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The Impact of Fiscal Policy on Manufacturing Sector Output: Empirical Study Evidance from Algeria (1999-2021)

أثر السياسة المالية على قطاع التصنيع: دراسة تطبيقية على الجزائر (1999–2021)

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Abstract:

Do to Due to the importance of fiscal policy and the Manufacturing Sector Output, this study came to looking at the effects of fiscal policy instruments during the period (1999-2021) on the Manufacturing Sector Output in the Algerian economy, through studying the impact of the General Government Final Consumption Expenditure (GEXP), Inflation (INF), Oil Rents (OR),Trade openness (OPP), and Real Interest Rate (RIR) on the Industry (Indu) output. The long-run equilibrium relationship between study variables was estimated. The present Study relies on The Bounds testing Methodology, Using the Autoregressive Distributed Lag (ARDL) co-integration framework. The results confirm that a stable long-run relationship exists between the study variables, and the results show that the government expenditure have a negative and significant impact on the industry output in the short and the long term. Finally, the study suggests that government expenditure put more efforts in providing capital infrastructures to further enhance manufacturing sector's productive and utilisation capacity. The study also recommended that the corporate income tax should be reduced by the government to encourage actual and potential investors in this sector.

Keywords: Fiscal Policy, Manufacturing Sector Output, Oil Rents, Government Expenditure, ARDL**.**

JELClassificationCodes: E62, L6, H5, Q35, C22.

ملخص:

نظرا لأهمية السياسة المالية ومخرجات قطاع التصنيع، جاءت هذه الدراسة لبحث آثار أدوات السياسة المالية خلال الفترة (1999–2021) على مخرجات قطاع التصنيع في الاقتصاد الجزائري، من خلال دراسة تأثير الانفاق الحكومي ($GEXP$)، والتضخم (INF)، وعائدات النفط (OR)، والانفتاح التجاري (OPP)، ومعدل الفائدة الحقيقي (RIR) على إنتاج الصناعة ($Indu$). تم تقدير علاقة التوازن طويلة المدى بين متغيرات الدراسة بالاعتماد على منهجية اختبار الحدود، استخدام نموذج الانحدار الذاتي للإبطاء الموزعة ($ARDL$) للتكامل المشترك. أكدت النتائج على وجود علاقة مستقرة طويلة المدى بين متغيرات الدراسة، وأظهرت النتائج أن للإنفاق الحكومي تأثير سلبي ومعنوي على ناتج الصناعة في المديين القصير والطويل الأجل. وفي الأخير، أشارت الدراسة إلى أن الإنفاق الحكومي يركز بالدرجة الأولى على توفير البنية التحتية الرأسمالية لزيادة تعزيز القدرة الإنتاجية والاستغلالية لقطاع التصنيع، كما أوصت الدراسة إلى وجوب خفض الضريبة على دخل الشركات من قبل الحكومة لتشجيع المستثمرين الفعليين والمحتملين في هذا القطاع.

كلمات مفتاحية: السياسة المالية، مخرجات قطاع التصنيع، النفقات الحكومية، العائدات النفطية، نموذج ARDL.

تصنيفات JEL: E62، L6، H5، Q35، C22.

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INTRODUCTION:

After the recent huge transformations that affected global economies, the focus on both fiscal policy and the performance of the industrial sector has increased to become at the center of economic discourse.

In many economies, The performance of the industrial sector is a measure for evaluating the effectiveness of fiscal policy, although they are two different phenomena where one can complement the other, while the industrial sector may be a channel for achieving fiscal policy goals, fiscal policy can pave the way for the development of the industrial sector.

Fiscal policy is the use of two main instruments (tax and expenditure) to influence the economy for the purpose of stability and growth. Public expenditure is mainly used for allocation, stabilization and distribution, while tax policy is used to promote objectives such as redistribution, industrialization, promotion of employment and resources allocation. (James & Sunday, 2019, p. 14)

After 60 years of independence, Algeria is yet to be an industrialized nation. The country remains an exporter of crude oil. Over 90 percent of export earnings and 70 percent of government revenues are derived from crude oil export. This made the Algerian economy fragile and unstable.

Like other developing countries, Algeria working hard to engaged in efforts to build an industrial economy, especially after the dynamic developments that were linked to the movement of oil prices, as it was the main cause of its economic crisis due to the great dependence of the hydrocarbon sector. This prompted the Algerian government to follow a new economic model that relies on making the budget at the service of growth, with the development of an industrial and production base, openness to foreign markets in order to export Algerian products and services, and work to reduce imports, in order to improve the trade balance and balance of payments and provide the necessary foreign exchange to the economic development process, and work to change the fiscal policy approach adopted, as it is the true measure of the success of the contemporary state. Through the quantitative adjustment of the size of government expenditures, which in turn are affected by the size of its revenues.

Because the importance of fiscal policy and the Manufacturing Sector Output, this study came to ansering the following question:

What is the impact of fiscal policy instruments during the period (1999-2021) on the Manufacturing Sector Output in the Algerian economy ?

To answer this problem, we ask the following sub-questions :

1. *What is the impact of General Government Final Consumption Expenditure on the Manufacturing Sector Output ?*
2. *What is the impact of GDP Deflator on the Manufacturing Sector Output ?*
3. *What is the impact of Oil Rents on the Manufacturing Sector Output ?*
4. *What is the impact of Trade openness on the Manufacturing Sector Output ?*
5. *What is the impact of Real Interest Rate on the Manufacturing Sector Output ?*

To answer the questions, the following main hypothesis was introduced :

There is no significant impact of fiscal policy instruments during the period (1999-2021) on the Manufacturing Sector Output in the Algerian economy ?

1. *There is no significant impact at 5% of General Government Final Consumption Expenditure on the Manufacturing Sector Output ?*
2. *There is no significant impact at 5% of GDP Deflator on the Manufacturing Sector Output ?*

3. *There is no significant impact at 5% of Oil Rents on the Manufacturing Sector Output ?*
4. *There is no significant impact at 5% of Trade openness on the Manufacturing Sector Output ?*
5. *There is no significant impact at 5% of Real Interest Rate on the Manufacturing Sector Output ?*

1. Literature Review :

Many researchers have contributed to explaining how fiscal policy affects the industrial sector ; Where most of them focused on developing oil-producing countries, explaining the effective role that government revenues and expenditures can play in the course of economic life, Especially from the manufacturing side, as follows :

(Osinowo, 2015): This study examined the effect of fiscal policy on sectoral output growth in Nigeria from1970 to 2013. The study employing an Autoregressive Distributed lag (ARDL) and Error Correction Model (ECM). The results showed that total fiscal expenditure have positively contributed to all the sectors output with an exception of agriculture sector. The findings established that manufacturing sector has a positive relationship with all the determinant variables, while inflation rate has negatively impacted output growth of the various sectors with an exception of manufacturing sector. The study concluded that the existence of disparity in the sectoral response to fiscal policy variables underscored the difficulty of conducting uniform and economic wide fiscal policy in Nigeria. Therefore, the best policy approach is to adopt sector specific policy based on their relative strength and significance in each sector of the economy within the overall fiscal policy mechanism framework.

(Oka, Anthony, & Ojong, 2017): This study examined the impact of fiscal policy on the performance of the manufacturing sector in Nigeria. Time series data were collected from the CBN statistical Bulletin using the desk survey method from 1982 to 2014. The data were analyzed using the ordinary least square multiple regression statistical technique. Result From the analysis, it was discovered that increases in government revenue reduces insignificantly manufacturing sector output in Nigeria. Again, increases in government expenditure increases significantly manufacturing sector output in Nigeria. Relying on these findings, the study concluded that the growth of the manufacturing sector in Nigeria is strongly linked to fiscal policy performance of government. Finally, the study recommended that Government should increase it expenditure on infrastructural development and community services as this will have a multiplier effect on manufacturing activities and enhance economic growth in Nigeria.

(Loto & Musa, 2018): This study examined the short and long run effects, of specific policy instruments combination, on each industrial sub-sector by decomposing industry into three major parts. The nonlinear Autoregressive Distributed Lag (ARDL) bound test approach to co-integration is employed as estimation technique. It was found that a long-run bound relationship exists between selected policy variables and each industrial sub-sector. Error correction terms show that short run disequilibrium can be corrected in the long run without extended lag period. Financial deepening, exchange rate depreciation and economic openness are significant in the long run while monetary policy rate is effective in the short run. Deepening of financial system and prudential management of macroeconomic framework are recommended essential for industrial growth in Nigeria.

(Imide, 2019): The main objective of the study is to examine the impact of fiscal policy on the manufacturing sector of the Nigerian economy from Annual time series data 1980 to 2017. Using Ordinary Least Square (OLS) method to test the performance of the variables in the

model. The results reveals that the Government Expenditure and Company Income Tax Rate have positive relationship with the Index of Manufacturing Sector while Federal Government Domestic Debt Outstanding has a negative linear relationship with the Index of Manufacturing Sector. The study recommends that Government should channel its expenditure into the provision of direct physical structures that will be able to stand the competitive nature of both domestic and global markets as well as draw a policy plan that will subsidize company income tax for the manufacturing sub-sector rather than increase it.

(James & Sunday, 2019): This study investigated the effect of fiscal variables (Total Government Expenditure and Company Income Tax) on manufacturing sector output in Nigeria, utilizing time-series data from the period of 1981 to 2016. It employed the Autoregressive Distributed Lag (ARDL) Bounds test approach. The ARDL approach exhibited long run equilibrium relationship among the variables. It established that government expenditure upwardly drove manufacturing output which can be underscored by increased government expenditure on capital infrastructure while company income tax dampened output owing to multiplicity of taxes. The Error Correction Model showed that disequilibrium in the short-run are adjusted for each period in the long-run. Based on the findings, the study suggests that government expenditure on capital infrastructures should be encouraged to further enhance the sector's productive and utilisation capacity and the need for tax-cut on company income to motivate both actual and potential investors.

(Ighodaro & Ajayi-Ojo, 2019): This paper employed the simultaneous equation model using the three-stage least squares (3SLS) regression technique to analyse the impact of money supply, government expenditure and exchange rate on industrial output; and the effect of industrial output on economic growth in Nigeria, using annual data over the period 1981 to 2017. The results showed that industrial output affects economic growth positively in Nigeria, just as exchange rate has a positive significant impact on industrial output. The study recommends that fiscal policies should be formulated with a clear-cut view to addressing the industrial needs of the country.

(Dasauki, Osundina, Okedina, Ajibade, & Olulana, 2020): The study investigated the relationship between macroeconomic policy tools and sub-sector output in Nigeria from 1981 to 2018, using an autoregressive co-integration model (ARDL)، where monetary policy rate, real exchange rate and broad money supply were used as monetary policy indicators while government spending served as a measure for fiscal policy. While the output of 4 manufacturing sub-sectors was used as a dependent variable) Chemical and Pharmaceutical sector, Cement sector, Food beverage and tobacco, Oil refining sector). The study revealed that macroeconomic policies have a positive impact on the output of the manufacturing sector in Nigeria. Macroeconomic policies affect various sub-sectors differently. Careful application of these policies is needed for the development of the economy.

(Hammed & Arawomo, 2020): This study investigate the impact of oil shocks on manufacturing output in Nigeria via fiscal variables during annual data from 1981 to 2019, using Structural Vector Autoregressive (SVAR) Model. The sdudy found that government revenue is explained by oil price in both short- and long-run while expenditure explains revenue in the long-run, though very weak. This is an indication that spending by government can further generate more revenue in the long-run. It equally found that government expenditure is not explained by its revenue which could suggest that it is financed largely by other means like borrowing, manufacturing output is jointly explained by inflation, revenue and oil price. This means that expenditure lost its explanatory power to price level in the process. Finally, the study recommend that efforts should be made to diversify the economy such that government expenditure would be financed by its generated revenue rather than

borrowing or unnecessary depending on foreign aids. Also, the monetary authority should always be quick in controlling inflation so that meaningful and real impact of expenditure can be felt by the manufacturing sector which will translate to growth of the aggregate economy.

(James & Emmanue, 2021): The paper studied fiscal policy and industrial sector output in Nigeria within a time period spanning 1987 to 2019. Fiscal policy was disintegrated into government expenditure, tax revenue and budget deficit while industry sector output was measured as the GDP contribution from the industrial sector. The model developed was analysed using multiple regression methods based on Johansson cointegration Error Correction Modelling (ECM). The results showed that fiscal policy has a long run and short run effect on industry sector output. The specific results evidenced that government expenditure and budget deficit have significant positive impact on industry sector output in Nigeria ; while tax revenue has positive but insignificant effect on industry sector output in Nigeria. The study posits that fiscal policy drives the industrial sector of Nigeria and thus recommended that should formulate and implement viable fiscal policy options that will stabilize the economy.

(Kerdouci & Daoudi, 2021): This research paper aimed to study the effects of fiscal policy on the manufacturing industry growth in Algeria, through the determination of the impact of public revenues and expenditures on the raw domestic production of the manufacturing industry, as well as, studying the effect of the interest rate and inflation, the annual oil price and the index of commercial openness on the domestic raw production of the manufacturing industry., using, an Autoregressive Distributed Lag (ARDL) Bounds test approach. Basing on annual data during the period from 1970 to 2017, The results showed that there is a relative effectiveness of the adopted fiscal policy in Algeria. On the other hand, the causal relationship was tested between the study variables using the Toda Yamamoto method. It was found that there is a one-way effect between the raw internal production of the manufacturing industry and the revenues and overheads in the short term. Finally, the study recomanded that Raw materials, equipment and modern technology must be provided locally, developed and directed towards real production by abandoning external dependence and Replace imports and increase manufacturing for export.

2. The procyclical Fiscal Policy and the Algerian economy :

Fiscal policy plays an increasingly important role in many developing countries. Decisions on fiscal policy, especially if properly synchronised with monetary policy, can help smoothen business cycles, ensure adequate public investment and redistribute incomes. (Jha, 2007, p. 2)

The term fiscal comes from the Latin word fiscalis which in turn comes from fiscus, i.e. a basket used for collecting money. In Italian il fisco refers to the agency that collects taxes. Thus ‘fiscal policy’ means policy related to taxes. The same is the case in Spanish, French and Portuguese. (Tanzi, 2006, p. 1)

The fiscal policy is considered one of the most important economic policies affecting economic growth, where it can play an important role in achieving the various objectives of the national economy, especially in terms of raising the rate of economic growth through its various tools, which are easily controlled by the government. (Abad & Haron, 2018, p. 1318).

Fiscal policy describes changes to government spending and revenue behavior in an effort to influence the economy. By adjusting its level of spending and tax revenue, the government can affect economic outcomes by either increasing or decreasing economic activity. (Weinstock, 2021, p. 1).

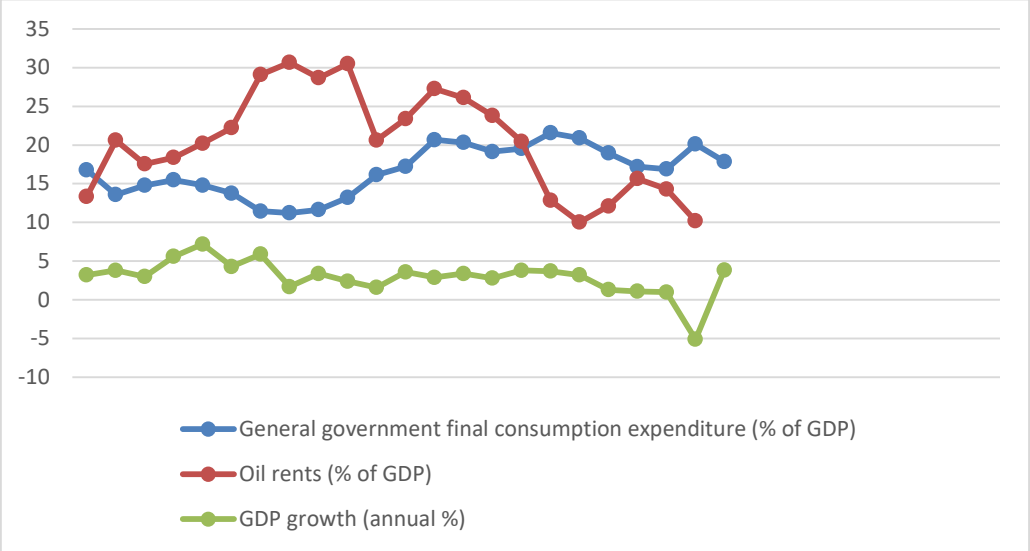
As well as, fiscal policy is the use of government spending and taxation to influence the economy. Governments typically use fiscal policy to promote strong and sustainable growth and reduce poverty. (Horton & Elganainy, 2009, p. 52).

In fact, there are two types of fiscal policy, the first is **Countercyclical fiscal policy** where Some components of the budget balance vary with the business cycle, independently of policy decisions. Such automatic stabilisers include many types of tax revenue and social transfers. The structural, or cyclically adjusted, fiscal deficit is a measure of the hypothetical fiscal stance if output were to equal potential. (Montoro, Takáts, & Yetman, 2012, p. 12)

The second, **procyclical fiscal policy** we can defined as a negative correlation between the central bank's policy rate and the output gap, where it involves higher (lower) government spending and lower (higher) tax rates in good (bad) times, and we call it a procyclical policy because it tends to reinforce the business cycle (i.e., fiscal policy is expansionary in good times and contractionary in bad times), in general, it is regarded as potentially damaging for welfare: they raise macroeconomic volatility, depress investment in real and human capital, hamper growth, and harm the poor. If expansionary fiscal policies in good times is not fully offset in bad times, they may also produce a large deficit bias and lead to debt unsustainability and eventual default. (Amira, Samir, & Mohamed, 2014, p. 5)

After introducing the various types of financial policies, it is clear that the Algerian economy belongs to the group of pro-cyclical financial policy, which has become an obstacle to economic development.

Figure (1) : Oil rents (% of GDP), General government final consumption expenditure (% of GDP) and GDP growth in Algeria (1999-2021)



Source : prepared by the Author according to WB data.

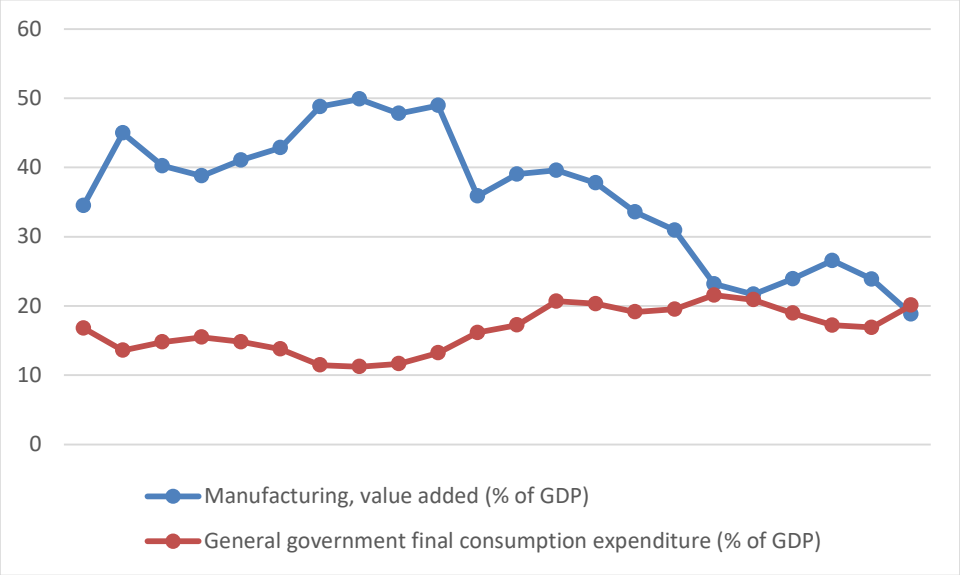
As illustrated in the figure (1) there is a clear correlation between oil revenues, government spending and the economic growth, as the Algerian economy depends to a large extent on oil revenues in its development plans and decisions.

The year 2001 was the beginning of a paradigm shift in the Algerian economy after oil prices witnessed a significant increase, which called on the Algerian government to take important economic decisions, the most important of which is working to achieve development through orientation and support for the productive sectors to liberate the Algerian economy from the specter of the Dutch bug and the best evidence of the development programs that it applied From 2001 to 2019.

The economic crisis caused by the pandemic follows five consecutive years of slowdown in GDP growth (2015-2019) in Algeria, driven by a shrinking hydrocarbon sector, a labyrinthine and public-led model of growth, and a private sector struggling to become the new engine of economic growth. The hydrocarbon industry, which accounted for 20% of GDP, 41% of fiscal revenues, and 94% of export earnings in 2019, is experiencing structural decline.

Algeria, like other oil-exporting countries across the MENA region, will need to shift toward a more diversified economy to lift job prospects in the country, which are crucial given its young demographic profile. The structural decline in hydrocarbon revenues also suggests that current levels of public spending are unsustainable, and that policies designed to generate additional fiscal revenue need to be complemented by measures to improve the efficiency and the fairness of public spending. The success of structural economic reform will hinge on its ability to restore macroeconomic stability and enact decisive policies to support private sector development while continuing to protect the most vulnerable segments of the population.

Figure (2) : Manufacturing and General government final consumption expenditure (% of GDP) in Algeria (1999-2021)



Source : prepared by the Author according to WB data

Algerian industry has been dominated by oil and natural gas in two ways. First, the hydrocarbon sector is by far the largest industrial sector. Second, the revenues generated by the export of oil, gas, and related products have been the main source of investment capital for other industries.

The Algerian government continues to increase the role of industry in the economy by encouraging diversification to tackle a budget deficit that resulted from low oil and gas prices. Economic contribution of the sector has increased to reach 5.6% of total GDP. According to figures from the National Statistics Office (Office National des Statistiques, ONS), industry grew by 3.1% in terms of added-value in 2018. The fastest-growing industrial segment in the second quarter of the year, in annualized terms, was wood, paper and cork (10.1%), followed by water and energy (8.2%), and agro-industry (3.7%).

With low oil prices imposing limits on state-led capital expenditure, the government is seeking to attract more private sector investment – both domestic and foreign – as part of more general economic diversification efforts, and to reduce the country's import bill by stepping up local production.

3. Methodology and Model Specification :

3-1 Data and Variables:

To investigate the Impact of fiscal policy on the manufacturing sector in Algeria, after reviewing many empirical literatures, the researcher used an Autoregressive Distributed Lag (ARDL) co-integration framework, based on annual data for the period of 1999-2021; including six key macroeconomic variables:

General Government Final Consumption Expenditure (% of GDP) (GEXP)
Industry (Including Construction), Value Added (% of GDP) (Indu)
Inflation, GDP Deflator (Annual %) (INF)
Manufacturing, Value Added (% of GDP) (MANUF)
Oil Rents (% of GDP) (OR)
Trade openness (OPP)
Real Interest Rate (%) (RIR)

3-2 Model Selection *:*

Recently, A large number of studies have used an alternative cointegration technique determine the long-term relationships between variables ; known as the 'Autoregressive Distributed Lag (ARDL)' bound test, introduced by Pesaran and Shin (1996) ; Pesaran and Pesaran (1997) ; Pesaran and Smith (1998) and Pesaran et al. (2001).

The ARDL "Auto Regressive Distributed Lag/ARDL" modeling is a combination Between AR autoregressive models (the models where among the explanatory variables we find past values of the variable to be explained), and stepped delay models or distributed lag DL (the models whose explanatory variables are : X_t and its past values). (Benyakoub & Es-salmani, 2021, p. 4). This model has three main features:

♦ The first, is that the ARDL test can be applied if the sample size is small, unlike most conventional co-integration tests that require that the sample size be large in order for the results to be more efficient is relatively more efficient in the case of small and finite sample data sizes. (Hakima, Adem, & Abbes, 2020, p. 45).

♦ The second, is that approach can be applicable if running variables have ambiguous order of integration i.e. purely I(0), purely I(1) or I(0) / I(1) which is not acceptable in traditional approaches. However, it requires that the dependent variable is of I(1) in levels and none of the explanatory variables is I(2) or higher). (Fatukasi, Olorunleke, Olajide, & Alimi, 2015)

♦ Finally, with the ARDL approach it is possible that different variables have different optimal numbers of lags (Pahlavan, Wilson, & Worthington, 2005, p. 8), and by applying the ARDL technique we obtain unbiased estimates of the long-run model. (Belloumi, 2013, p. 10)

The ARDL model takes a sufficient number of time lags to obtain the best set of data from the general frame model, and it also gives the best results for the parameters in the long run, as it enables us to separate the effects of the short-term from the long-term, as it enables to determine the integrity of the dependent variable and the independent variables in The long and short run in the same equation, in addition to determining the size of the effect of each of the independent variables on the dependent variable.

Our specification of the ARDL model is formulated as follows :

$$Indu_t = B_0 + B_1 * (-1) + B_2 * Indu_{(t-i)} - B_5 * GEXP_t + B_6 * OR_t + B_7 * OPP_t - B_8 * RIR_t - B_9 * INF_t + e_t \ldots (1)$$

Model (1) shows that Industry can be explained by its decelerating values and the values of independent variables.

3-3 Empirical Results:

3-3-1 Order of Stationary of Series:

Many econometric studies (Stock & Watson, 1988) (C & Plosse, 1982) (J, 1991) (Yule, 1926) prove that time series of macroeconomic variables unstable resulting problem of Spurious Regression, this is shown by the misleading results obtained where R^2 values are high even in the absence of a real relationship between the variables, and be sure of the stability of variables The study based on the Unit Root Test by using test (ADF) Augmented Dickey Fuller and (PP) Philips–Perron test, to test the stability of the time series. Where the null hypothesis is to contain the variable of time series the unit root (it is not stable) and we judge this hypothesis by observing the value of probability less than (0.05), which means refused the null hypothesis existence of unit root and stability of time series variables.

Variables	Lag	ADF						Decision
		Intercept		Trend and Intercept		None		
		Level	1st deff	level	1st deff	level	1st deff	
Indu	4	0.4748	0.0023	0.2976	0.0260	0.5843	0.0001	**I(1)**
GEXP	4	0.6132	0.0049	0.5537	0.0319	0.6311	0.0002	**I(1)**
OR	4	0.6122	0.0037	0.5322	0.0564	0.4793	0.0002	**I(1)**
OPP	4	0.3216	0.0945	0.9816	0.1051	0.0158	0.0277	**I(1)**
INF	4	0.0033		0.0083		0.0052		**I(0)**
RIR	4	0.0022		0.0064		0.0002		**I(0)**

Table (1). ADF Unit Root Tests for variables :
Source : prepared by the Author.

From the results obtained in the Table 1, shows that all economic variables except inflation and real interest rate are not stationary at level, where the absolute values was less than the critical value for all variables which requires accepting the null hypothesis on the existence of a unit root, but after taking first difference all the variables has become stable (stationary) at the abstract level 5%, in other words, all variables are integrated of order I(1) except inflation and real interest rate are stationary at level, which integrated of order I(0).

Table (2).PP Unit Root Tests for variables:

Variables	***PP***						***Decision***
	Intercept		**Trend and Intercept**		**None**		
	Level	***1st deff***	***level***	***1st deff***	***level***	***1st deff***	
Indu	0.4748	0.0023	0.2976	0.0260	0.6117	0.0001	***I(1)***
GEXP	0.5650	0.0049	0.4901	0.0319	0.6311	0.0002	***I(1)***
OR	0.5569	0.0037	0.5310	0.0126	0.4751	0.0002	***I(1)***
OPP	0.5496	0.0816	0.9906	0.0971	0.0101	/	***I(0)***
INF	0.0036	/	0.0055	/	0.0053	/	***I(0)***
RIR	0.0023	/	0.0030	/	0.0002	/	***I(0)***

Source : prepared by the Author.

From the results obtained in the Table 2, shows that all economic variables except trade openness, inflation and real interest rate are not stationary at level, where the probability was greater than (0.05), which requires accepting the null hypothesis on the existence of a unit root, but after taking first difference all the variables has become stable (stationary) at the abstract level 5%, in other words, all variables are integrated of order I(1), except trade openness, inflation and real interest rate are stationary at level, where the probability was less than (0.05) which integrated of order I(0).

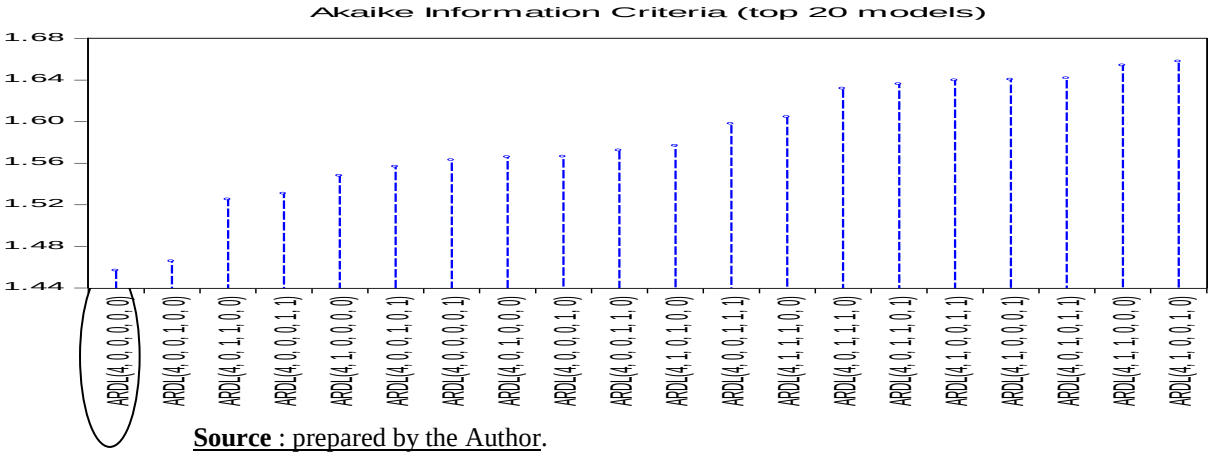
Through the obtained results and considering that the variables are integrated at I (0) and I (1), and considering that all the variables are not integrated at the second degree I (2),

the null hypothesis that the variables are not integrated can be rejected. Therefore, An autoregressive lag time lag (ARDL) model will be used.

3-3-2 ARDL Model Estimation:

The appropriate lag order of variables should be determined before proceeding to the ARDL bounds testing approach to cointegration (Fatukasi, Olorunleke, Olajide, & Alimi, 2015). To visualize the optimal ARDL model, we extract the optimal lag graph according to the Akaike information criteria (AIC).

Figure (3) : Optimal lags



Source : prepared by the Author.

Based on figure 3, the model that offers the smallest AIC value will be the best. In this case, ARDL (4,0,0,0,0,0) is the best.

Table (3): Unrestricted ARDL Model

Variable	Coefficient	Prob.*
INDUSTRY__INCLUDING_CONS(-1)	0.045542	0.6671
INDUSTRY__INCLUDING_CONS(-2)	0.034036	0.3818
INDUSTRY__INCLUDING_CONS(-3)	0.087427	0.0557
INDUSTRY__INCLUDING_CONS(-4)	0.091715	0.0163
GENERAL_GOVERNMENT_FINAL	-0.511953	0.0003
OIL_RENTS____OF_GDP_	0.687585	0.0001
OPENNESS	0.181469	0.0001
REAL_INTEREST_RATE____	-0.579849	0.0190
INFLATION__GDP_DEFLATOR_	-0.493394	0.0355
C	22.22130	0.0000
0.000000	**Prob(F-statistic)**	
Adjusted R-squared	0.998246	
Durbin-Watson stat	2.727256	

Source : prepared by the Author.

The above table3 indicates reports the results of the estimation in the short term of the ARDL model, as it appears that fisher probability is 0.0000, which is less than 5%, indicates the quality of the model and the ability of the independent variables to explain the dependent variable where The adjusted R-squared was 0.998 which implies that 99.8% of the Industry (Indu) change explained by independent variables (General Government Final Consumption Expenditure (GEXP), Industry (Indu), Inflation (INF), Oil Rents (OR),Trade openness (OPP), and Real Interest Rate (RIR)).

As it can be seen from the table3, based on the Coefficients and probability of the model, that there is a positive and significant relationship that links oil rents, trade openness,

and industry to industry, and in contrast, total public spending, real interest rate and inflation rate have a negative and significant relationship with industry.

3-3-3 Bound Test :

The bounds test for cointegration involves the comparison of f-statistics against the upper bound critical values I(1), and the lower bound critical values I(0), which are extracted from pesaran and pesaran 1997. To check for the cointegration by applying bound test using (4,0,0,0,0,0) model specification, the calculated f-statistic when export volume is the dependent varible f=4.964029 is higher and the lower bound critical values of 2.62 than the upper bound critical value of 3.79 at the 5% significance level (tabele4). This suggests that the null hypothesis of no cointegration cannot be accepted and that there exists cointegration relationship between variables. (Seema & Nayaran, 2004, p. 106). Therefore, there is a long-run relationship between the Industry (Indu) and Government Final Consumption Expenditure (GEXP), Industry (Indu), Inflation (INF), Oil Rents (OR), Trade openness (OPP), and Real Interest Rate (RIR).

Table (4) : ARDL Bounds Test

Test Statistic	***Value***	**k**
F-Statistic	4.964029	5
Critical Value Bounds		
Significance	**I(0) Bounds**	**I(1) Bounds**
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source : prepared by the Author.

3-3-4 Diagnostic Tests:

Before estimating the long-run and short-run parameters, it is necessary to check for diagnostic tests to avoid the misleading conclusion. These tests are performed to evaluate the robustness of our ARDL model : the Jarque-Bera test for the normality of residuals, and heteroscedasticity test, and the no serial correlation for no suffering from serial correlation. The results of diagnostic tests are reported in table 5. Also, Figure02 improve that there is no serial correlation.

Table (5) : Diagnostic Tests

Test F	**Statistics (p-values)**	**Results**
Residual Normality : ***Jarque Berra Test***	1.562141 0.457916	***Normal distribution***
Heteroscedasticity ***:*** ***Breusch-Pagan-Godfrey Test***	1.004284 0.5030	***No Heteroscedasticity***
Serial Correlation : ***Breusch-Godfrey LM Test***	2.751005 0.1412	***No serial correlation***

Source : prepared by the Author.

Figure (4) : Correlogram of Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.393	-0.393	3.2781	0.070
		2	-0.195	-0.414	4.1336	0.127
		3	0.302	0.044	6.3215	0.097
		4	-0.216	-0.161	7.5257	0.111
		5	-0.151	-0.295	8.1571	0.148
		6	0.143	-0.274	8.7701	0.187
		7	0.150	0.088	9.5072	0.218
		8	-0.338	-0.306	13.623	0.092
		9	0.222	-0.126	15.596	0.076
		10	0.109	-0.089	16.135	0.096

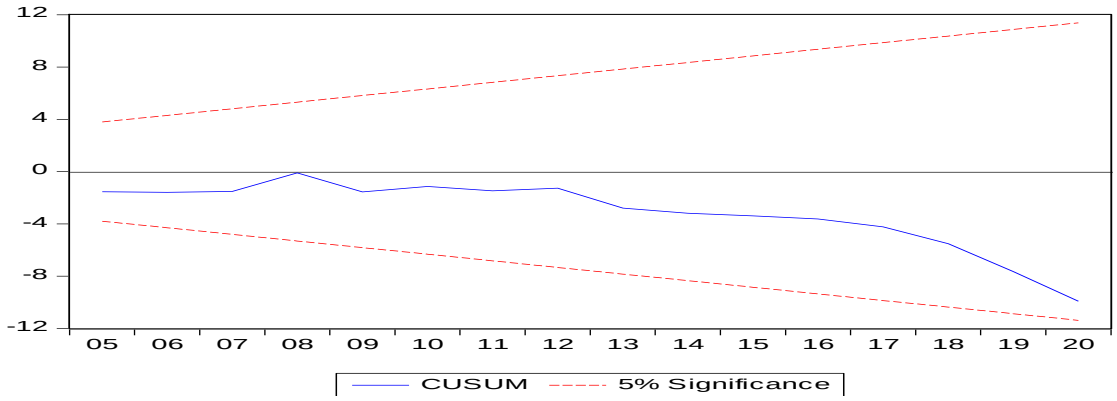
Source: prepared by the Author.

Figure4 showed that the autocorrelations and partial autocorrelations at all lags were nearly zero, and all Q-statistics were insignificant with large P-value. Prouving that, there is no serial correlation in the residuals.

3-3-5 Parameters Stability Test:

After making sure that there is no correlation between the residuals, it is also necessary to check the stability of the model because, the existence of a co-integration relationship between the variables does not necessarily mean that the estimated coefficients are stable.

Figure (5): CUSUM tests



Source : prepared by the Author.

Through what was estimated in the above figure (5), and since the CUSUM line (the continuous line) is located between the two dashed lines or the confidence limits, the model is characterized by stability over time at a significant level of 5%, which confirms that the estimated parameters are stable throughout the study period, Which allows for the next step.

3-3-6 Short-Run and Long –Run Dynamics:

The bound test finds long-run relationship between t the Industry (Indu) and Government Final Consumption Expenditure (GEXP), Industry (Indu), Inflation (INF), Oil Rents (OR), Trade openness (OPP), and Real Interest Rate (RIR). Therefore, long-run parameters are estimated and presented in Table 6.

Table (6) : Short Run Dynamic

Cointeq = INDU **-0.6906** *GEXP **+ 0.9276***OR **+ 0.2448***OPP **-0.7822***RIR *INF **+ 29.9770**	
Variables	***Coefficient***
GEXP	-0.511953 **0.0003**
OR	0.687585 **0.0001**
OPP	0.181469 **0.0001**
RIR	-0.579849 **0. 0190**
INF	-0.493394 **0.0355**
CointEq (-1)	-0.741279 **0.0000**

Source : prepared by the Author

The results of the short-run model (presented in table 6) show that the error correction coefficient CointEq (-1) is negative and significant at 5% level, so there is an error correction mechanism. The CointEq coefficient -7.41279 implies that deviations from the long-term of Industry (Indu) are corrected by 7.41279% (that mean the speed of adjustment is 74.1279 %).

Thus, the condition is fulfilled, and this confirms the existence of a long-term co-integration relationship between Industry (Indu) and Government Final Consumption Expenditure (GEXP), Industry (Indu), Inflation (INF), Oil Rents (OR), Trade openness (OPP), and Real Interest Rate (RIR).

Table (7) : Long Run Dynamic

Variables	***Coefficient***
GEXP	-0.690635 **0.0004**
OR	0.927566 **0.0000**
OPP	0.244806 **0.0000**
RIR	-0.782228 **0. 0347**
INF	-0.665598 **0.0465**

Source: prepared by the Author

As for the long-term, as shown in Table 7, there is a positive and significant relationship that at 5% links oil rents and trade openness to industry.

This result can also be explained by the presence of a long-term convergence relationship between the two variables and industry, this means that 1 percent rise in oil rents and trade openness indicates a long-term relationship of 0.93% and 0.25% respectively.

In contrast, total public spending, real interest rate and inflation rate have a negative and significant relationship with industry, means that 1% rise in total public spending, real interest rate and inflation rate contributes to a drop in industry equivalent to 0.69%, 0.78% and 0.67% respectively.

The negative impact of government spending on the manufacturing sector during the study period can be explained by the rise in public spending resulting from a significant rise in oil revenues and their reaching record levels in the global market, until 2014 when the

Algerian economy witnessed a focus on investment in infrastructure, which caused a decline in the manufacturing sector. Because of what is known as the phenomenon of deindustrialization, which is one of the reflections of the Dutch disease.

3-3-7 The Ramsey RESET Test:

In statistics, the *Ramsey Regression Equation Specification Error Test (RESET) test* is a general specification test for the linear regression model. More specifically, it tests whether non-linear combinations of the fitted values help explain the response variable. The intuition behind the test is that if non-linear combinations of the explanatory variables have any power in explaining the response variable, the model is misspecified in the sense that the data generating process might be better approximated by a polynomial or another non-linear functional form.

Table (8) : Ramsey (RESET) test

Vlue		***df***	***Prob***
t-statistic	0.565304	7	0.5895
F-statistic	0.319569	(1,7)	0.5895

Source : prepared by the Author

Table 8 showed that the probability of the F test is greater than 5%, which proves the validity and appropriateness of the functional form used in the estimate.

Conclusion:

Due to the importance of fiscal policy and the Manufacturing Sector Output, this study came to looking at the effects of fiscal policy instruments during the period (1999-2021) on the Manufacturing Sector Output in the Algerian economy. Eemploying the Autoregressive Distributed Lag (ARDL) bound test approach.

To visualize the optimal ARDL model, we extract the optimal lag graph according to the Akaike information criteria (AIC) In this case, ARDL (4,0,0,0,0,0) is the best.

The results of the estimation in the short term of the ARDL model, as it appears that fisher probability is 0.0000, which is less than 5%, indicates the quality of the model and the ability of the independent variables to explain the dependent variable where The adjusted R-squared was 0.998 which implies that 99.8% of the Industry (Indu) change explained by independent variables (General Government Final Consumption Expenditure (GEXP), Industry (Indu), Inflation (INF), Oil Rents (OR),Trade openness (OPP), and Real Interest Rate (RIR)).

The results of the short-run model show That CointEq coefficient -7.41279 implies that deviations from the long-term of Industry (Indu) are corrected by 7.41279% (that mean the speed of adjustment is 74.1279 %).

Thus, the condition is fulfilled, and this confirms the existence of a long-term co-integration relationship between Industry (Indu) and independent variables.

As for the long-term, there is a positive and significant relationship that at 5% links oil rents and trade openness to industry.

This result can also be explained by the presence of a long-term convergence relationship between the two variables and industry, this means that 1 percent rise in oil rents and trade openness indicates a long-term relationship of 0.93% and 0.25% respectively.

In contrast, total public spending, real interest rate and inflation rate have a negative and significant relationship with industry, means that 1% rise in total public spending, real interest rate and inflation rate contributes to a drop in industry equivalent to 0.69%, 0.78% and 0.67% respectively. This result is agree with (Nienke & Kalcheva, 2007)

Based on the findings, the study suggests that government expenditure put more efforts in providing capital infrastructures to further enhance manufacturing sector's

productive and utilisation capacity and there should be tax-cut on company income by the government to encourage both actual and potential investors in the sector.

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