# The contribution of agricultural and manufacturing sectors to non-oil economic growth in Algeria: An empirical analysis

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**Abstract:**

The research aims to examine the contribution of the agriculture and the manufacture sectors to non-oil economic growth in Algeria. We have applied the Ordinary Least Square (OLS) method, for the period from 1999 to 2021. The results suggest the existence of a significant and positive influence of agriculture value added on non oil-economic growth in Algeria. The second result confirms the negative influence of the manufactured value added on Algerian economic growth. This result could be explained by the inefficiency of the Algerian industry. The Algerian economic diversification could be achieved by developing the two sectors.

**Keywords:** Non-Oil economic growth, Algeria, Agriculture Value Added, Manufactured Value Added, OLS

**JEL Classification Codes:** O11,O31,O41,Q18,N67.

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**1-Introduction :**

Manufacture and agriculture sectors have been thought of as an engine of economic growth. For a sustainable economic development, diversifying its economy has become a priority for the developing countries. Researchers agree that investing in agriculture and industry still remains a reliable source of wealth creation (Cigdem Borke Tunali (2019), Nicola Cantore and al (2017), Eman Attiah, (2019). Nevertheless, the question still arises for African countries. Indeed, the agricultural sector dominates the majority of economic activity in developing countries, but their economic growth remains low. Industry in African countries is still in its infancy and is struggling to reach the development levels of industrialized countries. So the question of the contribution of the traditional sectors of agriculture and industry to economic growth is still relevant, particularly in the Algerian context.

The structure of the Algerian economy is still dependent on oil; Algeria remains a developing country that vitally needs to take advantage of its existing potential in the various alternative sectors. Algeria's economic growth is driven by hydrocarbons at more than 50% followed by services which contribute 35%. The share of industry in the Algerian GDP is only 5% in 2020, while the share of agriculture is 14% the same year. In this context, the country needs to diversify its economy for a sustainable economic growth; hence the interest of our study. Algeria attaches particular importance to the agricultural sector as a key pillar in achieving development objectives and as a catalyst for the Government's efforts to improve living conditions and reduce unemployment rates (Abdelaziz Abdous and al 2019).

This paper examines the role of the manufacturing and agricultural sectors in generating economic growth, by econometrically testing the relationship between Algeria's non-hydrocarbon economic growth and manufacturing value added and agriculture value added. This research makes an important contribution to the literature. Researchers focus on analyzing the evolution of the two sectors in Algeria, using a descriptive analysis but few studies examine empirically their contribution to wealth creation. The non-hydrocarbon variable has been chosen to have more conclusive results and not lead to biased results, given the structure of the Algerian economy which is largely dependent on oil. The period of analysis extends from 1999 to 2021, a time sample selected based on data availability.

The article is organized as follows. The next section presents a review of the literature related to the impact of agricultural and manufactured sectors on economic growth. The section 2 briefly describes the agricultural and the manufacture sectors in Algeria, by dressing an overview of the Algerian economic structure. In Section 3 we describe the data, and the empirical strategy. In Section 4 we present the results of the study and Section 5 concludes.

**2. Literature review:**

It is commonly accepted in the literature review that industry, and more specifically the manufacturing sector, as well as the agricultural sector are key determinants of economic growth and development. Nevertheless, the results still vary according to the type of country and the degree of its development. In the case of Algeria, empirical studies treating the interaction between agriculture and industrial sectors and economic growth are still lacking.

### 1.1. Empirical studies on the impact of agricultural sector on economic growth

On the topic, many authors have investigated the relationship between agriculture and economic growth. Ceylan and Özkan (2013) analyzed the effect of agricultural value added per capita on per capita income in the European Union countries. Using the panel data analysis method, the authors used two samples of 25 and 30 member states for the periods 1995-2007 and 2002-2007, they found that the per capita income elasticity with respect to agricultural value added was 0.025 for the period 1995-2007 versus 0.22 for the period 2002-2007. Bakari and Mabrouki (2018) applied the correlation analysis and static gravity model to verify the impact of agriculture trade on economic growth in the North Africa countries. Their findings suggest a positive correlation between agricultural trade and GDP. They also concluded that, agricultural exports have a positive influence on economic growth while agricultural imports have no significant effect on GDP. Dercon and Gollin, (2014) suggests that public investments in agriculture may have a significant impact on rate of return and therefore may add to a country's GDP. Tiffin and Irz (2006) used bivariate Granger causality tests to examine the causal relationships between agricultural value added and economic growth for a panel of 85 developing and developed countries. For developing countries, agriculture causes economic growth, but they find inconclusive results for developed countries. These empirical results may suffer from specification problems, such as variables omitted because the authors failed to control for the potential influence of other key determinants of economic growth. Ousman Traore and al (2022), studied the performance of agriculture sector on well-being in Burkina Faso, from 1970 to 2017 using a Vector Autoregressive technique. Granger's causality test has demonstrated a unidirectional causal impact from agriculture value-added to household income. The same causal links were also discovered, respectively from the agricultural and service sectors to life expectancy.

### 1.2. Empirical studies on the influence of manufacturing sector on economic growth

The development of manufacturing sector leads to economic growth by a number of effects such as the generation of backward and forward linkages, the expansion of technology knowledge and training on the job (Cigdem Borke Tunali 2019). According to Nobuya Haraguchi and al (2017) industrialization has continued to play an important role in the growth of developing countries, which have sustained rapid and long-term growth for the last 25 years. They confirm that developing countries have the potential to benefit more from their lagging industrialization. The industrial sector will be an important engine of growth for low-income countries, in contrast to developed countries that have undergone rapid industrialization and whose manufacturing industry is already mature. Nicola Cantore and al (2017) use GMM techniques for a sample of 80 countries for the period 1980–2010, the paper provides new evidence supporting the role of the manufacturing sector as an engine of growth. Cigdem Borke Tunali and Furkan Boru (2019) tried to find out whether manufacturing sector has a causal relationship with services sector, savings and economic growth in Turkey. According to the results of the empirical analysis, it is found that while there is no causality relationship among manufacturing sector, services sector and economic growth there is a one-way causality relationship between manufacturing sector-saving and manufacturing sector-gross fixed capital formation. Eman Attiah (2019) investigates the role of manufacturing sector in economic growth in selective developing countries in the period (1950-2015). The empirical study shows that the effects of manufacturing are particularly pronounced in

periods of growth acceleration. Adam Szirmai and al (2015) examined the role of manufacturing as a driver of growth in developed and developing countries in the period 1950–2005. The results show that manufacturing acts as an engine of growth for low- and some middle-income countries. The second interesting result indicates that a higher level of human capital is necessary for manufacturing to play a role as an engine of growth in developing countries.

## 2. Overview of Algerian economic structure:

In this section we will highlight some facts about Algerian economy structure. Indeed, it is not without interest before moving to the econometric analysis, conducting a descriptive analysis that will capture the state of the Algerian economy.
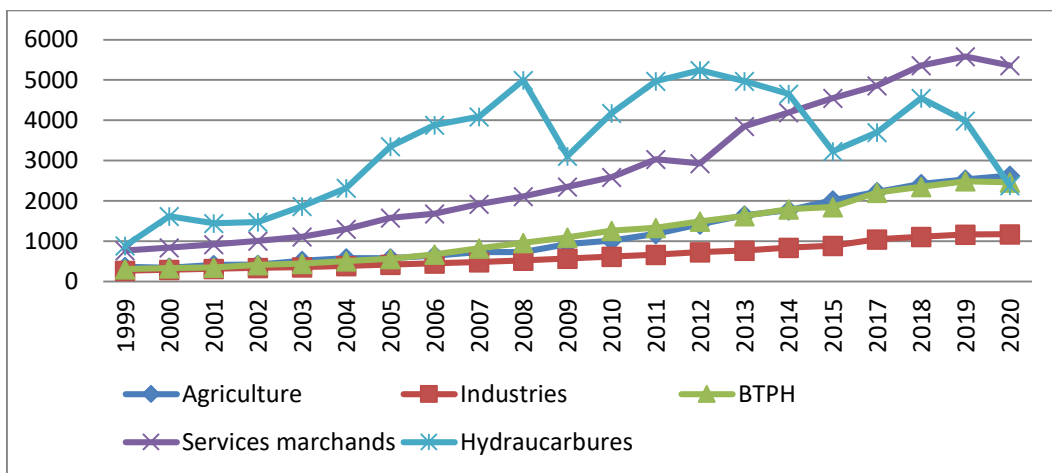
**Fig (1): Evolution of Non-Oil GDP growth in Algeria (Billion Dinars)**
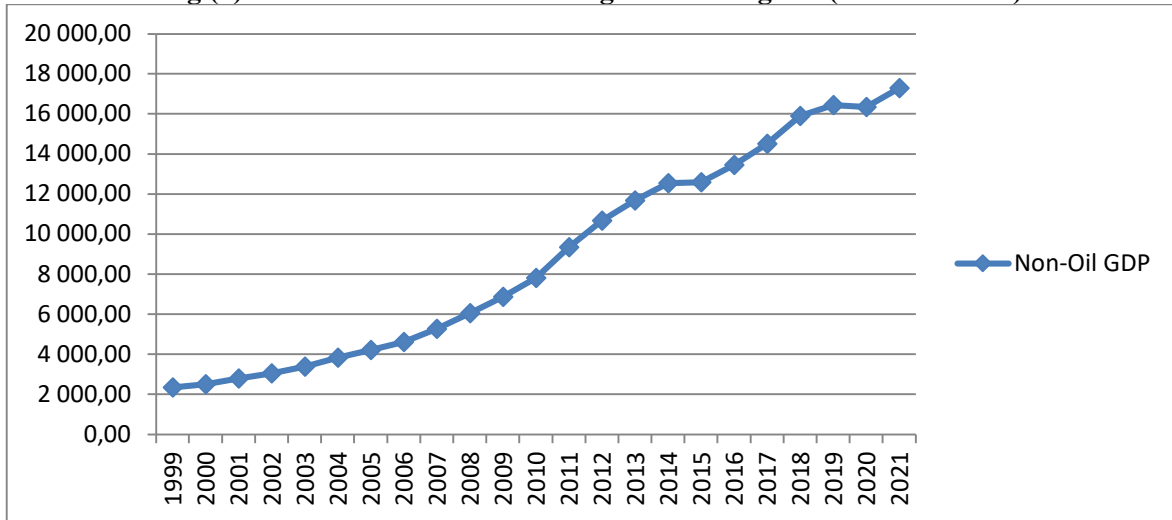


**Source:** National statistics office

Algeria's non-hydrocarbon GDP is on an upward trend, rising from 2.347 billion dinars to 17.287 billion dinars in 2020. Algeria has clearly put forward its willingness to diversify its economy by investing in more productive sectors. However, the Algerian economy still remains a rentier economy, hence the need to invest more in alternative sectors that bring economic growth. We notice from figure 2 that the Algerian GDP is generated by two main sectors: hydrocarbons and market services. The non-hydrocarbon sector is mainly dominated by services

**Fig(2): GDP by main sectors of activity at current price in Algeria (Billion dinars)**

Indeed, Algerian growth is highly dependent on the performance of the hydrocarbon sector and the services sector. The agricultural and industrial sectors contribute marginally to GDP. The low contribution of the productive sectors, (agriculture and manufacturing sectors),  is a concern for the sustainability of Algerian growth in the long term. The low share of manufacturing industry in exports shows that this sector is very much focused on its domestic market. Thus, in 2005, 50% of Algeria's growth was generated by the hydrocarbon sector, 35% by services, 12% by agriculture and only 2.6% by manufacturing.

The structure of the Algerian economy has not changed much in 2020, as it remains heavily dependent on hydrocarbons. This fragility does not encourage progress in competitiveness through an active policy of innovation, which further reduces the prospects for long-term growth. Nevertheless, it is important to emphasize (Figure 2) that both sectors (agriculture and industry) have experienced a positive evolution since 1999. The share of agriculture in Algerian GDP has increased from 3 million dinars in 1999 to 2.6 billion dinars in 2020. The industry sector has experienced a significant rebound, from 7 million dinars in 1999 to 1.17 billion dinars in 2020.

**Fig (3): Share of manufacture and agriculture sectors in Algerian GDP (percentage)**
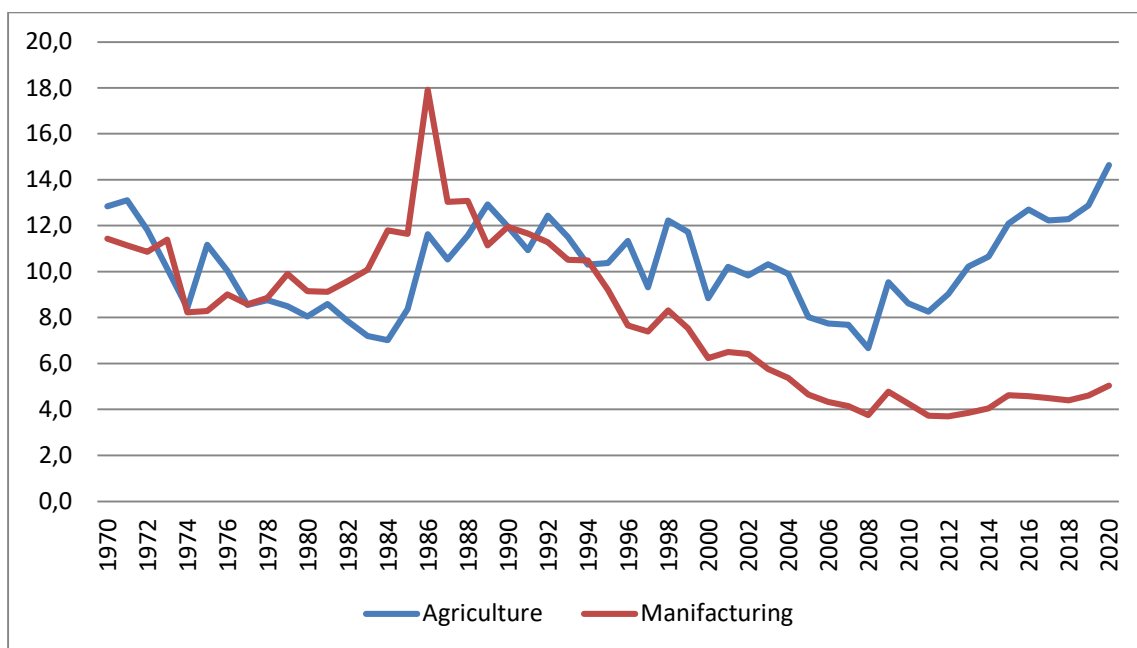
However, it is essential to note that the manufacturing sector in Algeria has experienced a collapse since 1986, as highlighted in Figure 3. The sector's share of Algerian GDP was 18% in 1985, collapsing to 3.8% in 2008, to reach 5% of GDP in 2020. This collapse is a direct consequence of several factors: political, security, regulatory and socio-economic factors; more specifically: the political crisis and the debt crisis that affected the country from 1986. The application of the conditions of the structural adjustment imposed by the IMF, had disastrous repercussions on the Algerian industry. Indeed, the Algerian industrial fabric has broken up into small and medium-sized enterprises, which have gradually disappeared in the face of a constraining environment and exacerbated international competition.

Algeria is still struggling to rebuild its industry and make this sector a locomotive for growth. In parallel, the share of the agricultural sector in the Algerian GDP has experienced a very significant rebound; it reached a performance of 14% in 2020. This increase is the result of the development policy and the promotion of the sector initiated by the government through its various programs and investments. In terms of value added from the agricultural and manufacturing sectors, Algeria remains far behind the industrialized countries. It is useful to recall that Manufacturing value added (MVA) of an economy is the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate consumption. It's the sum of the value added of all manufacturing activities (United Nation 2022).

**Fig (4): Manufacturing Value added in selected countries in 2020 (Current USD).**
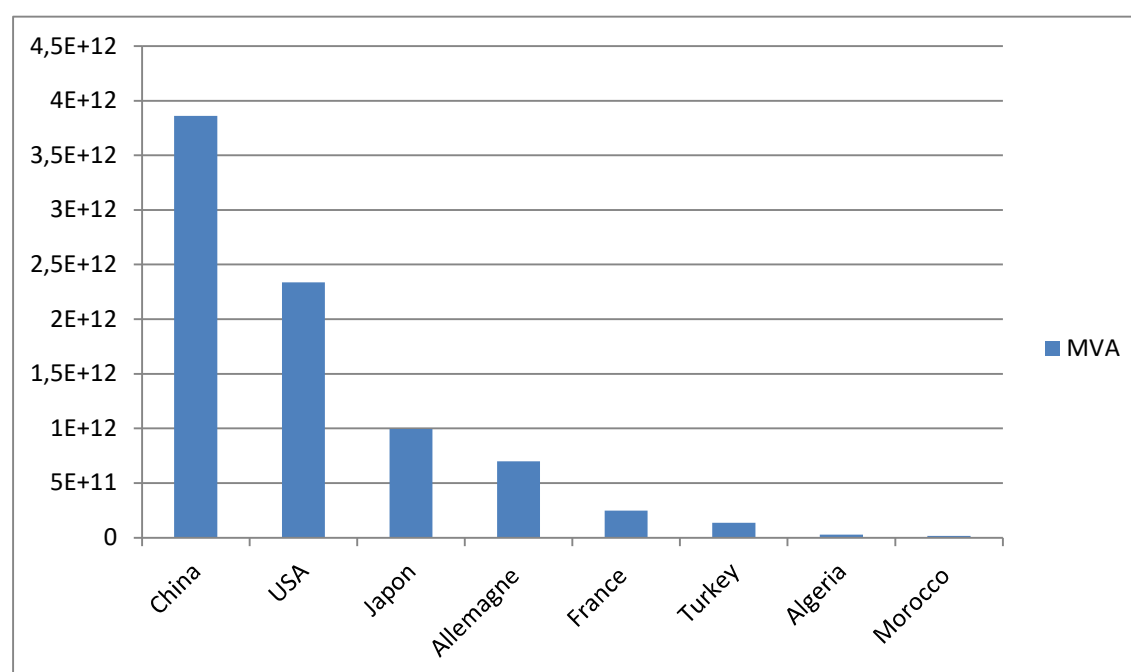


**Sour** **ce:** World Bank

While agricultural value added represents the sum of the incomes of the suppliers of factors of production: farm employees, non-operator owners of farmland, lenders, and farm operators. It represents the value of the gross output of the agricultural sector in a year. China dominates the global ranking in terms of value added from manufacturing (Figure 4). China is the first economy that generates value added through its manufacturing sector (3860 billion dollars), followed by the USA with a value added of 2337 billion dollars, and Germany with 698 billion dollars. The share of value added of the manufacturing sector in Algeria is insignificant compared to the major powers; the performance of the sector is only 2.7 billion dollars. Figure 5 presents the value added of the two sectors. As we can see, the manufacturing value added is constantly decreasing, while the value added of the agriculture sector is relatively constant.

**Fig (5): Agriculture and manufacturing value added in Algeria % GDP**
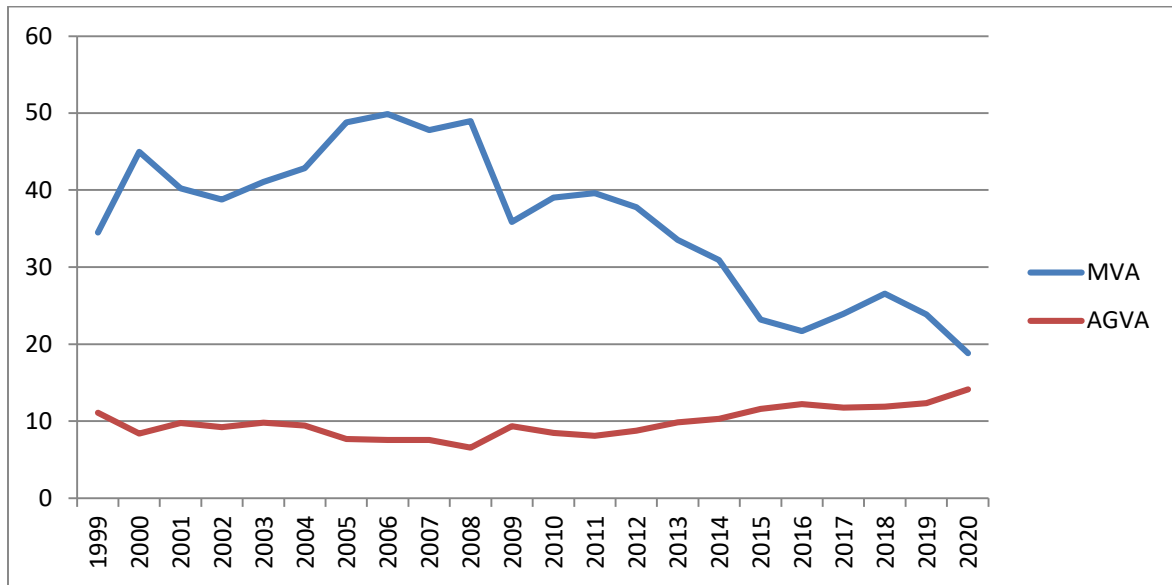


**Source:** World Bank

## 3. Empirical study

In this study, we have applied the ordinary least squares method to capture the contribution of manufacturing and agriculture sectors to economic growth in Algeria, for the period: 1999 to 2021. We will empirically test the following hypotheses.

### 3.1.Research hypothesis

**H1:** *The manufacturing sector is crucial to enhance economic growth in Algeria.*

As exposed in the literature revue, it is admitted that manufacturing sector contributes to economic growth; however some studies confirm the opposite for African countries. In this hypothesis we suppose the positive relationship between the manufacturing sector and economic growth in Algeria.

**H2:** *Agriculture sector contributes to Algerian economic growth.*

In this hypothesis, the study will measure at what extent agriculture sector boosts Algerian economic growth. We suppose the existence of a positive correlation between Algerian economic growth and agriculture sector.

### 3.2.Methodology and data sources

This study focuses on the Algerian case and attempts to highlight the contribution of agriculture and the manufacturing sectors to economic growth, but excluding hydrocarbons. We have chosen the non-hydrocarbon variable to have more conclusive results and not to lead to biased results, given the nature of the structure of the Algerian economy (depending on oil production and oil exports). The period of analysis is from 1999 to 2021, a time sample selected according to data

availability. We estimate a multiple regression using a dependent variable $Y_{i,t}$ which represents economic growth in Algeria measured by the change in non-hydrocarbon gross domestic product (GDP). As for the explanatory variables $X_{i,t}$, the key variables are the agricultural value added, and the manufactured value Added from World Bank. The other explanatory variables are chosen rather as control variables: Level of credit, inwards FDI, and Real interest Rate. Their codification and their significance are summarized in the following table:

**Table (1): Variables and data sources**

| Variables | Definition | Source |
|-----------|------------|--------|
| Log NOGDP | Annual variation of Non Oil GDP | National Statistics Office |
| Log CREDI | Level of credit as % of GDP | National Statistics Office |
| Log AGV | Agricultural value added | World Bank |
| Log MVA | Manufactured value Added | World Bank |
| Log FDI | FDI inflows as % of GDP | World Bank |
| Log RIR | Real Interest Rate % | World Bank |

The equation to estimate is:

Log NOGDP= $\alpha_i$+ $\beta_1$ log AGV+ $\beta_2$ log MVA+ $\beta_3$ log CREDI+ $\beta_4$ log FDI+ $\beta_5$ log RIR+ $\varepsilon_{i,t}$

Before analyzing the results of the regression, it is important to respect a certain number of conditions, namely: the overall and partial significance of the model, the heteroscedasticity, the autocorrelation and the normality of the residuals. The omission of this step, can lead to estimation bias and distort the coefficients given by the regressions.

The table 2 highlights descriptive statistics, it allows to understand the information contained in the data and to describe them in a synthetic way to better analyze them. The number of observation is 23, there no big gap between minimum and maximum values. Our data are stable.

**Table (2): Descriptive statistics**

| Variables | Obs | Mean | Std.dv | Min | Max |
|-----------|-----|------|--------|-----|-----|
| NOGDP | 23 | 3.858887 | 0.2973261 | 3.370569 | 4.237722 |
| AGV | 23 | 10.08686 | 0.237422 | 9.662728 | 10.34229 |
| MVA | 23 | 1.528454 | 0.1360032 | 1.274733 | 1.697921 |
| CREDI | 23 | 1.169134 | 0.1975481 | .7314348 | 1.472682 |
| RIR | 23 | 0.1166704 | 0.9774486 | -2.530379 | 1.333831 |

| | | | | | |
|---|---|---|---|---|---|
| **FDI** | 23 | 7.843613 | 0.6083053 | 6.880814 | 8.927479 |

**Source:** Stata outputs

## 4. Empirical results

The first condition when it comes to regression analysis, is to verify the absence of multi-colinearity, we used VIF test. The result from Stata indicates, mean VIF equal to 3.66, inferior to 5 which acceptable. The result indicates a low level of multi-colinearity. Further diagnosis of the test results, including residue diagnosis, is necessary to verify whether: The residues are normally distributed; the residues are not heteroscedastic; and the residuals are not auto-correlated.

First, to find out if the errors are normally distributed, the Skewness and Kurtosis test of normality test will be applied.

**Table (3): Skewness and Kurtosis tests for normality**

| Variable | Obs | Pr(skewness) | Pr(Kurtosis) | AdjChi2 (2) | Prob >Chi2 |
|---|---|---|---|---|---|
| **Residu** | 23 | 0.6917 | 0.5884 | 0.47 | 0.7923 |

**Source:** Stata outputs

Secondly, the existence of the heteroscedasticity phenomenon is analyzed. In a test of heteroskedasticity, the null hypothesis states that all coefficients of the squared residuals regression are zero, so there is homoskedasticity. The alternative hypothesis states that there is heteroscedasticity. Thus, if the P-value is less than 5%, the null hypothesis is rejected, and it can be understood that heteroscedasticity is present (Ouellet et al., 2005). The table 4 gives the results of the most commonly heteroskedasticity test in time series econometrics, namely the Breusch-Pagan test. According to the table, the p-value is 0.79 >0.05, we accept the alternative hypothesis, our residues are homoskedastic.

**Table (4): Breusch-Pagan test for heteroscedasticity**

| Chi 2 (1) | 2.88 |
|---|---|
| **Prob > chi 2** | 0.0895 |

**Source:** Stata outputs

The table 5 highlights the results of Breusch-Godfrey LM test for auto-correlation. The p-value is superior to 0.05. We conclude that the residuals are not auto-correlated.

**Table (5): Breusch-Godfrey LM test for auto-correlation**

| Lags (p) | Chi 2 | df | Prob > chi 2 |
|---|---|---|---|
| **1** | 1.832 | 1 | 0.1759 |

**Source:** Stata outputs

In view of the results of this preliminary analysis, the main conditions are met. We will then estimate the coefficients of the multiple linear regressions (Table 6).

**Table (6): Regression results**

| Variables | Coefficients | Std-Erro | P-value |
|---|---|---|---|
| Constant | -5.158417 | 0.6363157 | 0.000*** |
| Log AGV | 0.8962933 | 0.0735346 | 0.000*** |
| Log MVA | -0.2572152 | 0.1122918 | 0.035** |
| Log CREDI | 0.3170622 | 0.107809 | 0.009*** |
| Log FDI | -0.0388817 | 0.0585456 | 0.561 |
| Log RIR | -0.0076939 | 0.0086327 | 0.385 |
| R-squared | | 0.9904 | |
| Adj R-squared | | 0.9876 | |
| Fisher | | 0.000*** | |

**Source:** Stata outputs

The results of the regression are appreciable since the Fisher statistic is significant at the 1% level, which indicates that the overall significance of the model is good. In addition, the coefficient of determination (R-squared) is 99%, which means that the variability of the dependent variable is almost totally explained by the estimated explanatory variables. This confirms that the explanatory power of the estimators is relatively high.

## 5. Economic discussionn

The results of the regression seem interesting, as we can see, the agriculture value added is significant up to 1%; the agriculture sector is a wealth creating sector in Algeria. Any increase in the agriculture Value added contributes to the increase of the economic growth by 0.89%. We can therefore confirm our second hypothesis: There is a positive correlation between the agriculture sector and Algerian economic growth. To this effect, investing in this sector will be an opportunity for Algeria to diversify its economy. The country is already on the right track, public investments and support programs for farmers and the development of Saharan agriculture are all part of a national strategy for the development of the sector. Nevertheless, the Algerian potential in terms of agriculture remains unexploited at its optimum. Efforts remain to be made in terms of infrastructure, adoption of technology, and opening up to the foreign markets to revitalize the sector through exports.

The manufacturing sector seems influencing the non-oil Algerian economic growth at 5% threshold. Nevertheless, the relationship between the two variables is negative. This result could be explained by the inefficiency of the Algerian industry. Indeed, the Algerian manufacturing sector suffers from several constraints that hinder its development: the proliferation of corruption that has become over the years, a pandemic corruption that has marred the sector by several scandals generating losses amounting to billions of dinars (the scandals in the automobile sector, the food industry ...), a restrictive business environment, bureaucracy, unstable laws and regulations, non developed financial system and a complicated export procedures. The quality of manufacturing production does not meet international standards, which leads to a lack of competitiveness in international markets. However, the results clearly show that the sector influences the Algerian economic growth; the authorities

should now focus on the constraints hindering the sector, and mobilize the necessary resources to make the manufacturing sector, an engine of economic growth.

The regression analysis states that the level of credit is a significant variable that influences economic growth at the 1% threshold. The authorities should improve the size of the financial sector and insure a large penetration of the banking system. A better use of financial services, a wide range of financial products will inevitably have a better contribution of financial inclusion to the non-hydrocarbon growth in Algeria. The two last variable FDI and Real interest rate seem to be not significant to economic growth.

## 6. Conclusion

The major objective of this study was to investigate the contribution of manufacturing and agricultural sectors to Algerian economic growth. We applied the Ordinary Least Squares (OLS) method to test the contribution of the traditional sectors, namely agriculture and manufacturing, on the non-oil GDP in Algeria. This study confirmed the positive and significant influence of agriculture on economic growth. As a result, the national diversification strategy should involve more the agriculture sector and should intensify investments in the sector. Concerning, the manufacturing sector, it also seems to influence and contribute to the economic growth of the country, however, the relationship between the two variables is negative, which means, that the contribution of the Algerian industry to the economic growth is negative, the investments in the sector are not profitable enough. The Algerian industry is very late and suffers from many constraints and obstacles. It is therefore important to carry out structural reforms in the sector to make it a growth engine. Our study also confirmed the importance of financial inclusion in non-oil economic growth. Indeed, a stable, innovative and flexible financial system can only drain the growth upwards, and contribute to the development of the alternative sectors.

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