parts. First, we evaluate stationarity conditions and the variables' asymptotic stability characters through panel unit root testing. Subsequently, we evaluate the co-integration relationship to determine the long-run equilibrium relationship among the variables of interest. Finally, we determine the direction of causality among the variable using the Granger causality test.

3.1 Panel unit root test

It is pertinent to determine the stationarity conditions of economic variables because estimating non-stationary variables would result in spurious regression, thereby creating problems and misleading policymakers. However, due to the nature of the data at hand (panel data), the conventional unit root test (Phillip–Perron and augmented Dickey–Fuller) tests are weak in power and size because they have no power to distinguish the unit root null hypothesis from stationary alternatives (Maddala and Shaowen, 1999; Barbieri, 2006). Recent studies depend on panel unit root tests in their empirical findings. Because of this, Levin, Lin and Chu (LLC) (2002) and Im, Pesaran and Shin (IPS) (2003) tests are used in this study.

The LLC unit root test is known to be very restrictive, while the IPS unit root test came to relax the assumptions of LLC (2002) unit root test. The IPS offers a procedure that

accommodates ρ, which varies across all i. Thus, it is less restrictive than LLC. It is estimated as

$$\Delta y_{it} = \mu_i + \rho y_{it-1} + \sum_{j=1}^{k} \alpha_j \Delta y_{it-1} + \delta_{it} + \theta_t + \varepsilon_{it} \quad (1)$$

where $\rho = 0$ for all i and the alternative hypothesis of $\rho < 0$ for at least one i. Thus, all series are non-stationary against the alternative of stationarity; that is, the series is stable.

3.2 Johansen's co-integration test

Johansen's co-integrating test is in terms of a multivariate framework and before its procedure can be applied on variables, that is, dependent and independent variables, to determine the co-integrating relationships between them. The stationarity order of the variables has to be found whether they are stationary at the same order or different order, I(0), I(1), or contain both variables. Suppose all the variables are stationary at the same order, for example, at I(1), Johansen's co-integration test can be used to determine the long-run relationships between the dependent and independent variables. The Johansen's co-integration test (Johansen, 1991, 1995) equation is given as

$$y_{it} = \rho y_{it-1} + \ldots + \rho_n y_{it-n} + \beta x_{it} + \varepsilon_{it} \quad (2)$$

In Eqn (2), y_{it} is the vector for the I(1) independent and dependent variables, x_{it} is the vector of the non-random variable and ε_{it} is the error correction term.

3.3 Granger causality test

One of the most common tests always carried out in existing literature to test the causal relationships between two variables is the Granger causality test (Chandio *et al.*, 2019; Guirguis, 2018; Naidu *et al.*, 2017; Adenutsi, 2011; Tekin, 2012; Tang and Abosedra, 2014). The test involves estimating the equations for the simple vector auto-regression (VAR) for GDP/capita, agriculture, industry and export and service. The simple AR for

$$\Delta Y_{it} = \alpha_1 + \sum_{i=1}^{P_{11}} \alpha_{11}\, i\Delta Y_{it-1} + \sum_{i=1}^{P_{12}} \alpha_{12}\, i\Delta X_{it-1} + \ldots + \theta_1 \varepsilon_{it} - 1 + u_{it} \quad (3)$$

$$\Delta X_{it} = \alpha_2 + \sum_{i=1}^{P_{21}} \alpha_{21}\, i\Delta X_{it-1} + \ldots + \sum_{i=1}^{P_{2i}} \alpha_{2i}\, i\Delta Y_{it-1} + \theta_2 \varepsilon_{it} - 1 + u_{it} \quad (4)$$

$$X_{it} = X_{it-1} + X_{it-2} + X_{it-3} \quad (5)$$

where Δ denotes the variance operative, p represents the numbers of lags, αs are the model parameters to be determined, u_{it} are the serially uncorrelated error terms, Y_{it} represents the dependent variable (GDP/capita), and X_{it} denotes the independent variables comprising of the agricultural sector, industrial sector and export and service sector and $\varepsilon_{it} - 1$ denotes the error-correction term (ECT), which is obtained from the long-run co-integration association.

3.3.1 Justification of variables selected. A well-managed natural resources or income-producing sectors will positively impact the economy, which, in turn, impacts such a country's citizens. GDP is the overall monetary value of all goods and services that are manufactured in a country within a particular time. The incessant neglect of agriculture by all these African countries to solely exportation of oil, mineral resources and under consideration of how agriculture promotes industrialisation with the availability of raw materials that will

be needed by these industries and as such create more unemployment, food scarcity, insecurity etc.

4. Results and discussion

Table 1 shows the unit root test of the variables. Considering LLC test alongside with IPS *W*-stat which both show that the variables are stationary at the first difference level with a probability of 0.0000. GDP/capita has a Levin, Lin and Chu (LLC) *t*-statistic of −13.5164 and Im, Pesaran and Shin (IPS) t-statistic of −23.0240 with both *t*- statistic having *p*-values of 0.0000 while agriculture has LLC *t*-statistic of −13.1735 and IPS *t*-statistic of −14.5922 also with both *t*-statistic having *p*-values of 0.0000. The industry has LLC t-statistic of −9.0905 and IPS *t*-statistic of −11.6443, with *p*-value of 0.000, and export and service have LLC *t*-statistic of −13.2071 and IPS of −13.4765 with their *p*-value being 0.0000 as well. The stationarity test has established relationships among the variables, but whenever variables are stationary of the same order like this, it becomes of necessary to perform a co-integration test on the variables in order to establish the long-term economic relationship that exists among the variables.

H0. There is no long-run relationship between the GDP/capita and the explanatory variables.

H1. There is a long-run relationship between GDP/capita and the explanatory variables

To establish the relationship among the variables, the panel co-integration hypothesis is stated above. From the Pedroni co-integration test results in Table 2, most of the test statistics (in each case, at least six statistics) carried out strongly rejected the null hypothesis of no long-run relationship among the variables. Considering the within-group statistic of the Pedroni co-integration test, the panel rho statistic has a *t*-statistic of −5.024922 with a *p*-value of

	Levin, Lin and Chu test			Im, Pesaran and Shin *W*-stat		
Variable	*t*-statistic	Prob	Differencing order	*t*-statistic	Prob	Differencing order
GDP/Capita	−13.5164	0.0000	I(1)	−23.0240	0.0000	I(1)
Agriculture	−13.1735	0.0000	I(1)	−14.5922	0.0000	I(1)
Industry	−9.0905	0.0000	I(1)	−11.6443	0.0000	I(1)
Export and service	−13.2071	0.0000	I(1)	−13.4765	0.0000	I(1)

Source(s): Author's computation using E-views and data from WDI (2021)

Table 1. Panel unit root test

	Test type	*t*-statistic	*p*-value
Within-group	Panel *v*-statistic	−3.077323	0.9990
	Panel rho-statistic	−5.024922	0.0000
	Panel Phillips-Perron statistic	−14.46636	0.0000
	Panel ADF-statistic	−6.862897	0.0000
Between-group	Group rho-statistic	−1.747867	0.0402
	Group PP-statistic	−16.97160	0.0000
	Group ADF-statistic	−6.598571	0.0000
Kao Co-integration	ADF type *t*-statistic	−5.206017	0.0000

Source(s): Author's computation using E-views and data from WDI (2021)

Table 2. Panel Co-integration test

0.0000, while the panel Phillips–Perron statistic has a *t*-statistic of −14.46636, also with a *p*-value of 0.0000. The panel augmented Dickey–Fuller (ADF) statistic shows a *t*-statistic of −6.862897 with a *p*-value of 0.0000. To summarise the between-group results, all the between-group test statistics have *p*-values less than 0.05. Besides, the Kao co-integration test result also rejects the lack of co-integration relationship among the model variables at 5% level.

4.1 Granger causality test results

Moreover, whenever variables are co-integrated, as in the case above, we can specify an error correction model and estimate using standard methods and diagnostic tests. The co-integration tested above indicates that causality existed between the four variables, that is, GDP, agriculture, industry and export and service, but it fails to show us the direction of the causal relationship. Engel and Granger suggested that if co-integration existed between two or more variables in the long-run, then there must be either unidirectional or bi-directional Granger causality between these variables. Engle and Granger illustrated that the co-integrating variables could be represented by error correction model (ECM) representation. In other words, according to Granger, if there is evidence of co-integration between two or more variables, then a valid error correction model should also exist between them. As GDP, agriculture, industry and export and service are co-integrated, an ECM representation can be seen in Table 3.

Table 3 has shown that agriculture, an independent variable, has no causality from GDP, but there is causality from GDP to agriculture; this reveals a unidirectional causality. This means most African countries have neglected agriculture, as agriculture is seen not to contribute to their economic growth, and wherever there is economic growth in these countries, it is only because of increased agricultural production. This is a very peculiar subject area that every decision-maker needs to focus on as African countries will only experience stable economic growth if agriculture also contributes to their economic growth consistently, which will help solve the problem of unemployment that is a serious problem in this continent. This finding corresponds with the work of Runganga and Mhaka (2021) for Zimbabwe economy, one of the countries under study. Their result reveals that agriculture has no long-run relationship on economic growth, but only short-run relationship using ARDL test.

Table 3 also shows no causality from industry to GDP and no causality from GDP to industry. This shows that there are no or not enough industries to contribute to these African countries' economic growth. Whenever these countries even experience economic growth or boom, they do not think of creating or increasing the number of industries they have, that is, there is no actionable foresight for industries creation. This explains why there is massive unemployment in these countries which keeps increasing every year. This finding is in tandem with the work of Bennet *et al.* (2015) whose study reveals that there is no significant relationship between industrial output and economic growth in Nigeria, but contradicts the

Table 3.
Granger causality test

Directions	*F*-statistic	*p*-value	Decisions
Agriculture → GDP	3.51799	0.0611	Do not reject H0
GDP → agriculture	11.3104	0.0008	Reject H0
Industry → GDP	0.04380	0.8343	Do not reject H0
GDP → industry	0.55184	0.4578	Do not reject H0
Export and service → GDP	1.02383	0.3119	Do not reject H0
GDP → export and service	5.00848	0.0255	Reject H0

Source(s): Author's computation using E-views and data from WDI (2021)

work of Matleena (2007) whose work shows that industrial development in countries like Indonesia, China, Korea and Taiwan province of China has had great impact on their economic growth.

Table 3 also shows that there is no causality from export and service as an independent variable on the dependent variable GDP, but there is causality from GDP to export and service. This is also a unidirectional causality which shows that export and service do not contribute significantly to these countries' economic growth. Whenever they experienced economic growth, they tend to increase their export and services. This is because there are no significant inputs from both agriculture and industry that could have warranted their products to be exported to other countries. This finding corroborates with the study of Gabriele (2006) whose study also indicates that the relationship between export/service and economic growth in developing countries is weaker compared to developed countries and that the growth-enhancing factors of export appear to have been declining since 1990s in these developing countries.

5. Conclusion and recommendation

This study seeks to investigate the impact of non-oil sectors, that is, agricultural sector, industrial sector and export and service, on the economic growth (GDP/capita) of some selected African countries taking into consideration the time and cross-sectional factors; this is to allow decision- and policymakers know the right channels or sectors for investment and policy implementation. Johansen co-integration and Granger causality test were used to determine the long-run relationships and the direction of relationship among the variables.

The findings of the study reveal that the independent variables, that is agricultural sector, industrial sector and export and service, do not have causal relationships on the dependent variable, GDP/capita. In contrast, GDP/capita has a causal relationship on the agricultural sector and export and service but has no causal relationship on the industrial sector. This indicates that government in these countries have not really done too well to make these non-oil sectors variables positively impact their economic growth (GDP/capita); instead, resources from other sectors or oil sector were used to boost the agricultural sector and export and service, while industrial sector, on the other hand, has no causal relationship on GDP/capita, and GDP/capita equally does not have any causal relationship on it. This means this sector is yet to be fully utilised to make it a major contributor to economic growth. These findings correspond with the work of Zayone *et al.* (2020), who in their own study said these key variables, agriculture, manufacturing and mineral export, contribute to the economic growth of Angola, which is part of the African countries included in this study on a short-run using ARDL.

For these countries to positively impact their economy using these three key variables, a lot has been done on agriculture. This study suggests adopting policies and institutional structure that will promote investment in agriculture and even encourage more people to go into farming. Importation of agricultural produce that these countries could produce should be outrightly discouraged and instead the domestic agro-processing sector should be promoted as it will greatly help revitalise the industrial sector that is, at present, down. Most industries in these countries are not functioning due to the high rate of raw materials, and the rates are high because they are imported; however, if agriculture is strengthened to produce enough raw materials for these industries, this will considerably reduce their cost of production and keep them floating. Also, electricity needs to be made available to these industries at an affordable cost, and policies to keep them in operation in the long term should be adopted. These countries need to redefine their export and service sector and determine the suitability of product exportation that will positively impact their economy and work on it. Also, income made on export and service should be used on infrastructure that will, in turn,

grow the economy. An interesting or suitable example of a country that did this is the UAE, where income from their export and service was invested in infrastructures like top-notch airports and good roads, making it easy for them to diversify into tourism, construction and industries. Future studies can estimate the impact of these independent variables on the economic growth of each participating country using dynamic ordinary least squares or other suitable robust techniques in order to compare the outcomes of all participating countries from one another and see which one is better.

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