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ECONOMIC GROWTH DYNAMICS IN CONGO BRAZZAVILLE: A THOROUGH EXPLORATION OF AGRICULTURE'S ROLE

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Abstract
Economics, driven by the imperative of managing scarcity, necessitates astute decision-making. The primary metric employed to assess the efficacy of resource allocation is economic growth—an augmentation in the production of goods and services within an economy. Acknowledged as a potent force, economic growth stands as a linchpin for poverty alleviation and enhancement of the quality of life, particularly in developing nations. This pursuit of economic growth resonates universally, with both developed and developing countries fervently aspiring to attain this pivotal objective (Bakari and Mabrouki, 2018).

INTRODUCTION

Economics is all about making smart choices to cope with scarcity. The most fundamental measurement used to evaluate the success in allocating the scarce resources is economic growth which is an increase in the amount of goods and services that an economy produces economic growth is the most powerful instrument for reducing poverty and improving the quality of life in developing countries. It is currently one of the main goals that all countries both developed and developing aim to achieve (Bakari and Mabrouki, 2018). Economic growth is an important phenomenon whose reality differs depending on the context in which one may be because there are countries whose economic growth depends on the agricultural sector: this is the case of China. In Iran, on the other hand, it depends on the service sector, mining and oil industry (Tehranchian and Behravesh, 2014). This phenomenon results in rising wages and higher standards of living for citizens (measured as increases in real gross domestic product [GDP] per capita; it allows a society to increase its consumption of goods and services

In 2018, the GDP growth rate in Central Africa (i.e., Cameroon, Central African Republic, Congo, Democratic Republic of Congo, Gabon, Equatorial Guinea, and Chad) accelerated slightly to 2.2 percent from 1.1 percent in 2017, while remaining below the African average of 3.5 percent. (BAD, 2019).

Sub-Saharan African countries' growth is essentially based on natural resources (fossil fuels, metallic and non-metallic minerals, forestry and agricultural resources). Most of these resources does not regenerate quickly enough to serve some human purpose in a sustainable way. (UNCTAD, 2012). Congo's economy is dominated by the oil sector, which accounts for 50% of GDP, 60% of budget revenues and 90% of exports (FAO, 2017). This country experienced strong economic growth (4.5% per year) between 2002 and 2015(World Bank, 2017). Following

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the fall in oil prices, Congo, lowered its annual production goal to 110 million barrels from 140 million barrels. These encouraging performances fell. Economic growth in the Republic of Congo declined to -2.8% in 2016 and-3.1% in 2017 (World Bank, 2018).

Taking into account the weaknesses related to the volatility of oil prices on the world market, the Congolese economy resorts to the agricultural sector as a sector that can boost economic growth.

However, Congolese agriculture is not very competitive due to many factors such as human resources. This is because the sector is dominated by smallholders who practice traditional cultivation and the means of production used are still rudimentary and archaic (hoe, machete, etc.), which slows down agricultural activities and therefore economic growth in the Congo. (FAD, 2008).

Despite the reforms introduced in the country to boost the agricultural growth and its effect on the economy, agricultural output has failed to bring the desired growth needed to achieve the Millennium Development Goals which was to halve the poverty rate by 2015. Congo has been investing its scarce resources in agriculture but there is lack of empirical studies supporting the theory that agriculture is primordial for economy growth in the country. To continue using agriculture as source of economic growth, it is important to reevaluate to which extent agriculture contribute to economic growth. It is therefore fair to ask what effect agricultural production has on the Congo's economic growth?

The research problem of the study is to measure the impact of the agriculture sector on economic growth of Congo during the period of 2005 to 2018.

I.3- Objectif de recherche

The main objective of this study is to evaluate the impact of agricultural on economic growth in Congo.

II.- Literature Review

It highlights the various theoretical and empirical research works that have contributed to the literature on agricultural production and economic growth. Thus, it is subdivided into two subsections: the theoretical approach and the empirical approach.

II.1- Theoretical approach

We will present two groups of theories. The first one maintains that agricultural production positively influences economic growth. The second however maintains that economic growth occurs when agricultural production is associated with the production of the industrial sector. For the first group, we used the endogenous growth theory and the agricultural growth theory, and for the second, we highlighted the surplus theory.

Endogenous growth theory

Developed by Romer (1986), Lucas (1988) and Barro (1990), The purpose of this theory is to define the sources of economic growth. Growth is considered to be a self-sustaining phenomenon thanks to the accumulation of four main factors, namely: physical capital, human capital, public capital and technology.

Indeed, Lucas (1988) thinks that human capital plays an important role in economic growth because when farmers are young and well trained, they can help increase agricultural production and therefore generate strong economic growth.

Likewise, Romer (1990) also believes that economic growth depends on the accumulation of knowledge because advanced technology stimulates production which in turn will stimulate economic growth.

In the same vein, the theory of the double economy developed by Fei and Ranis (1964) shows us that agriculture has a positive effect on economic growth through the establishment of dualist models that divide the economy into two sectors: the traditional sector dominated by subsistence agriculture and the modern sector dominated by industry. In this sense, farmers must increase productivity in the agricultural sector in order to enable the development of the industrial sector and therefore boost economic growth.

Agricultural growth theory

Agricultural growth theory developed by Mounier (1994) aims to interpret the relations between agriculture and the rest of the economy. It includes two approaches: a global approach and a multisectoral approach. It shows that agriculture plays a primordial role in production and employment. This agricultural growth theory takes into account human capital through three (3) factors: labor, agricultural income and food prices.

The surplus theory

The surplus theory is based on the work of Lewis (1954), inspired by classical political economy. This theory states that economic growth depends on two sectors: one traditional (agricultural) and the other modern (industrial). He considered that economic development depends relatively on the growth of the mentioned sectors. The shift of labor from the traditional sector to the modern sector develops the economy.

Thus Lewis (1954) believes that there is interdependence between the agricultural sector and the industrial sector. This is because the agricultural sector has a large quantity of labor, which leads to zero marginal productivity. The non-agricultural sector, on the other hand, has abundant capital and resources in relation to labor. Agriculture frees up low-productivity labor to supply other sectors, particularly industry.

Empirical research

A number of publications provide some explanations for the effect of agricultural production on economic growth. Among them there are those who argue positive effect of agricultural production on economic growth and those who discuss the contrary.

Several authors argue that growth in the overall economy depends on the development of the agricultural sector (Schultz, 1964; Gollin, Parente, and Rogerson, 2002). Also, growth can follow from agriculture when countries are invested with large-scale famers (Reardon and Berdegue, 2006; Maxwell, 2004; Collier and Dercon, 2009). Advocates of agriculture-led growth (ALG) contend that investment in agriculture and the accompanying creation of infrastructure and institutions in other sectors is a prerequisite for national economic growth (Schultz, 1964; Timmer, 1995, 2002). These researchers note that growth in the agricultural sector could be a catalyst for national output growth via its effect on rural incomes and provision of resources for transformation into an industrialized economy (Eicher and Staatz, 1998; Dowrick and Gemmell, 1991; Datt, and Ravallion, 1998; Thirtle, Lin, and Piesse, 2003).

In contrast to the ALG arguments above, proponents of the opposite viewpoint contend that the agricultural sector does not have strong linkages to other sectors and lack adequate innovative structure necessary for fostering higher productivity and export growth (Lewis, 1954, Hirschman, 1958; Fei and Ranis, 1961; Jorgenson, 1961). In a theoretical analysis, Matsuyama (1992) used the comparative advantage argument to refute the claim that agricultural productivity is an engine of economic growth. Further reflecting this negative view of agriculture in the development process, policymakers in many developing countries proposed and adopted development strategies that were anti-agriculture and rather emphasized the role of the manufacturing sector as the preferred source of economic growth (Okonkwo, 1989; Schiff and Valdez, 1998).

Although several studies have outlined the theoretical relationship between agriculture and economic growth, disagreements still persist. The causal dynamics between agriculture and economic growth is an empirical question worthy of further investigation

This current analysis attempts to bridge the gap in the empirical literature on the interaction between agriculture and economic growth. The objective of this study is to analyze the relationship between agriculture and economic growth, we use the autoregressive distributed lag (ARDL) error correction modeling approach to investigate both short-run and long-run dynamic causal relationships between agriculture and economic growth.

III- DATA AND METHODOLOGY

Resent study is based on the impact of agriculture production on economic growth in Congo for a period of 2005 to 2018. Gross domestic product per capita is taken as dependent variable and the explanatory variables areas

follows agricultural value added (AVA), gross fixed capital formation (GFCF), industrial value added (IVA) and the Corruption Perceptions Index (CPI)

The data for this study are from a quarterly database. These data come from the various sites of international institutions including: the World Bank (2018), Perspective Monde Congo (2018) and Transparency International (2018).

Data on the average annual growth rate were obtained from the World Outlook Congo (2018) database.

As for the data on agricultural value added, gross fixed capital formation, and industrial value added, they were collected from the World Bank database (2018).

The data on the Corruption Perceptions Index were taken from the Transparency International (2018) database, we developed graphs using Microsoft Excel -2010, and econometric analysis results was made possible through the use of Eviews-9 software.

III.2- Econometric Approach

This approach includes: the theoretical and the empirical model.

III.2.1- theoretical model

The theoretical model used in this study is the one developed by Solow (1956) to which Mankiw Romer and Weil (1992) incorporate physical and human capital. We obtain this Cobb-Douglas:

$$Y_t = K_t^{\alpha} + H_t + A_t L_t^{-\alpha-1}( ) \quad ( ) \quad ( )^{\beta} \quad ( ) ( )^{1} \quad ^{\beta}( )$$

With:

- K_t: represents the physical capital;
- H_t: represents the human capital;
- L_t: represents labor;
- A_t: represents the exogenous technical progress;
- **α** et **ß**: represent the constants.

III.2.2- Empirical model

Given the specificity of the Congolese economyand the availability of economic and agricultural data, we will lean on the empirical model of Amina and Kabuga (2016).

Amina and Kabuga (2016) use the staggered lag linear autoregressive (ARDL) model to assess the impact of agricultural production on economic growth in Nigeria over the period 1986-2015. With GDP as the explanatory variable, agricultural production as the explanatory variable, and gross capital formation and labor force as the control variables. The results obtained after study show that there is a significant positive relationship between agricultural production and economic growth in the short and long term. Thus, the model of Amina and Kabuga (2016) is as follows:

$$GDP_t = \propto_0 + \propto_1 AP_t + \propto_2 GCF_t + \propto_3 LBR_t + \in_t \qquad (2)$$

- GDP_t: Gross Domestic Product;
- AP_t:Agricultural production;
- GCF_t:Gross capital formation;
- LBR_t:laborforce;
- $\mathcal{E}_t$:Specificationerror • . $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4$: constants.

From this model, we retain three (3) variables namely: gross domestic product (GDP), agricultural production (AP), and gross capital formation (GCF). Also, we add the variables industrial value added (IVA) and corruption perception index (CPI). The reason for including these two variables is that they are assumed to be related to the endogenous variable (average annual growth rate). Besides, we excluded the labor force variable (LBR) because of data unavailability .Because of its non-stationarity the GDP variable was substituted by the average annual

growth rate (AAGR). We also replaced agricultural production by agricultural value added(AVA) because it is an indicator witch better explains agricultural production.

Thus, four (5) variables will be used: the average annual growth rate (AAGR), agricultural value added (AVA), gross fixed capital formation (GFCF), and industrial value added (IVA) and the Corruption Perceptions Index (CPI).

The model used to examine the impact of agricultural production on economic growth was expressed as follows:

$$\mathbf{AAGR_t} = \alpha_0 + \alpha_1\ \mathbf{AVA_t} + \alpha_2\ \mathbf{GFCF_t} + \alpha_3\ \mathbf{IVA_t} + \alpha_4\ \mathbf{CPI_t} + \epsilon_t$$

With:

$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4$: constants; ε_t:term of errors, t indexing years. dependent variable

- $AAGR_t$: average annual growth rate

Independent variables

- $\mathbf{AVA_t}$:agricultural value added.
- GCF_t: representsgross fixed capital formation;
- IVA_t: represents the added value of the industrial sector;
- $\mathbf{CPI_t}$**:**representsthe Corruption Perceptions Index.

III.2.3- link between the dependent and independent variables Agricultural Value Added (AVA)**:**

According to Charts (2020), agricultural production is defined as all goods and services related to the transformation of the natural environment. It includes mainly crop and livestock activities. Indeed, the indicator used to measure agricultural production is the agricultural value added. In our work, the latter is used as an exogenous variable and is expressed as a percentage of GDP.

Several authors have highlighted the positive relationship between agricultural production and economic growth: for example the work of Amina and Kabuga (2016).Hence the expected sign is positive (+).

The industrial value added (VAI):

According to INSEE (2020), the value added measures the creation of wealth, the contribution of the production process considered by the economygrowth . In our study, it is a control variable and is expressed as a percentage of GDP. Hence the expected sign is negative (-).

Gross fixed capital formation (GFCF):

According to INSEE (2020), gross fixed capital formation consists of the acquisitions of fixed assets by resident producers. These fixed assets are tangible or intangible assets resulting from the production process and used repeatedly or continuously in other production processes for at least one year. In our study, gross fixed capital formation is used as a control variable and is expressed as a percentage of GDP. It refers to a country's investment that is expected to increase output. Hence the expected sign is positive (+).

Corruption Perceptions Index (CPI):

Alesina and Weder (2002) define corruption as the misuse of state property by an official for personal gain. It is used as a control variable and has no unit. Hence the expected sign is negative (-).

Table 1: Table 1: Summary of expected signs for different variables

Variables	Assumptions	Expectedsigns
AVA	Agricultural value added significantly increases economic growth.	+
GFCF	Gross fixed capital formation significantly increases economic growth.	+
IVA	The value added of the industrial sector significantly reduces economic growth.	-

CPI	Corruption perception index significantly reduces economic growth.	-

Source: Author's calculations.

IV- Econometric results

This section deals with some basic econometric issues like stationarity of data, auto regressive distributed lags model and bound testing procedure. Augmented Dickey and Fuller (ADF) test is used to check the order of integration. The use of ARDL model should be justified on the basis of ADF test i.e. if all variables are integrated in different orders such as I(0) and I(1) only then auto regressive distributed lags model (ARDL) can be used. Otherwise if all variables are integrated on I (0) then usually simple ordinary least square method (OLS) is used. Whereas, Johanson co-integration technique is used if variables are integrated on I
(1). Table 2 presents the results of ADF test.

Table 2*Stationarity tests*

Variables	**Type of test**	**without constantand without trend**	**With constantandwithout trend**	**Withconstante and trend**	**Critical value (5%)**	**Stat of test**	**Decisions**
AAGR	**ADF**	yes	no	No	-1,947665	-4,187011	I(1)
	PP	yes	no	No	-1,946996	-2,763288	I(1)
AVA	**ADF**	yes	no	No	-1,948313	-2,125097	I(1)
	PP	yes	no	No	-1,946996	-2,612717	I(1)
IVA	**ADF**	yes	no	No	-1,612229	-1,720570	I(1)
	PP	yes	no	No	-1,946996	-2,820162	I(1)
GFCF	**ADF**	yes	no	No	-1,947665	-3,007740	I(1)
	PP	yes	no	No	-1,946996	-2,526056	I(1)
CPI	**ADF**	yes	no	No	-1,948313	-2,436811	I(1)
	PP	yes	no	No	-1,946996	-3,366829	I(1)

Source: Author's calculations.(*Eviews -9)*

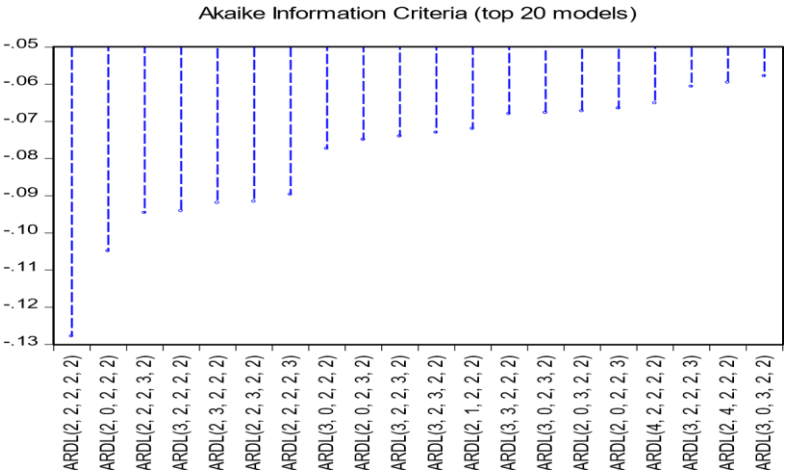
Table 2 above presents different stationarity tests (ADF; PP) results of the different variables carried out through the Eviews-9 software. A simple reading of the latter reveals that all the series are stationary in first difference

(AAGR; AAGV; IAGV; GFCF; CPI). Moreover, no series is stationary in second difference. This is essential for the application of the ARDL model.

- Choice of the optimal mode

For the choice of the number of delays, we have chosen the Schwarz information criterion (SCI).The graph n°1 presents the results

Graphn°1: Choice of the optimal model

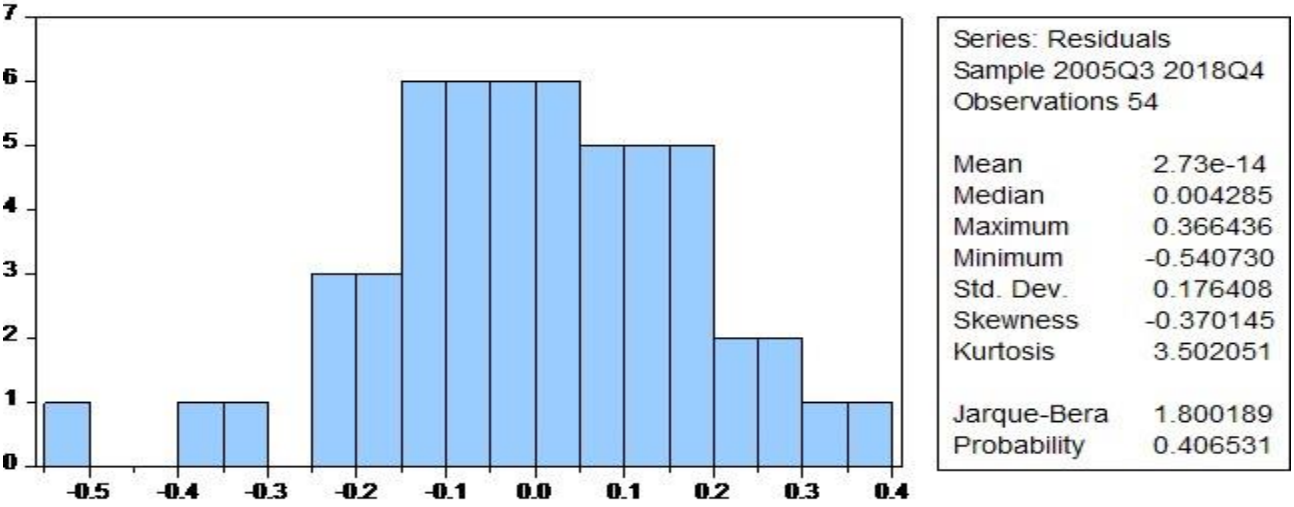


Source: *auteur à travers Eviews -9*

The above graph shows twenty (20) best models according to the Schwarz information criterion. The ARDL (2, 2, 2,2) model is equivalent to the smallest value of the Akaike information criterion as confirmed in Graph 1.

Error autocorrelation test

In order to validate our model, it is necessary to carry out an error autocorrelation test (see graph n°2). The results of this test show that there is no autocorrelation between the errors because the probability is higher than the 5% threshold (0.406531 > 0.05). graph n°2**: Error autocorrelation test**



- **Cointegration test results**

The results of the cointegration test are given by the Bounds test and the critical values of the Bounds test.

- **ARDL Bounds test**

The table below shows the ARDL Bounds test results

Tableau n°3: ARDL Bound test

T Statistic	Value	K
F-statistic	17,96432	4

Source:Author's calculation

Table n°4: Critical values of the Bounds test

Significance	**I0 Bound**	**I1 Bound**
10%	2,2	3,09
5%	2,56	3,49
2,5%	2,88	3,87
1%	3,29	4,37

Source: Author's calculation

Test Equation:
Dependent Variable: D(GFCF)
Method: Least Squares
Date: 11/26/21 Time: 16:59
Sample: 2005Q3 2018Q4
Included observations: 54

Variable	Coefficient	Std. Errort-Statistic	Prob.
D(GFCF(-1))	0.959778	0.042112 22.79125	0.0000
D(AVA)	1.979520	1.179993 1.677569	0.1014
D(AVA(-1))	-2.315213	0.980735 -2.360690	0.0233
D(IVA)	0.904825	0.174640 5.181096	0.0000
D(IVA(-1))	-0.923622	0.157383 -5.868618	0.0000
D(GFCF)	0.320533	0.083956 3.817892	0.0005
D(GFCF(-1))	-0.329167	0.094764 -3.473540	0.0013
D(CC)	-9.061087	1.249179 -7.253635	0.0000
D(CC(-1))	8.432392	1.069322 7.885739	0.0000
C	0.698425	3.704556 0.188531	0.8514
IVA(-1)	-0.184194	0.272523 -0.675883	0.5031
IVA(-1)	0.022941	0.030125 0.761514	0.4509
GFCF(-1)	0.029507	0.014211 2.076282	0.0445
CC(-1)	-0.823339	0.456289 -1.804426	0.0789
AAGR(-1)	-0.103169	0.013496 -7.644614	0.0000

R-squared	0.982510	Mean dependent var	-0.104998

Adjusted Rsquared	0.976232	S.D. dependent var	1.333908
S.E. of regression	0.205648	Akaike info criterion	-0.095171
Sum squared resid	1.649349	Schwarz criterion	0.457325
Log likelihood	17.56961	Hannan-Quinn criter.	0.117905
F-statistic	156.4907	Durbin-Watson stat	1.550438
Prob(F-statistic)	0.000000		

Referring to the asymptomatic critical values proposed by Narayan (2004), we reject the absence of a long-run relationship hypothesis because the calculated Fisher statistic (F=17.96432) as shown in Table 3 is above the upper limit for the different significance levels. We conclude that there is a long run relationship between the different variables.

Long and short run Model

- Results of the long and short run estimation between the average annual growth rate and the agricultural value added are shown in Table 5 and 6

Tableau n°5: short run results

Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(AAGR(-1))	0,959778	0,026793	35,822122	0,0000
D(AVA)	1,979520	0,884343	2,238409	0,0310*
D(AVA(-1))	-2,315213	0,744992	-3,107703	0,0035**
D(IVA)	0,904825	0,136009	6,652684	0,0000
D(IVA(-1))	-0,923622	0,120493	-7,665345	0,0000
D(GFCF)	0,320533	0,066612	4,811918	0,0000
D(GFCF(-1))	-0,329167	0,071099	-4,629671	0,0000
D(CPI)	-9,061087	0,685423	-13,219694	0,0000
D(CPI(-1))	8,432392	0,719182	11,724984	0,0000
Coint Eq(-1)	-0,103169	0,009356	-11,027449	0,0000
Cointeq=AAGR-(-1,7854*AVA+0,2224*IVA+0,2860*FBCF-7,9805*CPI)6666+ 6,769)				

Source: *author's calculations (Eviews- 9)*

*: significance at 5% level; **: significance at 1%level

-In our short run model four variables are significant. These are: agricultural value added (AVA), industrial value added (IVA), gross fixed capital formation (GFCF) and the Corruption Perception Index (CPI). Indeed, the agricultural value-added variable is significant at the 5% threshold and positively influences economic growth by 1.979520%. In other words, when agricultural value-added increases by 5%, economic growth also increases by 1.979520%. This result corroborates with the expected sign of our study and fits well with the endogenous growth theory that agricultural production has a positive effect on economic growth.

Economically, the positive effect of agricultural value added on economic growth in Congo can be explained by the implementation of projects and programs such as the National Development Plan (NDP), the Rural Development Project (PRODER 1, 2, 3), and the Agricultural Development and Rehabilitation of Rural Trails

Project (PDARP). These results are in phase with those obtained by Amina and Kabuga (2016). Furthermore, at date t -1 agricultural value added is significant at the 1% threshold and negatively affects economic growth by -2.315213%.In other words when agricultural value added increases by 1%, economic growth decreases by 2.315213%.These results are similar to those of Salako et Al (2015) also presented in our empirical review.

-long-run estimation results Table n°6: long run model results

Variables	Coefficient	Std. Error	t-Statistic	Prob.
AVA	-1,785359	2,758920	-0,647123	0,5213***
IVA	0,222363	0,278327	0,798926	0,4292
GFCF	0,286004	0,158070	1,809348	0,0781*
CPI	-7,980492	5,014018	-1,591636	0,1195
C	6,769715	36,376962	0,186099	0,8533

Source: *author'scalculationsEviews- 9*

From the different estimationit is shown that the chosen ARDL (2, 2, 2, 2) model is a good model. Indeed, in the top 20 models considered good, it has the advantage of losing less information according to the Akaike criterion. Moreover, its coefficient of determination (R2=0.976232) shows us that in the long run, 97.6232% of the variation in the average annual growth rate could be explained by agricultural value added, industrial value added, gross fixed capital formation and the corruption perception index.

Moreover, the coefficient of the **CointEq(-1)**in table n°5 corresponding to the residual lagged by one period and the estimated long-run equilibrium equation is negative (-0.103169) and significant (p= 0.0000), which confirms the existence of a short-term relationship between the variables.

The ARDL model (2, 2, 2, 2) validation is also confirmed by the absence of autocorrelation between the residuals because the probability of **Error autocorrelation test**graph confirms that there is no autocorrelation relationship between the residuals (0.406531> 0.05), moreover the Durbin-Watson statistic

1.550438 being close to 2, announces an absence of autocorrelation

The chosen model is better because the errors do not bias the quality of the information.

In the long run, the variable agricultural value added (AVA) as a variable of interest is not significant, so it does not impact or explain economic growth because, the coefficient associated with this variable is negative (-1.785359%) and lower than its probability (0.5213). Economically, this result can be explained by the fact that Congolese agriculture is mainly a subsistence agriculture (PAP, 2016). It is essentially an organic agriculture because the means of production used are still rudimentary and archaic (hoe, machete, etc...). In addition, the public authorities have given priority to the oil sector, so they have not put in place the necessary investments to develop Congolese agriculture. These results are in line with those of Eze and al (2020).

CONCLUSION

The present study investigates the impact of agriculture on economic growth in CONGO Brazzaville using the Autoregressive Distributed Lag (ARDL) estimation technique, employing data from 2005 to 2018. It emerges from the estimates that in the short run the coefficients associated with agricultural value added (t and t -1) are respectively positive and negative at the thresholds of 5% and 1% and then affect economic growth by 1.979520% and -2.315213%. This result means that in the Republic of Congo, the improvement of agricultural value added contributes to the improvement of economic growth. Furthermore, the positive relationship between agricultural value added and short-term economic growth can be explained by the implementation of programs and policies to develop the agricultural sector. These include the Rural Development Project (PRODER 1, 2, 3), the

Agricultural Development and Rural Track Rehabilitation Project (PDARP) in 2013 and the National Development Plan (PND) in 2018.

In the long run, agricultural value added as a variable of interest is not significant. This variable does not impact or explain economic growth in Congo. Because its coefficient (-1.785359%) is lower than its probability (0.5213). This result is explained by the fact that Congolese agriculture is a subsistence agriculture, despite the policies and programs put in place by the State to increase its share in the gross domestic product.

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