Effect of fiscal policy tools on the productivity of the industrial sector in Algeria – EMPIRICAL STUDY - 1970-2018

أثر أدوات السياسة المالية على إنتاجية القطاع الصناعي في الجزائر-دراسة قياسية-1970-2018

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Abstract:

This study aims to analyze the impact of fiscal policy on the industrial sector in Algeria for the period 1970-2018, using the ARDL model. The results found that public spending has a positive impact on the industrial sector in the short- run, but becomes negative in the long-run. As for direct taxes, we found that it has a positive relationship with the production of the industrial sector in the short and long-run. For indirect taxes, has a negative effect on the model in the short-run, but do not continue effect in the long-run. Public debt, fiscal deficits have a negative impact on the industrial sector in Algeria.

Keywords: fiscal policy; industry; Algeria; ARDL model

Jel Classification Codes : E62 C3 L16

الملخص:

تهدف هذه الدراسة إلى تحليل تأثير السياسة المالية على القطاع الصناعي في الجزائر خلال الفترة 1970-2018 باستخدام نموذج ARDL. وقد أظهرت النتائج أن الإنفاق العام له تأثير إيجابي على القطاع الصناعي في المدى القصير ، ولكنه أصبح سلبيا على المدى الطويل، بالنسبة للضرائب المباشرة، وجدنا أن لها علاقة إيجابية مع إنتاجية هذا القطاع في المدى القصير والطويل. أما الضرائب غير المباشرة، يكون لها تأثير سلبي في النموذج على المدى القصير فقط أما الدين العام والعجز المالي له تأثير سلبي على القطاع الصناعي في الجزائر.

الكلمات المفتاحية: السياسة المالية ، الصناعة ، الجزائر ، نموذج ARDL

تصنيف Jel: E62 C3 L16

Introduction:

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The industrial development process is a desirable goal that the Algerian government seeks to achieve. So, it has paid great attention to adopting a national strategy to increase industrial competitiveness, hence added-value, and thus increase contribute industrial sector in GDP. Fiscal policy has a role in the production and the ability to exploit the industrial sector, as it leads the market to the industrial sector through manipulation of government revenues and expenditures. When the government pursues an expansionary policy, it reduces taxes and increases spending and purchasing power of economic units, which in turn leads to expand the market for manufactured products, and an increase in the productive capacity of companies to seize the opportunity to increase demand on the market and vice versa when the government follows deflationary policy. Fiscal policy also provides the necessary legal, social and economic framework for a profitable process, and Algeria has expanded the use of fiscal policy within the framework of various legislations that allow the Ministry of finance through spending and revenue achieve the country's economic policy goals.

The problematic of the study:

During the period under study, Algeria used many fiscal policy tools that aim in its entirety to increase GDP of the national product as the main input to increase the total supply and what it requires to increase the level of investments, employment and thus reduce inflation pressures, the unemployment problem and the achievement of the general economic balance. Little attention has been given to the relationship between fiscal policy and the industrial sector in Algeria. This study seeks to bridge this research gap. So, the problem posed as follows: Has the financial authority, through its management of fiscal policy, affected industrial production in Algeria?

Research Objectives:

 The results of this research will assist the monetary authorities in evaluating the performance of the fiscal policy in Algeria on the outputs of the industrial sector, and open the way for policy-makers to use results in formulating and implementing appropriate policy measures towards accelerating growth through the industrial sector.

Research hypotheses: The following hypothesis will be formulated for this study:

H_0: The fiscal policy does not affect industrial production in Algeria.

1.Theories of study:

Different opinions have continued to emerge on how fiscal policy can affect growth in the economy through the industrial sector. The origin of these controversies has been traced to the theoretical exposition of three schools; the Classical School believes that debt issued by the public does not affect the private sector savings; this means that fiscal deficit financed by the debt crowds-out private sector investment and well as lowering the level of economic growth and development. As for the Keynesian School, it showed that there is a positive relationship between deficit financing and investment; this means that fiscal policy is a tool used to overcome fluctuation in the economy. Neoclassical School challenged the position of the Keynesian School on the ground that how the fiscal deficit is financed is capable of influencing the level of consumption, investment, and economic growth.(Eze, 2013, p. 40)

- Theories of fiscal policy and the industrial sector have been discussed in developed and developing countries. These theories include as follows: (Oka felix Arikpo, 2017, p. 13)

1.1Managerial Theory of the Firm

Managerial theory of the firm was propounded by Bumole (1967) as cited in Eze & Ogiji (2013), in his research titled "Business behavior, value and growth". The theory believes that for any economy to grow rapidly through industrialization, the country needs to increase its public expenditure to facilitate the development processes of the economy. It emphasizes that a firm's decisions whether to grow or not depend on the level of fiscal policy because the firm grows through government expenditure on industrialization. In other words, government expenditure triggers industrial productivity.

1.2 The Savers-Spenders Theory

By Mankiw (2000), it has three propositions, the first proposition states that temporary tax changes have large effects on the demand for goods and services, meaning that alterations in tax rate charged on taxpayers reduce or increases their income and consumption. In other words, higher tax rates reduce spender's pay (income) while lower tax rates increase spenders' incomes. This in effect implies that the purchasing power of spenders is affected by the rate of tax imposed on their income at any particular point in

time; the second proposition believes that government expenditure crowds out capital in the long-run. By this, the theory implies that extra consumption reduces investment, which in turn raises the marginal product of capital and as well decrease the level of employment and output. Another opinion that higher interest rate margin induces savers to save more. The implication of this proposition is that extra consumption and higher interest rate margin reduce investment which in turn reduces the level of output and employment, the third proposition states that a higher level of debt means a higher level of taxation. The tax will fall on both the savers and the spenders but the interest will only fall on savers, the implication of this is that a higher level of debt raises the income and consumption of the savers and lowers income and consumption the spenders.

1.3-According to (Barro 1991), Fiscal policy can have a short-run and long-run impact on the economy. In the short-run, fiscal policy can move the output from its potential level by affecting the demand for goods and services. In the long-run, fiscal policy can affect the output by affecting the quantity and quality of labor force or other input factors or through changes in the total factor productivity (Omran, 2017, p. 08). The fiscal policy is not important in "the Ricardian equivalence theory" because economic agents will reduce their current consumption after an increase in government expenditure or a reduction in taxation. The rationale is that the economic agents will expect that the tax rate will increase in the future to reduce the deficit caused by an expansion of fiscal policy. The crowding out effects of fiscal policy on private investment can reduce the effectiveness of fiscal policy as well. Finally, the theory of expansionary fiscal contraction argues that an increase in fiscal spending that is coupled with increasing uncertainty and the low credibility of government could reduce the desire for current consumption, leading to negative reactions to the output as a result of expansionary fiscal policy (Malaysia, 2016, p. 82).

-The relationship between public expenditure and industrial sector growth can be analyzed both in the short-run and in the long-run. Time is a significant factor in analyzing the relationship between policy action and its influence on industrial productivity (Mankin, 1994). So, the distinction between short-run and long-run impacts of public expenditure is relevant for policy-making. Government expenditures can influence the dynamics of industrial growth through its consequences for the effectiveness of resource allocation and the accumulation of productive resources. Both of these conditions assume the influence on the productivity of the private sector. For instance, an increase in government expenditures on a public

intermediate good (e.g. building road, bridge or financing of education) has a significant influence on industrial productivity. Firstly, fiscal policy via taxes or borrowing with draws financial resources from the private sector. Secondly, at the time this public intermediate good becomes freely available and fully effective, it affects the productivity of the industries and labor force that use these goods. On the contrary, underdeveloped infrastructure may distort the industry structure making it less efficient. Lack of good infrastructure can cause in creating an irregularity in the production process (Carbajo, 1997). In most papers on the issue of public investment, industrial growth is regarded as an integral part of economic growth and it is viewed as a long-run phenomenon, so the analysis is focused on the effects of government expenditures in the long-run equilibrium. However, investigation of the short-run effects is also an important issue. Firstly, it is important to explain that the policy of public spending is short-run it often has the opposite effect on policy in the long-run. Secondly, distinguishing the time lag between short-run and long-run effects allows one to assess the outside lag inherent in public expenditure policy. Let's consider theories behind the channels through which public investment can affect growth. According to Edward, 2006 the effects of public expenditure are divided into macro-economic and micro-economic effects. To analyze the macro-economic effects of public expenditure on industrial growth, we examine five channels through which public investment can affect industrial growth, namely: complementing private capital, crowding in private investment, increased market integration, increased aggregate demand, and increased national savings. Most discussions on the effect of public expenditure on industrial growth begin with the assumption that public and private capitals are complements. This is justified on the grounds that public and private capital are made up different things, with public capital consisting mainly public goods (e.g., roads, electricity supply) and private capital consisting of private goods (e.g., buildings, machinery). In this case, the total production function of the economy is determined. So, the increase is in public capital stock raises aggregate output. It also raises the productivity of all other factors of production, including labor. If labor markets are competitive, and labor supply is inelastic, an increase in the productivity of labor leads to an increase in real wages. When public and private capital is complemented in this way, an increase in public investment will raise a country's rate of growth, at least up to a point. (Joseph, 2012, p. 207)

2. Empirical evidence:

- ﴾Adefeso ,Hammed A, 2018﴿, in a study titled "Government Tax Policy and Performance of Listed Manufacturing Firms in Nigeria". This study examined the effect of government tax policy on the performance of 54 listed companies chosen randomly during the period 1990-2002 using (GMM). The study found a positive relationship between the corporate tax policy and the production performance of manufacturing companies, this may be an indication that government revenues from corporate tax have been spent wisely on productive government expenditure.

- ﴾Law Chee Hong , 2016﴿, in a study titled " Sectoral Impact of Fiscal Policy in Malaysia " ‹during the period of 1991-2014 using the var model, the results indicated that government spending plays a role in pushing the economy forward and increasing government spending is more beneficial compared to reducing government revenue (taxes).

- (SHAHBAZI KIUMARS, KARIMZADEH ELHAM, 2015), in a study titled " Impacts of monetary and fiscal policies on value-added of the industrial sector in Iran in line with the general policies of the industrial sector", from 1979-2010, the research investigates the impact of fiscal and monetary policies on value-added of the industrial sector in Iran using the (ARDL) model. The results show that the impact of monetary and fiscal policies on value-added to the industrial sector is positive and statistically significant in the short-run. In contrast, the impact of tax revenues as an alternative variable of fiscal policy on value-added of the industry is positive and significant, which can indicate that the tax revenues have been influenced by the activities of the industry. Moreover, government expenditures have no significant effect on value-added of the industrial sector in the long-run, indicating that the government expenditures has not been complementary to the investments of the industrial sector and had no significant effect on industry value added because of the existence of the crowding-out effects and different forms of government expenditure financing.

- ﴾Bakare–Aremu and others, 2015﴿ , in a study titled " Effect of Fiscal and Monetary Policies on Industrial Sector Performance- Evidence from Nigeria" During the period 1970-2009, using VECM, in short, the government should encourage and maintain spending toward developing the manufacturing sector and developing infrastructure facilities in the country simultaneously, and to encourage domestic investors and gain more foreign investors the government should also maintain its moderate tax pattern Since it affects the investor and encourages the growth of production.-

(Macdonald, D., 2011) , he conducted a study on Canadian companies to answer the argument that lowering the corporate tax rate enables companies to invest in machinery, technology, employees and that these investments will help stimulate productivity growth for a long period of economic growth, employment, and wealth creation in the long-run. Far from it, it was found that low tax rates did not lead to an increase in job creation because the number of jobs created was relatively lower than the economic rate as a whole, but there was a positive relationship between low tax rates and corporate profits.

- (Rina, O and others, 2010), in a study titled " the impact of fiscal and monetary policy on industry and growth of the economy in Indonesian ", using the CGE model It has been shown that fiscal and monetary policy has a positive impact on the performance of Indonesia's macroeconomics in terms of changes in GDP, investment, consumption and the rate of return on capital. This result has a research gap and this is because CGE is not a good model of a correlation.

 - (Marina Tkalec,Maruška Vizek, 2009) , in a study titled " The Impact macro-economic policies on manufacturing Production in Croatia ", using multiple slopes from 1998 to 2008, the results indicate that an increase in government spending causes an increase in industrial production in most industries, So governments should spend in a way that promotes industrial growth.

- (Strulik, H., 2003), using a general equilibrium model, based on the production function at Cobb-Douglas and finding that a 10% tax cut would increase the company's profit by 5%. Thus the results of these studies showed a positive relationship between tax and financial performance.

3. The reality of fiscal policy and industrial production in Algeria:

- The reality of fiscal policy

Graphique 1: Tax Taxes, Overheads (RG) and Budget Balance (DEFT), Public Debt (DEPT) in Algeria
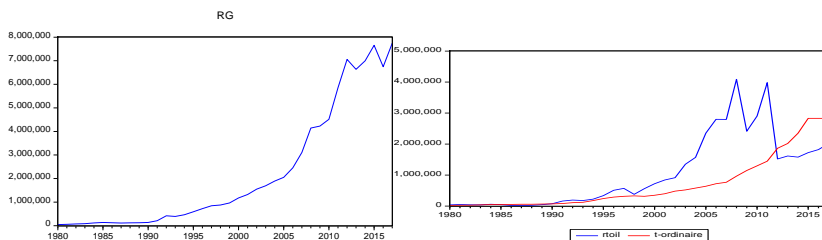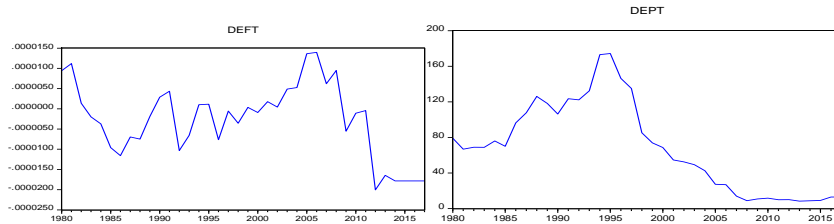
Source : Prepared by researchers based on World Bank data and evieuws10 output

-Tax revenue increased between 1992 - 2007 from 302.66 billion dinars to 3478.6 billion dinars, but we note the dominance of oil taxation in the tax structure as it moved from 64.03% of the total tax revenue in 1992 to 77.96% in 2007, while we note decreased taxes Ordinary in total tax revenue, as it decreased from 35.97% in 1992 to 22.04% in 2007. So, this situation does not contribute to the effectiveness of the tax system as a hostage to external factors, especially petroleum prices which subject to price fluctuations in international markets, and such position reflects the need to change the structure of the Algerian economy by directing the investment towards the non-oil sectors and encouraging the formation of small and medium-sized enterprises. In 2009, tax revenue decreased strongly by 29.18% as a result of the decrease in petroleum prices and rose again from 2010 to 2012. In 2017, revenue reached 6182 billion dinars and was accompanied by an increase in ordinary taxes to 52.8% of total revenue. This increase is due to the increase in taxes on income and customs duty. (Nasser Mourad , 2009)

- Algerian government expenditure has also fluctuated, as Algeria witnessed the emergence of features of economic reform during the period (1980-1984) an average spending of 32.62%, the period of urgent reforms (1985-1989) during which Algeria suffered a financial crisis, as a result of the drop in oil prices, which caused an acute crisis in liquidity shortage, as expenditure reached 29.5%. (Bashir Khmera , 2016) . Starting in the year 2001, Algeria pursued an expansionary spending policy; the reason is due to the improvement of oil revenues. At the beginning of the millennium, it adopted three important spending programs with a total cost of 443 billion $. These programs were the economic recovery program (2001-2004), the economic growth program (2005-2009), the growth Consolidation Program (2010-2014) the five-year plan was also launched (2015-2019). (Rattoul Mohamed, Roushou Abdelkader, 2016)

-As for the budget balance, the first budget deficit was recorded from 1983 to 1989 due to the unexpected drop in oil prices. In 2000, a surplus was recorded in the total treasury balance of 398.84 billion dinars, and the surplus continued to rise until 2005, it reached 896.59 billion dinars, and the total treasury balance in recent years recorded a continuous deficit during 2009-2018, because the difficulty of controlling the deficit in public expenditures, which leads to its exacerbation year after year, and the dependence of the public budget on petroleum tax revenues to finance the deficit which has decreased continuously and weakness in the ordinary tax collection due to the weak efficiency of the tax system and the heavy burden of public debt on the state's public budget. (Bank of Algeria, 2018)

- As for public debt, a rise was witnessed during the period 1980-1995. With the drop in oil prices in 1986, the state's revenues decreased. However, Algeria succeeded managed to reduce its public debt to the limits of 4 billion US dollars at the present time. In 2005, borrowing from abroad was stopped and payment of foreign debts was started after the country's foreign currency reserves increased, of which in 2009 amounted to about 150 billion dollars due to high oil and gas revenues, and Algeria paid nearly 160 billion $ of debts foreign between 1980-2005. IN 2006, Algeria signed with Russia an agreement to cancel the debt owed to it amounting to 7.4 billion $. In 2007, Algeria paid about 9.7 billion $ of its debts to the Paris Club after signing an agreement with it in 2006 and during the years 2015 and 2016 the proportion of public debt decreased Algerian about 67% to 7% only.(Adnan Ahmed Youssef, 2016)

- The reality of industrial production

Graphique 2: Added value of the industrial sector (% of GDP) in Algeria (1980-201**8**)
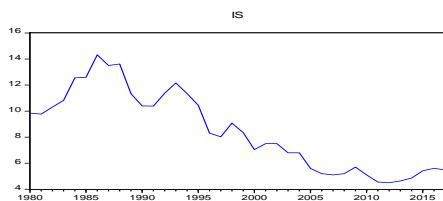
Source : Prepared by researchers based on World Bank data and evieuws10 output

-We can observe that the growth rates in the industrial sector were known to have the greatest rates at the beginning of the 80s, given to the Algerian government's adoption at the time of a focused industrial policy aimed at creating a solid industrial base, and as for the second half of the 80s, and

until the end of the first half of the 90s, Algeria adopted an economic policy austerity as a result of low oil prices, this has negatively affected the growth rates of the industrial sector, where the annual growth rate was -2.3%, and despite the return of government support to the industrial sector since 2001 due to high oil prices, the rate of growth rates in the industrial sector remained stable within 2% to 5% in 2018. (Quri Yahya Abdullah, 2018, p. 04)

4.A standard study of the impact of fiscal policy on the growth of the industrial sector in Algeria (1970-2018):
We will try to build a standard model that explains to us the effect of fiscal policy on the growth of the industrial sector, it is necessary to define before that the variables of the model, the reason for its choice and its mathematical form.

Dependent variable: the industrial sector (value added at current local currency prices), denominated in "IS"

Independent variables: There is a set of factors affecting the industrial sector, including:

Total real government expenditure, denominated in "RG"

Real direct taxes, denominated in "RDIR"

Real indirect taxes, denominated in "RTINDIR"

The level of public debt, denominated in "DEPT"

Government budget balance (deficit/surplus), denominated in "DEFT"

Reason for choosing model variables:

We chose these variables by relying on theories of the empirical evidence and studies, where our studies with the previous studies were similar in two variables, namely government expenditure and tax revenues, and what distinguishes our study from empirical evidence is that we added two tools for the fiscal policy they are Government budget balance and the level of public debt.

Thus, the equation of the industrial sector in Algeria is:

After describing the fiscal policy in Algeria, and based on the previous theoretical approaches and applied studies, a model for the industrial sector in Algeria can be presented in the form:

$$IS_t = a_0 + a_1 RG_t + a_2 RDIR_t + a_3 RTINDIR_t + a_4 DEPT_t + a_5 DEFT_t + \varepsilon_t$$

4.1Explanation model ARDL

Autoregressive distributed lag (ARDL) Bounds testing approach to determine the existence of long-run equilibrium relationships between variables, which is co-integration, we use the Autoregressive Distributed Lag (ARDL). Bounds testing approach developed by Pesaran and Shin (1998) and later expanded by Pesaran, Shin and Smith (2001). One of the most important advantages of the ARDL method is that the variables used in the analysis can have a mix of different degrees of integration, that is, they can be a mix of I (0) or I (1). Also, with the help of using this approach, one is allowed to estimate short-run, long-run effects simultaneously by forming an Error Correction Model (ECM) derived from the ARDL model without loss of long-run information. Moreover, it provides efficient and unbiased estimator in small sample size and it has opportunities to determine different lag length with their respective variables (Tekilu Tadesse,Tesfaye Melaku, 2019, p. 99) The ARDL Bounds Testing approach implies the estimation of the following equation:

$$\Delta IS_t = \alpha + \sum_{t=1}^{p} \gamma_{0i}\, \Delta IS_{t-i} + \sum_{t=0}^{p} \gamma_{1i}\, \Delta RG_{t-i} + \sum_{t=0}^{p} \gamma_{2i}\, \Delta RTDIR_{t-i} + \sum_{t=0}^{p} \gamma_{3i}\, \Delta yRTINDIR_{t-i}$$
$$+ \sum_{t=0}^{p} \gamma_{4i}\, \Delta DEPT_{t-i} + \sum_{t=0}^{p} \gamma_{5i}\, \Delta DEFT_{t-i} + \Psi ECT_{t-1}\varepsilon_t$$

Furthermore, the optimal lag length for each variable was also selected with the aid of AIC. Once the model is estimated, the first step is to analyze the long-run relationship between variables in the equation. In this case, the F-statistic of the Bounds Test is computerized and compared to the asymptotic critical values of the test. If the calculated F-statistic is greater than the upper bound critical value, then the null hypothesis of no cointegration relationship can be rejected and it can be concluded that a long-run relationship exists between the variables. If F-statistic falls between the lower and upper bounds, the results of the test are inconclusive, while a value that is smaller than the lower bound critical value indicates that the null hypothesis of no cointegration cannot be rejected. If the long-run relationship is confirmed by the Bounds Test, the coefficient − of the error correction term (ECT) will show how quickly an equilibrium distortion is

corrected. Also, the long-run and short-run coefficients of the model will be discussed in order to assess their impact on the dependent variable, the ARDL model is tested for stability with the aid of the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests. The stability of the estimated coefficients is confirmed if the values of both tests remain within the critical values at 5%. (Andreea STOIAN, 2019, pp. 8-9).

4.2model estimation using the ARDL model

Our applied study relies in its data on the statistics published by international economic organizations such as the World Bank (WD) and also some national special bodies such as the National Bureau of Statistics, the Ministry of Finance and the Algerian Central Bank. The analysis from the applied side is based on an annual data series for the Algerian economy (1970 -2018), as standard quantitative methods will be used to identify the nature of the impact of fiscal policy on the Algerian industrial sector.

4.2.1 Test the stability of time series:

Unit root tests are the most important way to determine the stability of time series, and to know the statistical properties and characteristics of time series under study in terms of their integrity, despite the multiplicity of unit root tests, but we will use the Augmented Dickey-Fuller test and the following table shows the results of the test:

Table number (01): test ADF Augmented Dickey-Fuller test statistic

Variable	test ADF	Prob			Variable	test ADF	Prob		
IS	Model02/Level	0.2298	acptH_0	I(1)	RTINDIR	Model01/Level	1.0000	acptH_0	I(1)
	Model01/D(-1)	0.0000	acptH_1			Model02l/D(-1)	0.0000	acptH_1	
RG	Model03/Level	0.9999	acptH_0	I(1)	DEPT	Model02/Level	0.6697	acptH_0	I(1)
	Model01/D(-1)	0.0000	acptH_1			Model03/D(-1)	0.0000	acptH_1	
RTDIR	Model01/Level	0.9910	acptH_0	I(1)	DEFT	Model02/Level	0.1851	acptH_0	I(1)
	Model02/ D(-1)	0.0010	acptH_1			Model01/D(-1)	0.0000	acptH_1	

Source: Prepared by researchers using outputs EVIEWS10
Where: Form 01: Contains only static / Model 02: Contains static and general direction / Model 03: Without static and general direction

Through Table 01 it becomes clear that the hypothesis of a unitary root in the level cannot be rejected for all variables, where we note that prob <from the level of significance 1%, 5%, 10% which means that these variables are

not stable in the level, and for this we apply the difference from the first degree, where we note all the variables that are stable at all levels.

4.2.2.lag model

To estimate the industrial sector model in Algeria, we will use the ARDL model with a delay rank (p = 4). This rank was chosen considering the nature of economic variables based on a set of tests, the most important of which are Akaike (AIC) and (SC) Schwarz, and Table (2) illustrates this.

Table number (02): Determine the lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1620.716	NA	1.01e+24	72.29847	72.53936	72.38827
1	-1388.700	391.8480	1.69e+20	63.58668	65.27290	64.21529
2	-1364.225	34.80880	3.07e+20	64.09891	67.23046	65.26632
3	-1331.604	37.69636	4.52e+20	64.24905	68.82593	65.95526
4	-1224.929	94.82144*	3.26e+19*	61.10798*	67.13018*	63.35299*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: outputs EVIEWS10

4.2.3. Bounds test :

In order to confirm the existence of a common integration relationship, we compute a statistic (F) (Wald test), where the null hypothesis is that there is no common integration between model variables (no balance relationship long-run is tested):

Against the alternative hypothesis that there is a common integration relationship in the long run between model variables:

$$H_1: \gamma_8 \neq \gamma_9 \neq \cdots \neq \gamma_{14} \neq 0$$

Table number (03): Bounds test

Test statique	Value	Signif	I(0)	I(1)

F-statique	18.48385	10%	2.08	3
K	5	5%	2.39	3.38
		01%	3.06	4.15

Source: Prepared by researchers using outputs EVIEWS10

From the Bounds test, it appears that the hypothesis of a common integration relationship cannot be rejected at the levels 1%, 5%, 10% as the calculated statistic (18.48385) is higher in all boundaries; this means that there is a balance relationship long-run between model variables

4.2.4 A balance relationship long-run:

We measure the long-run relationship within the ARDL model. This stage involves obtaining an estimate of the parameters for the long -run, as shown in Table No. (4).

Table number (04):   Estimate parameters in the long-run

Variable	coefficient	Prob	Variable	Coefficient	Prob
RG	-1.24E-05	(0.0001)***	DEPT	-0.025455	(0.0003)***
RTDIR	6.93E-05	(0.0000)**	DEFT	-169886.7	(0.0000)***
RTINDIR	-1.77E-05	(0.1919)	C	13.54085	(0.0000)***
R-squared	0.98		F-STATIQUE	36.06130	(0.0000)***

Source: Prepared by researchers using outputs EVIEWS10

Where as: (): error probability / *: at the level of significance 1%, **: at level of significance 5%, ***: at level of significance 10%

$$ISt = 13.54085 - 1.24E - 05RGt + 6.93E - 05RDIRt + 1.77E$$
$$- 05RTINDIRt - -0.025455DEPTt - 169886.7DEFTt + Ɛ$$

4.2.5 Error Correction model: (ECM ARDL)

The error correction limit ECM (-1) showed a negative signal and at a significant level of 1%, which confirms the existence of a long-run balance relationship, and Table (5) shows the results of the ECM error correction model estimates.

Table number (05): Error Correction model (ECM ARDL)

Variable	Coefficient	Prob	Variable	Coefficient	Prob
RG	1.37E-07	(0.0000)***	DEPT	0.015302	(0.0276)**

RTDIR	2.04E-05	(0.0002)***	DEFT	-97698.10	(0.0001)***
RTINDIR	-1.63E-05	(0.0131)**	(1-)ECM	-1.19	(0.0000)***
R-squared		0.94	D.W		1.630367

Source: Prepared by researchers using outputs EVIEWS10

Through table (5) that shows the error correction model, we notice that the parameter of the error correction limit is 1.19- and we notice its significance at the level of significance of 1% and the negative signal and this increases the accuracy and validity of the equilibrium relationship in the long -run and that the mechanism of error correction is present in the model and the parameter measures the back speed to put balance in the long-run.

4.2.6Results of the estimate

✓ The value of the coefficient of determination R^2=0.98, which means that the interpreted variables explain to us about 98% of the changes in the dependent variable.

✓ Regarding the Fisher test, we note that "Prop (F-statistic) = 0.000", which means that the probability of the model's inability to explain the productivity of the industrial sector in Algeria is 0, and therefore the model as a whole is important, and the estimated model is able to explain the dependent variable during the period subject of study.

As for the significance of the variables explained, we find:

✓ For the RG variable, we find has a positive relationship with the productivity of the industrial sector in the short –run, and statistically significant, this is consistent with the management theory of the firm Bumole (1967), contrary to the long-run, we find that it has a negative relationship, this is consistent with "Ricardian's parity theory", which holds that fiscal policy is not important because economic factors will reduce its current consumption after increasing government expenditure, and it can be explained economically, that public spending policy did not have much impact on achieving the desired goal, due to the lack of positive effects it lasted from the short -run to the long -run, it was even there is a big fluctuation in light the reforms that were programmed in the nineties, in spite of the development programs that were allocated huge sums estimated with total coverage of 443 billion $, but the results on the industrial sector did not reach the expected ambition.

✓ Regarding the DEPT and DEFT variables, we find that they have an inverse relationship with industrial production in the long-run, and we explain that fiscal policy in Algeria depends on the economic cycle, unlike the economic theory of Keynes. So, high debt and deficit are evidence of

austerity fiscal policy, and which negatively affects economic activity, and thus the deficit is funded by crowding-out the private sector, which leads to a decrease in the level of economic growth and development. As for the statistical aspect, the two variables have a statistical significance, and therefore have explanatory power in the model in the long and short-run.

✓ For the RTDIR variable, it has a positive relationship with the productivity of the industrial sector in the short and long-run. It can be explained this economically, that paying the tax on profits reduces the financial pressure on companies; this is consistent with the results of a study. (Adefeso ,Hammed A, 2018)

✓ For the RTINDIR variable, it has a negative effect in the short-run, which is consistent with the Koch et al. (2005) study, and it can be explained this the higher the indirect tax rate, the more it leads to the economy shrinking and weakening the purchasing power of the citizen and thus the production is affected, but in the long-run, it has no illustrative ability in the model and this is consistent with a study (TESAR,RAZIM ,MENDOZA, 1994), where researchers found that indirect taxes have a negative and important effect on investment, but this effect is not sufficient to obtain statistically significant effects on growth long-run.

✓ **4.2.7 Model stability test:**
To ensure that the data used in this study are free of any structural changes, it is necessary to use one of the appropriate tests for this, such as the cumulative sum (CUSUM) and the cumulative sum of squares of (CUSUMQ). These tests are considered one of the most important tests in this field because they show the stability and consistency of long-run parameters with short-run parameters, where the structural stability of the estimated coefficients is achieved if the graph falls within the critical limits at the level at 5%.

Graphique 2: CUSUM test and CUSUM of squares test
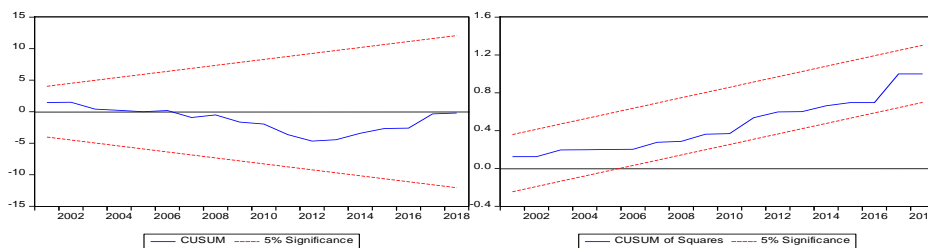
Source: outputs EVIEWS10

Through graph (2) we note the CUSUM test and CUSUMQ are located inside the critical limits at the level of 5%, this indicates the presence of stability and harmony in the model between the results of the long-run and the results of the short-run.

Conclusion:

The relationship between fiscal policy and the industrial sector was a fundamental issue for many economists. Fiscal policy plays a major role in the production and the ability to exploit the industrial sector in order to achieve the desired goal which is industrial development. This study examined the impact of fiscal policy on industrial production in Algeria during the period 1970-2018 through using the ARDL model, however, the effect of the variables under study did not have the expected positive impact on the industrial sector even in light the openness on the outside and the development programs, and this evidence that there is a defect in the fiscal policy in Algeria Thus we accept the hypothesis H0, in light of the results of this study. We believe that the main challenge of the state is to achieve sustainably and a diverse growth with the strength of productive investment, thus we will provide a set of suggestions and recommendations where the public authorities should work to achieve as follows:

- Working to control the government expenditure policy to ensure that the desired goals are achieved by directing it towards the productive sectors in order to stimulate the supply side.

-Continue to underline the economic correction programs in which the focus is on increasing investment expenditure directed towards infrastructure projects that allow the development of an investment climate appropriate to the growth of the private sector and increase production capacity.

-The necessity of determining the optimal size of public expenditure in order to avoid budget deficits and crowding out private sector investment, which is seen as a driving force for economic growth and development.

-Providing tax incentives to Algerian economic institutions to reduce the tax burden, which helps the institution to achieve tax savings that help it grows and survives.

-The need to pay attention to tax laws and investment promotion laws, and try to benefit from them as much as possible and not neglect any part of them.

-The government should reduce its revenue base by diversifying its revenue sources, and this will provide sufficient revenue to run government activities and enhance manufacturing performance in the long run.

-Working on developing the means of production and its methods to raise the level of production efficiency, which in turn leads to increasing competition with foreign products of great quality.

- Reconsidering the country's macroeconomic policy by relying on a clearly defined strategy that proceeds from clear and transparent data and is measurable and evaluation at any stage of its completion.

Citations:

Adefeso ,Hammed A. (2018). Government Tax Policy and Performance of Listed Manufacturing Firms in Nigeria: Evidence from Dynamic Panel Data Mode. *Zagreb International Review of Economics & Business*.

Adnan Ahmed Youssef. (2016). *the world's least public debt in Algeria - Al-Rai newspaper*. Retrieved from http://alrai.com/article/1021193

Andreea STOIAN. (2019). Fiscal Policy and Stock Market Efficiency: An ARDL Bounds Testing Approach. *Journal Pre-proof*, 8-9.

Bakare-Aremu and others. (2015). Effect of Fiscal and Monetary Policies on Industrial Sector ,Performance- Evidence from Nigeria. *Journal of Economics and Sustainable Development*.

Bank of Algeria. (2018). *the economic and monetary development of Algeria.*

Bashir Khmera . (2016, 05 24). a study of the relationship between government spending and gross domestic product . 20. Ouargla, economic and commercial sciences and management sciences, algeria.

Eze, O. R. (2013). IMPACT OF FISCAL POLICY ON THE MANUFACTURING SECTOR OUTPUT IN NIGERIA: AN ERROR CORRECTION ANALYSIS. *International Journal of Business and Management Review (IJBMR)*, 40.

Joseph, T. (2012). Effects of Public Expenditure on Industrial Sector Productivity in Nigeria. *Canadian Social Science*, 207.

Law Chee Hong . (2016). Sectoral Impact of Fiscal Policy in Malaysia. *Jurnal Ekonomi Malaysia 50(1)* .

Macdonald, D. (2011). Corporate Income Taxes, Profit and Employment Performance of Canada's Largest Companies. *Behind the Numbers: Economic Facts, Figures and Analysis*.

Malaysia, L. C. (2016). Sectoral Impact of Fiscal Policy in Malaysia. *Jurnal Ekonomi Malaysia ,50(1) , 81*, 82.

Marina Tkalec,Maruška Vizek. (2009). The Impact of Macroeconomic Policies on Manufacturing Production in Croatia. *Privredna kretanja i ekonomska politika 121*.

Nasser Mourad . (2009). Evaluation of Tax Reforms in Algeria. *Damascus Journal of Economic and Legal Sciences,* المجلد*25*, 110.

Oka felix Arikpo, A. O. (2017). The Impact of Fiscal Policy on the Performance of the Manufacturing Sector in Nigeria. *Euro-Asian Journal of Economics and Finance*, 13.

Omran, E. A. (2017, 06 15). THE IMPACT OF FISCAL POLICY ON OUTPUT: A CASE STUDY OF EGYPT. tallinn, Majandusteaduskond, Estonie: Majandusanalüüsi ja rahanduse instituut.

Quri Yahya Abdullah(2018), The determinants of industry growth in Algeria, international conference, Algeria,p.4

Rattoul Mohamed, Roushou Abdelkader. (2016). the role of financial policy in achieving macroeconomic stability in Algeria during the period 2001-2016. *Journal of Strategy and Development, 07*(12), 170.

Rina, O. and others (2010). The Impact of Fiscal and Monetary Policy on Industry and Indonesian Economy: A Computable General Equilibrium Analysis. *International Journal of Economics and Management, 3(6): 34-52*.

- SHAHBAZI KIUMARS, KARIMZADEH ELHAM (2015). IMPACTS OF MONETARY AND FISCAL POLICIES ON VALUE ADDED OF INDUSTRIAL SECTOR IN IRAN IN LINE WITH THE GENERAL POLICIES OF THE INDUSTRIAL SECTOR. JOURNAL OF THE MARCO AND STRATEGIC POLICIES, volume2,N°8,93-110

Strulik, H. (2003). Capital Tax Reform, Corporate Finance and Economic Growth and Welfare. *Journal of Economic Dynamics and Control, Volume 28*(Issue 3).

Tekilu Tadesse,Tesfaye Melaku. (2019). analysis of the relative impact of monetary and fiscal policies on economic growth in ethiopia,using ardl

approach to co-integration:which policy is more potent? *Copernican Journal of Finance & Accounting*, 99.

TESAR,RAZIM ,MENDOZA. (1994). Effective tax rates in macroeconomics Cross-country estimates of tax rates on factor incomes and consumption. *Journal of Monetary Economics*.

List of appendices:

Appendix 01: bounds test and estimate parameters in the long run

Appendix 02: Error Correction regression.