

## The Influence of Fiscal Policy on Economic Growth. The Cases of Algeria and Morocco.

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Received: 30/03/2020 ; Revised: 05/04/2020 ; Accepted: 23/10/2021

**Summary:** Because budgetary policy is considered as an important tool for influencing global macroeconomic variables, particularly the rate of economic growth. In this paper, our objective is to assess the contribution of financial policy on economic growth in Algeria and Morocco using recent econometric techniques during the period 1970 to 2018 (for Algeria) and 1990 to 2017 (for Morocco). Doing so, we specified and estimated a model that explains the impact of financial policy on economic growth (dependent variable), using tax revenues and government expenditure as explanatory variables. Our results indicate the existence of a significant effect of financial policy on economic growth in both countries.

**Keywords:** budgetary policy; economic growth; government expenditures; tax revenues.

**Jel Classification Codes :** C61 ; E62 ; O47

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### I- Introduction :

Thanks to the public investment of the state, the growth rate can be evolved. The importance of public investment is related to the level of public expenditure and their destination, so public investment is directly influenced by tax revenues and their provenances.

There is a numerous empirical works showing the existence of the relationship between growth and various indicators of fiscal and budgetary policy. Endogenous growth models with externalities of public infrastructure expenditure accurately reflect the non-linear relationship between taxation and long-term growth. As well, according to Barro (1990), an increase in the tax rate provides resources to finance productive public spending, but at the same time reduces the net marginal return on private capital (Minea & Villieu, 2007). The inclusion of productive public spending was first introduced by Barro (1990) by integrating the active role of government policy into the standard model of endogenous growth (Rajhi, 1993).

Relevant questions related to economic policies, in particular financial policies, including the objective of revealing the role of these policies on economic growth, are still on the agenda, even since the publication of several of the most recent empirical studies on the theory of endogenous growth. There are still aspects concerning the relationship between long-term policies and economic growth that remain unresolved, including the impacts of increased government size, allocation of public expenditures, government financing costs, trade policies and foreign capital flows. (Easterly & al, 1991).

The aim of this work is to study the effect of financial policy in the two countries Algeria and Morocco on economic growth. More specifically, we wish to study the relationship between public expenditure and public revenue and economic growth. In this context, we can mention the following question "Does financial policy affect long-term growth in Algeria and Morocco?"

## I.1 The hypotheses

Considering the nature of the savings in the two countries (Algeria and Morocco), which generally comes from budgetary revenues. Therefore, it is assumed that it will have a significant impact of fiscal variables that are driven by financial policy, on economic activity, and subsequently on the rates of economic growth. But that will be with a difference between Algeria and Morocco because the Algerian economy is much more profitable and dependent on the hydrocarbon sector, in particular the petroleum taxation which generally represents more than half of the state budget.

## I.2 Literature review

For more than two centuries, economists have wondered about the causes of growth. Adam Smith (wealth of Nations, 1776), Thomas Malthus (The Principle of Population, 1796), David Ricardo (The Declining Returns of 1817) and Karl Marx (The Destruction of Capitalism, 1844) are the true precursors of growth. And since the 1950s of the 20th century, theoretical models of growth have been very successful. The post-Keynesian (Harrod-Domar) and neoclassical (Solow) models have introduced a real debate on the question of balanced growth. Since the 1970s and 1980s, growth has experienced a new rise under the impetus of regulation and endogenous growth theorists.

Empirically the studies carried out are much more interested in the effect of public spending on economic growth, and they fall into three approaches in an empirical order: the first attempts to determine the sign of causality between economic growth and the share of public expenditure in GDP, without any real reference to growth models. The second renews the neo-classical approach to public finance by looking at the real effects of fiscal and budgetary policies and no longer at their financing methods. The third comes from the new growth theories, which is in fact an extension of the previous approach (MESPLE-SOMPS, 1993). We shall cite some empirical studies that consider the effect of budgetary policy on economic growth:

- **Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960-80 (Landau, 1986).** The author studied 96 developing countries between 1960 and 1980 and found a negative relationship between public consumption, excluding education and military spending, and economic growth. In contrast, military spending has no significant effect, whereas education spending stimulates economic growth. Also he stated that public investments have a positive impact on economic growth, however, this impact is canceled by the negative effect of the means of its financing, taxes or debt.

- **Government Spending in a Simple Model of Endogeneous Growth (Barro, 1990)** constructed an econometric equation testing the relationship between the average annual growth rate of GDP per capita, the ratio of public consumption to GDP, public investment to GDP, variables reflecting the level of human capital (schooling ratio), population fertility, political and social stability, level of development at the beginning of the considered period (1960) and distortion with respect to the proper functioning of the market. The equation is tested on a sample of about 100 countries on an annual average from 1960 to 1985. With regard to the role of the state, the results obtained are similar to those of Landau (1986) but not to those of Kormendi and Meguire (1985) or, to a lesser extent, to those of Diamond (1989) : the coefficient associated with public consumption is significantly negative, while that of investment as a share of GDP is positive but not significant.

- **Government Expenditures and Economic Growth: The Supply and Demand Sides (Pak, 2007).** The author used a new approach to estimate the impact of government spending on the rate of real GDP growth. He found that, apart from public investment, all government spendings have marginal negative effects on productivity and GDP growth. In particular, an increase of 1 percentage point in the share of public consumption in GDP reduces the growth rate of equilibrium GDP by 0.216 percentage points, while the same increase in public investment increases the growth rate by 0.167 percentage points. This suggests that a reallocation of 1 percentage point of public consumption to public investment can increase the growth rate by 0.38 percentage points.

- **The macroeconomic effects of fiscal policy shocks in Algeria: an empirical study (Chibi, Benbouziane, & Chekouri, 2010).** The authors used an SVAR model for the period between 1965 and 2007 by integrating budgetary expenditure, budgetary revenue, real GDP, nominal interest rate and the GDP deflator index as a proxy variable for price variations. The authors find a small positive impact of permanent budgetary shocks in the short run, while in the long run the impact is negative on economic growth by excluding private investment. Consumption, the price level and interest rates are positively affected. An increase in budgetary revenues also has a small positive impact on growth by affecting consumption and investment, while its effect on the price level and financing costs is negative.
- **Allocation des dépenses publiques et croissance économique au MAROC (1970-2013) (HETTABI & EL ABBASSI, 2015).** Their work focuses on the analysis of the link between public expenditure allocation and economic growth in Morocco through the search for possible cointegration relationships between GDP and the components of public expenditure in the education, health and infrastructure sectors. They estimated a vector error correction model and concluded that there is a positive and statistically significant relationship between public expenditure on health and long-term growth, while public expenditure on education is negatively related to it.

## II Brief overview of financial policy in Algeria and Morocco

### II. 1. Development of financial policy in Algeria

Financial policy in Algeria since independence has undergone several reforms. The goal of which is to get out of economic and financial balances. From 1963 Algeria inherited a very difficult financial situation. Because of this situation, the authorities imposed a set of measures such as the increase of the customs tariff and the taxation of very high wages. During the period 1963 -1969, the taxation reached about 20% of state revenue while the petroleum taxation rose from 1.9% to 27.9% in the same period, and what concerns governmental spendings, they were stagnated at around 20% to 25% of GDP spending mainly on operating expenses which reached 80% against 20% capital expenditure.

The period 1970-1980 was characterized by the promulgation by decree in 1970 and 1974 of the first and second four- year plan respectively. During this period, operating expenses have increased from 13.7 billion to 15.3 billion DA. The overall budget balance was negative throughout the first four- year plan 1974-1977. This budget deficit was mainly covered by advances from the central bank which exceeded 3 billion DA as well as treasury deposits.

This situation made it possible to achieve an average annual growth of 6.1% overall, 9% excluding hydrocarbons approaching the initial target set at 10%.

From 1980, long-term budgetary policy objectives were set aimed at achieving a financial equilibrium for public enterprises and a reorientation of budgetary policy in favour of investments in the social field and small and medium-sized industries.

The GDP growth target is set at 7.1% on average per year and an investment rate of around 48.1% of GDP. To achieve this, the budgetary authorities had planned a public investment of more than 400 billion DA. However, initial assumptions were thwarted by economic developments, including a reversal in the hydrocarbon market along with low revenues for state-owned enterprises due to the failure of the strategy to increase productivity through restructuring. During this period, current expenditure was doubled under the impetus of high wage induced by socialist policies. Thus, the budgetary balance was negative and stands on average at -18 billion DA financed entirely by internal sources, in particular advances from the banking system. In fact, economic growth was only 4.3 % big below the target set at 7.1 % while investment was only 38 % of GDP for a target set at 59 % . From the 1990s, there was a period of transition from a planned economy to a market

economy. To achieve this change, the budgetary authorities launched the macroeconomic stabilization and structural reforms program, the work plan of the PTG government, as well as the structural adjustment plan under the aegis of international monetary institutions. These measures enabled a return to economic growth which averaged 3.2% per year between 1994 and 2000. Despite the constraints imposed by the implementation of the SAP, public investments continued to grow at a sustained rate, 15% per year, reaching 346.58 billion DA for the year 2000. The expenditure relating to structural reforms represented the major part. Then fell sharply from 1998 while housing expenditure increased sharply from 1998, the end date of the SAP which limited social spending. Operating expenses grew steadily at 15% per year, that the total payroll has been controlled at a rate of less than 10%.

For the period 2001 - 2017 and due to the sharp rise in hydrocarbon revenues, the budgetary authorities continued with the new economic orientation, initiating an expansive budgetary policy focused mainly on demand to improve purchasing power through the plans stimulus. Thus, the PSRE economic recovery support plan was put in place in April 2001 and covers the period 2001-2004. This plan is followed by a five-year plan in 2005, called the PCSC Complementary Growth Support Plan, which is supposed to give continuity to the measures of the first four-year plan. After that a second five-year plan 2010-2014 called the Public Investment Program, set up to complete the projects launched during the two previous plans and also introduces new investments in economic infrastructure. Finally, a last five-year plan is put in place for the period 2015-2019 with the same objectives revised upwards due to the significant accumulated reserves.

In this sense, the objectives of long-term fiscal policy during this period are the achievement of significant growth and the reduction of inequalities in terms of infrastructure and purchasing power between urban and rural areas, Improving social climate and standard of living, in particular through housing projects. Moreover, the results in terms of real growth and jobs have been positive and are in line with the objectives set. Thus, economic growth has registered a rate of 7% per on average.

## **II.2 Development of financial policy in Morocco**

The Moroccan system of public finances emerged during the period of the French protection over Morocco. The Moroccan legal and institutional history proves the existence of an interconnected relationship between the constitutional reviews on the one hand, and the reform of the regulatory laws framing the budget on the other hand.

After the issuance of the kingdom's first constitution in 1962, followed by the issuance of the first financial regulatory law in 1963, which established the interrelationship between finance laws and schemes approved by Parliament. The article 50 of this constitutional text emphasized the separation between budgetary and financial rules and principles and those related to the accounting and public procurement systems.

After the state of exception was announced in 1965, then Parliament was dissolved and the approved budgets were returned without authorization. This resulted in the issuance of financial laws for the two years (1970-1972) which created new mechanisms for voting on the Finance Bill and devoted a unified and definitive liquidation law. The organizational Law of the Finance Law of 1998 made it possible to make the legal provisions framing the state budget that fit with the requirements of the 1996 constitution, especially those related to planning and the return of the two-chamber parliamentary system, taking into account the lack of interruption with the budgetary approach in force since independence. The adoption of the new constitution in 2011 necessitated the reform of organizational Law N° 7.98 of the Finance Law to fit with the new constitutional principles framing public finances. The organizational Law N°. 13.130 of the Finance Act constituted a legislative framework that consolidated the measures taken during recent years in the

field of modernizing public finance measures. It devoted the principles of accounting, evaluation and budget transparency. This regulatory law also enabled the expansion of the right to submit parliamentary amendments. It was actually a significant shift in the process of managing public finances and an important development in the budgetary practice of the Moroccan administration, whether at the legislative level or at the level of practices and behaviors.

### **III– Methods and Materials:**

For our empirical study that will explain the relationship between economic growth and financial policy in the two countries Algeria and Morocco. We are going to base on the studies mentioned above to have an econometric modeling that will allow us to shed light on this relationship.

For the reason of the non-availability of data concerning the explanatory variables, two different models were used for the two countries.

The approach is as follows:

- The study of the stationarity of the series in order to know the order of integration, focusing on the ADF test.
- The study of the cointegration relationship to see the existence of a long term relationship, using the Johansen's test
- The estimation of a VECM model and the verification of the existence of short-term dynamics and error correction.
- The validation of the estimated model by the appropriate tests.

#### **a. Presentation of the model case of Algeria**

We proposed a growth model based on the variables of the Algerian financial policy, represented by the following equation:

$$\ln GDPT_t = \beta_0 + \beta_1 \ln Fiso + \beta_2 \ln Fisp + \beta_3 \ln Depf + \beta_4 \ln Depe + \varepsilon_t$$

With:

$GDPT_t$ : GDP per capita

$\beta_0$  : Constant.

$\beta_1 \dots \beta_4$  : Model coefficients.

$Fiso$  : Ordinary taxation (Million dinars).

$Fiso$  : Oil taxation (Million dinars).

$Depf$  : Public operating expenditure (Million dinars).

$Depe$  : Public equipment expenditure (Million dinars).

$\varepsilon_t$  : Error term

The data are extracted from the World Bank database<sup>1</sup>, the ONS<sup>2</sup> report and the report of the Directorate General of the Treasury<sup>3</sup>, the sample covers the period from 1970 to 2017, i.e. 47 observations.

## b. Presentation of the model case of Morocco

The model for Morocco is reduced compared to the Algerian model, it is based solely on overall budget expenditure and revenue:

$$\ln GDPT_t = \beta_0 + \beta_1 \ln Rec + \beta_2 \ln Dep + \varepsilon_{it}$$

With:

$GDPT_t$ : Current GDP per capita.

$\beta_0$ : Constant.

$\beta_1 \dots \beta_2$ : Model coefficients.

$Rec$ : Budgetary revenues (% of GDP)

$Dep$ : Budgetary expenditure (% of GDP)

$\varepsilon_i$ : Error term.

The data are extracted from the World Bank database; the sample covers the period from 1990 to 2017, i.e. 28 observations.<sup>4</sup>

## IV Results and discussion :

### 1- Empirical study (Case of Algeria)

#### a. Study of time series stationarity

According to Table (1), the result of the Augmented Dickey Fuller (ADF) test for our series show that the series are not stationary in level, but stationary in first difference I(1). This result assumes the existence of a risk of cointegration between the variables I(1). In order to confirm that there is cointegration between the variables, the series derived from the residuals must be stationary in the first difference identical to our series.

The result of stationarity of the residuals series, presented in table (2), confirm that there is a risk of cointegration between the variables.

#### b. Series Co-integration Test

After confirming the identical order of stationarity for all variables I(1), the next step is to verify the existence of a possible cointegrating relationship. We carry out our study of the long-term relationship in the framework of Johansen's (1988) process.

<sup>1</sup> GDP per capita. <https://donnees.banquemondiale.org/indicateur/NY.GDP.PCAP.CD?locations=DZ>

<sup>2</sup> Other variables from 1970-1999. [http://www.ons.dz/IMG/pdf/CH12-FINANCES\\_PUBLIQUES.pdf](http://www.ons.dz/IMG/pdf/CH12-FINANCES_PUBLIQUES.pdf)

<sup>3</sup> Other variables from 2000-2018. [http://www.dgpp-mf.gov.dz/images/stories/PDF/retrospective/tresor/srot\\_2018.pdf](http://www.dgpp-mf.gov.dz/images/stories/PDF/retrospective/tresor/srot_2018.pdf)

<sup>4</sup> All variables are taken from the World Bank database.

<https://donnees.banquemondiale.org/indicateur/NY.GDP.PCAP.CD?locations=DZ>, except for the data for the years 2000-2001, are taken from the database of the Financial Studies and Forecasting Department <http://depf.finances.gov.ma/>

According to this method, we use the trace statistics (likelihood ratio) obtained with the multivariate maximum likelihood technique of Johansen (1988).

In the trace test result shown in Table (3), we reject at a significance level of 0.05 ( $91.08194 > 69.81889$ ) the null hypothesis  $H_0$ : absence of cointegration relation, against the alternative hypothesis : there is at least one cointegration relation.

Also we reject the null hypothesis  $H_0$ : there is at most 1 cointegration relation, against  $H_1$ : there are at least 2 cointegration relations, at a significance level of 0.05 ( $54.50041 > 47.85613$ ).

Then, we reject the null hypothesis  $H_0$ : there are at most 2 cointegration relations, against  $H_1$ : there are at least 3 cointegration relations, at a significance level of 0.05 ( $29.92075 > 29.79707$ ).

Finally, we accept the null hypothesis  $H_0$ : there are at most 3 cointegration relations, against  $H_1$ : there are at least 4 cointegration relations, at a significance level of 0.05 ( $11.18069 < 15.49471$ ).

As a result, we accept the presence of three cointegration relations at a significance level of 0.05 between the variables.

### c. Identification of the cointegration relationship

After verifying the existence of three cointegration relations, we represent the relation by the equation obtained from the following cointegration relation:

$$\ln(GDBT) = -3.69 \ln(Fiso) - 0.51 \ln(Fisp) + 3.11 \ln(Depf) + 0.51 \ln(Depe) - 2.03$$

$$[-9.5001] \quad [-5.9542] \quad [10.7136] \quad [2.7253]$$

This result of estimating the long-term relationship confirmed that the explanatory variables for growth are significant according to the Student test.

### d. Estimation of a VECM model

This type of econometric specification is known as a partial adjustment mechanism or error-correction. The latter type of specification was popularized by Hendry under the general theme of ECM (error correction models) Davidson, Hendry, Srba, and Yeo (1978). The approach of this model allows us to determine short-term and long-term properties at the same time and to obtain information on the speed of adjustment to the equilibrium.

The estimation of an ECM model gave us the following dynamic equation :

$$\begin{aligned} D(GDP) = & -0.364642645628*(GDP(-1) - 3.69659835195*FISO(-1) - 0.513641947008*FISP(-1) \\ & + 3.11993992175*DEPF(-1) + 0.517902842059*DEPE(-1) - 2.0340240202) - \\ & 0.0278825360049*D(GDP(-1)) - 0.145708593414*D(GDP(-2)) + 0.308785296644*D(GDP(-3)) + \\ & 0.129551453621*D(GDP(-4)) - 1.08082709232*D(FISO(-1)) - 0.463270472055*D(FISO(-2)) - \\ & 0.0840499697918*D(FISO(-3)) - 0.03243456041*D(FISO(-4)) - 0.201544890741*D(FISP(-1)) - \\ & 0.195456067966*D(FISP(-2)) - 0.133408675306*D(FISP(-3)) - 0.118124390657*D(FISP(-4)) + \\ & 1.26937534893*D(DEPF(-1)) + 0.954355910526*D(DEPF(-2)) + 0.334321769229*D(DEPF(-3)) \\ & + 0.507344891544*D(DEPF(-4)) + 0.0488040232945*D(DEPE(-1)) + \\ & 0.200761568976*D(DEPE(-2)) + 0.213231478292*D(DEPE(-3)) - 0.00253723117847*D(DEPE(-4)) - 0.181229895666 \end{aligned}$$



The result demonstrates the coefficient associated with the return force is negative (-0.3646). There is therefore an error correction mechanism, in other words this coefficient indicates the speed of adjustment to return to equilibrium following a shock. This mechanism indicates the convergence of growth trajectories towards the long-term target. Thus, shocks to growth correct to 36 % within a year.

#### e. Validation of the estimated model

We tested the autocorrelation of the residuals using the Lagrange multiplier test of Breusch-Godfrey (1978). Under the null hypothesis, all autocorrelations are statistically null. This decision is taken because the Breusch-Godfrey test statistic carries a probability of more than 5%. (Figure (1))

### 2- Empirical study (Case of Morocco)

#### a. Study of time series stationarity

The Augmented Dickey Fuller (ADF) test for our series shows that the series are not stationary in level, but stationary in first difference I(1). ADF Test results were presented in Table (4) below.

After having this result, the next step is verifying the existence of a cointegration relationship using the cointegration test, but before that we have to confirm that the residuals are stationary in the same order as the series.

Results of residuals stationarity test mentioned in Table (5) confirm the existence of a risk of cointegration between the variables.

#### b. Series Co-integration Test

The trace test results reveal that we reject at a significance level of 0.05 ( $26.58551 > 24.27596$ ) the null hypothesis H0: absence of cointegration relation against the alternative hypothesis there is at least one cointegration relation.

In addition, we reject the null hypothesis H0: there is at most 1 cointegration relation, against H1: there are at least 2 cointegration relations, at a significance level of 0.05 ( $12.35837 > 12.32090$ ).

Furthermore, we accept the null hypothesis H0: there are at most 2 cointegration relations, against H1: there are at least 3 cointegration relations, at a significance level of 0.05 ( $2.963917 < 4.129906$ ).

Accordingly, we accept the presence of two cointegration relations at a significance level of 0.05 between the variables. The trace test results are presented in Table 6 mentioned below.



### c. Identification of the cointegration relationship

The long-term cointegration relationship is presented by the following equation:

$$\ln(GDPT) = -2.3655 \ln(Rec) + 0.8982 \ln(Dep) - 0.4374$$

[6.0669]                      [3.1677]

So this result confirmed that the explanatory variables for growth are significant according to the Student's test.

### d. Validation of the estimated model

The results in Figure (2) show that according to the Breusch-Godfrey (1978) test, all autocorrelations are statistically null. This decision is made because the Breusch-Godfrey test statistic carries a probability of more than 5%.

## V- Conclusion:

The objective of this paper is to analyze the effect of financial policy in Algeria and Morocco on economic growth. Through an econometric modeling which determines the relationship between GDP per capita and the variables explaining the budgetary policy, in particular budgetary revenues and expenditures, an econometric methodology was used to have a better modeling which interprets this relationship well. Two tests were used: the stationarity and the Johansen cointegration tests.

The main results of the paper can be summarized as follows:

### 1. The Case of Algeria

#### a. Econometrically:

- The series of variables are all integrated of the same order I(1).
- The variables are cointegrated, they evolve together and therefore show a long-term relationship.
- The estimation of a VECM model shows that there is a 36% short-term to long-term adjustment (recall force).
- The relationship between GDPT and the explanatory variables Fiso, Fisp, Depf and Depe is significant.

#### b. Economically:

With regard to the two tax variables (ordinary and oil), a negative effect was found. So, the increase in tax rates and taxation disfavors the increase of the growth rate, but with a remarkable deference between oil taxation and ordinary taxation. The latter has a higher coefficient 3.69 compared to oil taxation, which has a coefficient of 0.51.

On the other hand, there was a positive effect on the part of public expenditure on growth. However it seems that operating expenditure has a greater influence than equipment expenditure.

On the whole, this result reflects the economic mechanism of growth and does not contradict previous studies which have practically the same effects.

## 2. The Case of Morocco

### a. Econometrically:

- The series of variables are all integrated of the same order I (1).
- The variables are cointegrated, they evolve together and therefore show a long-term relationship.
- The estimation of a VECM model shows that there is no adjustment from the short term to the long term (recall strength), which prevented us from estimating a VECM model.
- The relationship between GDPT and the explanatory variables Rec and Dep is significant.

### b. Economically:

There is a negative effect of the budget revenue variable on economic growth, i.e. an increase in government revenue through the tax effect reduces the growth rate.

Moreover, there is a positive effect of public expenditure on economic growth. Therefore, the increase of public expenditure favors the improvement of the growth rate, practically the same result as in Algeria and which is evident. This approves the empirical models studied previously on all the Barro's model (1990).

In conclusion, in both countries (Algeria and Morocco), there is a significant negative effect on economic growth of the budgetary revenue variable. This effect is more important in Algeria compared to Morocco and in particular the oil taxation. This finding is obvious given that in general the Algerian state budget is fed by more than 50% by this latter tax system. The advantage of Moroccan economic diversification has reduced the importance of tax revenue in participation and improvement of economic growth. Similarly, public spending has a significant positive impact in both countries, more important in Algeria by report Morocco, and this due to the nature of the Algerian rentier economy and the Moroccan economy which is diversified. So growth is generated mainly by public spending in Algeria and Morocco in a less intense way.

## VI- Appendices:

Table (1): ADF Test

Variables	In level			In first difference		
	t-statistic	t-tabulated	Prob	t-statistic	t-tabulated	Prob
GDP	-3.5063	-2.2966	0.4276	-4.8248	-2.9251	0.0003
Fiso	-1.2202	-2.9237	0.6583	-5.6971	-2.9251	0.0000
Fisp	-2.3416	-2.9237	0.1636	-5.5569	-2.9251	0.0000
Depf	-1.9764	-2.9237	0.2959	-5.1462	-2.9251	0.0001
Depe	-1.8482	-2.2966	0.3534	-5.9236	-2.9251	0.0000

The source: author (our calculations on Eviews 9)

Table (2): ADF Residue Test

Variables	In level			In first difference		
	t-statistic	t-tabulated	Prob	t-statistic	t-tabulated	Prob
Residues	-	-	-	-5.5640-3.	5085	0.0002

The source: Author (our calculations on Eviews 9)

Table (3): Trace test

Hypothesis	Trace statistic	critical value 5%	prob
None	91.08194	69.81889	0.0004
At most 1	54,50041	47,85613	0, 0105
At most 2	29,92075	29,79707	0, 0484
At most 3	11.18069	15.49471	0 .2006
At most 4	2.820072	3.841466	0 .0931

The source: Author (our calculations on Eviews 9)

Table (4): ADF Test

Variables	In level			In first difference		
	t-statistic	t-tabulated	Prob	t-statistic	t-tabulated	Prob
GDP	-0.6414	-2.9762	0.8450	-4.1867	-2.9810	0.0032
Rec	-1.6959	-2.9762	0.4219	-4.5023	-2.9810	0.0015
Dep	-2.7929	-2.9762	0.0726	-5.0676	-2.9810	0.0004

The source: Author (our calculations on Eviews 9)

Table 05: ADF Residue Test

Variables	In level			In first difference		
	t-statistic	t-tabulated	Prob	t-statistic	t-tabulated	Prob
Residues	-	-	--	-5,0366	-2,9810	0,0004

The source: Author (our calculations on Eviews 9)

Table 6: Trace test

Hypothesis	Trace statistic	critical value 5%	prob
None	26,58551	24,27596	0,0251
At most 1	12.35837	12.32090	0.0493
At most 2	2,963917	4,129906	0,1008

The source: Author (our calculations on Eviews 9)

Figure (1) : LM Test

VEC Residual Serial Correlation LM Tests  
Null Hypothesis: no serial correlation at lag order h

Sample: 1970 2018  
Included observations: 44

Lags	LM-Stat	Prob
1	19.10933	0.7918
2	22.91450	0.5826
3	28.78134	0.2732
4	12.99149	0.9766
5	28.16010	0.3005

The source: Author (Sorties Eviews 9)

Figure (2):LM Test

VEC Residual Serial Correlation LM Tests  
 Null Hypothesis: no serial correlation at lag  
 order h

Sample: 1990 2017

Included observations: 25

Lags	LM-Stat	Prob
1	15.27078	0.0838
2	4.595875	0.8680
3	11.64842	0.2339
4	7.750077	0.5595
5	4.521211	0.8739
6	11.80417	0.2246

The source: Author (Sorties Eviews 9)

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**How to cite this article by the APA method:**

Brahim REFAFA (2022), **The Influence of Fiscal Policy on Economic Growth. The Cases of Algeria and Morocco.**, Algerian review of economic development, Volume 09 (Number 01), Algeria: Kasdi Marbah University Ouargla, pp. 463-476.



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