

Determinants of public expenditure in Algeria: An application of ARDL cointegration approach

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Abstract:

This article aims to find the determinants of public expenditure in Algeria. Starting from the involvement theory of public finances in the financial system, we analyse the relationship between public expenditure and financial repression level. The specific methodology to assessing the nature of this relationship, including the relationship between public expenditure and others determining factors, is the ARDL cointegration approach. In attendance of structural break of the 1990s, the results provide strong evidence that financial repression factor determines the public expenditure level in short-term and long-term, notably the economic growth factor, public debt, urban population, trade openness and structural break.

Keywords: public expenditure; financial repression; ARDL cointegration approach

Jel Classification Codes: C32; E00; E62; E69 ; O55

Introduction

Because of its impact on economic development, public expenditure growth in the states has received many theoretical and empirical explanations and has become an important and emerging public debate (Mueller 2003, Henrekson and Bergh 2011).

In economic theory, the size of government is influenced by demand factors and supply factors of public spending (Varalakshmi 2010). The demand factors as population growth, inflation rate and unemployment rate. As for the supply factors, we find essentially the economic output, embodied by Gross Domestic Product, tax

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revenues and non-tax revenue as central bank dividends and the implicit taxes². In the two cases mentioned, annual budget decisions are influenced by the dynamic and the constitution of the financial system of economy³. Indeed, in a financially repressed economy, the budget authority is involved in the financial system through low interest rates. This considerably limits the supply of money supposedly intended for investors, and causes a drop in the volume of tax revenues, which influences in return the public expenditure program (Ting 2016). However, this policy of government involvement in the financial system provides some fiscal resources for states (Giovanni and De Melo, 1991), which favours the growth of public spending. In developing countries, where there is a very high rate of tax evasion, states prefer to resort more intensively to the taxes generated by financial repression than regular tax levies in order to finance public expenditures (King and Plosser 1985). Algeria, like developing countries, is one of the economies where its size is very important. Thanks to oil profits combined with the implicit taxes generated by the repression of its financial system, Algeria was able to stable funding the budget package. From this point of view, the repressive constitution of the financial system can induce or amortize total public expenditures (Reynoso and Dornbush 1989). Through legal acquisition of equity interests from other factors determined by previous research that have an impact on total public expenditures, we will modify a standard econometric model by incorporating the financial repression index. It is in this context that this article studies the determinants of public expenditures in Algeria. With the aid of the Autoregressive Distributed Lag (ARDL) cointegration approach, this work aims to make a better contribution to existing knowledge on the determinants of public spending by examining whether the degree of financial repression has a significant effect on total public expenditures in Algeria. On the basis of theory that treat the causality in the subject of the determinants of public expenditures, we use annual data covering the period between 1980 and 2015 and we try to empirically identify the short- and long-term causality between the financial repression index and the total public expenditures and causality between the rest of factors determinants and public expenditures. In order to study aspects of all factors influencing public spending, the rest of the document is structured as following. In Section 1 we examine briefly the literature on the main determinants of public spending. In Section 2, we analyze the trend and growth of public expenditure in Algeria during the period 1980-2015. In Section 3, we present the determinants of public spending tested and the basic econometric model to be modified. In section 4, we present the empirical results and their interpretation. In Section 5, we draw the most significant conclusions.

1. Literature review

1.1 International Studies in Public Expenditure determinants

The origin of the controversies over the determinants of public expenditure is back to Wagner (1883). According to this economist, the public expenditures growth is determined utterly by the Gross National Product that responds to the

²Implicit taxes that refer to the repression of the financial system, we quote in particular the inflationary tax, seigniorage, capital transfers tax...etc

³Regarding unemployment factor (demand factor), in developing countries, the fight against unemployment is designated as the mission of the monetary authority, whose the dynamic is determined by the repression or liberalisation level of financial system (Bradley and Smit 1991).

demand of households. It is the first theory tested empirically on the basis of causality tests (Bird, 1971). To Wagner, Gross National Product causes the public expenditure in only one direction. This theory constitutes the basis of many theories of the government size growth. Keynes (1924) indicates that the repression of the financial system introduces the increase in public spending. Thus, for Schneider (1988), the public expenditure level varies when the readjustment of economic activity necessarily depends of the government's involvement in the financial system and his intervention in the financial intermediation dynamic. Peacock and Wiseman (1967) realise a study which based on Wagner's theory; they find that public expenditures cause the Gross National Product. Their main argument is that temporary changes in public spending can lead to permanent changes in Gross National Product. Peden and Bradley (1989) examined the effect of the size of government on economic output and productivity. They concluded that the level of government activity in the economy has a negative effect on both the economic base (GDP) and the economic growth rate (GDP growth). Alesina and Tabellini (1990) suggest that the public debt accumulation plays a very important role in the state budget allocation. Indeed, sustained in the literature by Mahdavi (2004), he notes that the public debt has a significant role to play in the distribution of the budget as well as the budget structure lead to a potential usefulness of the budget, while starving all other sectors (Samuelson, 1954). Cameron (1984) and Lybeck (1986) uses an econometric model and find the unemployment rate affects the public expenditure in the short term, but since the rate of increase in unemployment is not often, it is difficult to envisage a long-term analysis. Strum (2001) realise a panel study on 123 developing countries and finds that Gross Domestic Product, trade openness and public debt affect public spending. Also, the demographic factors play an important role in the internal state budget distribution, such as the size of the population and the density of the urban population. Fabricant (1952) uses a multiple linear model and finds that population density and degree of urbanization affects public spending. Xu-ke et al (2011) use panel data on developing countries (1995-2008). Their results show that the Gross Domestic Product and urban population are important factors that cause variations in public spending. Okafor and Eiya (2011) examine the determinants of public expenditure growth in Nigeria and found that the urban population; public debt; total government revenues and inflation rate are significant overall. In addition, Edame and Eturoma (2014) use an ECM model in the VAR approach framework and find that government revenue, urban population and political regime, explain the public expenditure level.

1.2 Algerian Studies in Public Expenditure determinants

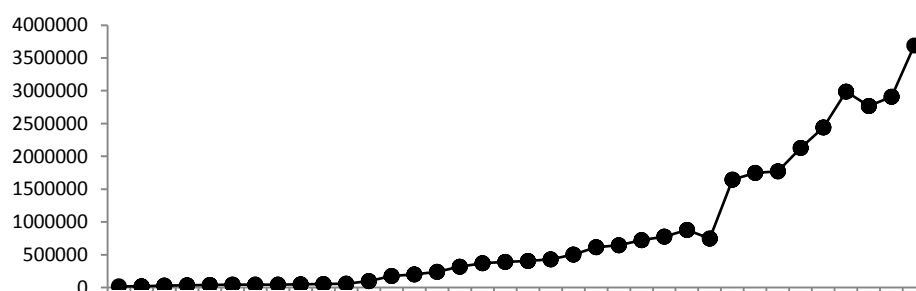
About the studies on determinants of public expenditure in Algeria, they are very limited, most of which relate to empirical objectives and do not take into account economic theory. Dahmani (2012) examines Wagner's hypothesis by using the ARDL approach over the period 1970-2010. On the basis of causal tests, the study found a significant correlation between GDP and government spending in the short and long term. Mekdad and Louaj (2014) realise a long-term analysis using three variables: Real Gross Domestic Product, Capital and Labour. Based on Cobb Douglas' endogenous growth model, the Granger causality test, and the ordinary least squares, the results support Wagner theory and that economic growth

positively influences public spending. Maachi and Zairi (2015) examine the determinants of public expenditure in Algeria during the period 1990-2012 using a four variables ECM model, Gross Domestic Product, inflation rate, open rate and the price of oil. The results show that the GDP and the open rate are significant in the long run. Laadjel and Yaakobi (2016) examine the impact of public expenditure structure on economic growth and find a positive relationship between the growth economic variable and capitalized expenditures and current expenditures. Belarbi, Saous and Mostéfaoui (2017) analyze the impact of total government expenditure on unemployment and income over the period 2000-2012 by adopting a model of error correction. The empirical results show that public spending has a positive impact on employment and the rate of inflation and negative on income.

2. Trend and growth in expenditure of Algerian government

Public expenditure in Algeria has known three stages overall: an expansion stage associated with nationalization and monopoly that refers to a financial repression system and centralized state that will until the early 1990s. Step of slowdown in expenditure associated with financial liberalization and which will start at the 1994. A current stage begins with the decade 2000, is characterized by the resumption higher level of expenditure and which is linked with very limited financial freedom. The figure.1 below shows the evolution of real public expenditure in Algeria during the period 1980-2015.

Figure 1. Public expenditure in real terms in Algeria (1980-2015)
(10⁶ DA)



Source: Established by the author from data of the Algerian Ministry of Finance/DGPP. 2016

Public expenditure in real terms increased from 18, 3 billion dinars in 1980 to 51, 8 billion dinars in 1989, an average growth rate of 12.6%. The growth of public expenditure between 1980 and 1989 is occurs out in a financial repression context for financing the increasing level of public debt at domestic low cost (53, 5 billion dinars in 1980 to 126, 8 billion dinars in 1989). This persistent increase in public expenditure is attributable to increased provision of basic social services by the government to cater for the increased demand due to population pressure and economic growth. However the growth in public expenditure is most significant during the period 1991 to 1993 when total expenditure almost tripled (198, 6 billion dinars in 1993 compared 56, 6 billion dinars in 1990). During this period the Country went through an economic breakdown aftermath the first oil shock in 1986 and in order to finance domestic public debt, the government resorted to financial

repression policy by printing of money and heavy borrowing from the money market. The up short of this action by the government was a huge inflation, heavy budget deficit, and exchange rate fluctuation. Therefore, the structural change in 1994 was launched mainly on the functioning of the national financial system. Broader financial reforms have been reflected in the declining share of public expenditures in GDP, which rose from 40% in 1993 to 32% in 1997. From the 2000s, the oil prices rise; consequently, public authorities are abandoning the financial reforms policy and resuming the financial repression policy. As a result, real public expenditure increases from 500 billion dinars in 2000 to 1 746, 9 billion dinars in 2008, i.e. a variation in the share in GDP of 29.5% and 42.3% respectively. The huge expenditure increase in recent times arose from increased wage bills following review of civil servant salaries, social and economic plans to combating unemployment, servicing of domestic debts, increase in the imports as part of the economic integration policy. Equally, revenues have tended to grow with time but at a lower rate than corresponding expenditures, giving rise to generally persistent fiscal deficits. Revenue grew significantly between 1980 and 1993, but a slow growth was experienced between 1995 and 1999 despite the introduction of income tax, and returns to its initial level from 2000s. The growth in revenue is mainly attributable to increased petroleum taxation and non-tax revenues generated from financial repression (11.03% of total revenue). Real spending grew faster between 2000 and 2015 than in the first two decades 1980-1999. Recent spending growth is particularly remarkable as 36 consecutive years of real GDP growth.

In the current environment, the government's resource-based costs of the economy are significantly higher than in previous periods despite the orientation of these resources to inactive capital. Resources are covered by half of the implicit non-tax revenue.

3. Empirical analysis

3.1 Public expenditure determination

The expenditure is mounting rapidly owing to the influence of various socio-economic factors. Hence, an attempt has been made in this paper to identify a group of variables influencing public expenditures. The determinant variables considered for this analysis are:

3.1.1 Gross Domestic Product

The economic growth of states in terms of GDP significantly influences the growth of public expenditure. In addition, it influences the model and the allocation of resources between different sectors.

3.1.2 Public Debt

The States borrow mainly for the purpose of financing development programmes on capital account such as the development of agriculture, industries and allied services owing to the mounting obligations and debt servicing charges, it influences negatively certain items of expenditure.

3.1.3 Financial repression level

Developing countries are focusing on a policy of financial repression to reap additional benefits on the one hand and to lower the cost of debt on the other. This policy has an influence on the economic structure of expenditure therefore, on the

total public expenditure by increasing or decreasing them according to the repressive level of the financial system opted.

3.1.4 Urban population

Increased urbanisation is an important cause of rising public expenditure. The increased demand for economic and social services such as water supply, traffic service and control, public protection, and of health and sanitation results in an increased outlay of state governments.

3.1.5 Unemployment

The unemployment rate has a positive relationship with expenditures because they correlate with economic development which in turn drives demand for higher development Commercial opening.

3.1.6 Trade openness

It is related to different elements such as terms of trade, imports and exports as well as the liberalization or repression level of financial system. This can negatively or positively influence expenses.

3.2 Methodology

This study is based on the function introduced by Okafor and Eiya (2011) in the analysis of determinants of public expenditures in Nigeria:

$$EX = f(INF, POP, DB, UNEMP, TREV)$$

EX: total public expenditures; INF: inflation rate; POP: population growth; DB: public debt; UNEMP: unemployment rate; TREV: tax revenues

However, in a financial repression policy context, such as that of Algeria, inflation rate is involved in financial repression (IRF). Therefore, this model is extended to this study by: - relaying tax revenues by the real gross domestic product (GDP) used by Mosoti (2014); -adding the opening up of trade (OPEN) and a dummy variable (BREAK). This latter is employed to determine structural breaks (Perron and Kim, 2006). For this, we estimate an AR (1) model for the EX variable in its own offset. Repeated points are tested using the Bai and Perron test (2003) which determines the breaks sequentially. The dummy variable takes the value 1 if there is a significant structural break and 0 for alternative. Following the political and security crises, Algeria has been marked by the rural crawling phenomenon, which encourages the replacement of the population density growth variable by the urban population variable (POP).

The function of our study is restored as follows:

$$EX = f(IRF, DB, GDP, OPEN, POP, UNEMP, BREAK)$$

The study by Okafor and Eiya (2011) was developed by Mosoti (2014) to analyse the determinants of public expenditure in the case of Kenya, and was based on Johansen co-integration tests. For a simple estimate there are econometric problems, which we must take into account to properly identify the determinants of public spending. The major empirical problem to be considered is the order of integration and which is often neglected by empirical analysis. Therefore, the evaluation of long-term determinants in this study is based on the ARDL

cointegration approach. The first step attempts to estimate the unrestricted basic error model (UECM):

$$\Delta \ln EX_t = a + \sum_{i=1}^p b_i \Delta \ln EX_{t-i} + \sum_{i=0}^{q_1} c_i \Delta \ln IRF_{t-i} + \sum_{i=0}^{q_2} d_i \Delta \ln OPEN_{t-i} + \sum_{i=0}^{q_3} e_i \Delta \ln DB_{t-i} + \sum_{i=0}^{q_4} f_i \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_5} j_i \Delta \ln POP_{t-i} + \sum_{i=0}^{q_6} h_i \Delta \ln UNEMP_{t-i} + \sum_{i=0}^{q_7} i_i \Delta \ln Break_{t-i} + \alpha_i EX_{t-1} + \beta_i IRF_{t-i} + \gamma_i OPEN_{t-i} + \delta_i DB_{t-i} + \theta_i GDP_{t-i} + \vartheta_i POP_{t-i} + \mu_i UNEMP_{t-i} + \phi_i Break_{t-i} + \varepsilon_t$$

Δ : difference operator; a : derivative component; p and q are lags optimal, selected by Akaike (AIC) criteria. The model above is estimated sequentially for the orders of $p = (0, 1, 2, 3, 4)$. $i = (0, 1, 2, 3, 4, 5)$ $t = (1 \dots 36)$. ε_t white noise; $b, c, d, e, f, j, \alpha, \beta, \gamma, \delta, \theta, \mu, \phi$ are short-term and long-term coefficients dynamics respectively. This estimate is based on Pesaran and Shin's (1995) bound test, whose null hypothesis postulates the non-existence of a long-term relationship between public expenditures and explanatory variables. On the basis of the F statistic, if the cointegration relationship is significant, it means the existence of equilibrium Error Correction Model (ECM), its usefulness is to estimate the dynamics of the parameters in the short term in the second step.

$$\Delta \ln EX_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta \ln EX_{t-i} + \sum_{i=0}^{q_1} \alpha_2 \Delta \ln IRF_{t-i} + \sum_{i=0}^{q_2} \alpha_3 \Delta \ln OPEN_{t-i} + \sum_{i=0}^{q_3} \alpha_4 \Delta \ln DB_{t-i} + \sum_{i=0}^{q_4} \alpha_5 \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_5} \alpha_6 \Delta \ln POP_{t-i} + \sum_{i=0}^{q_6} \alpha_7 \Delta \ln UNEMP_{t-i} + \sum_{i=0}^{q_7} \alpha_8 \Delta \ln Break_{t-i} + \pi ECT_{t-1} + \varepsilon_t$$

α_i are the coefficients of the short-term dynamics; ECT_{t-1} is lagged error correction term that must be negative; π coefficient of ECT, represents the speed of adjustment at which equilibrium is restored. The third step is to test the causality. The causality test is among the statistical techniques elected robust in determining factors that influence the public spending. In 1993, Henrekson tests cointegration in using the Engel and Granger approach in two steps, conducts the causality test between public expenditure and gross domestic product, in the error correction model to identify variables endogenous and exogenous. If income causes spending in one direction it means that Wagner's law is true for any economy. For this study, the Granger non-causality test is feasible in a short-term VAR approach. The long-term causality is spotted by Wald's test in the ARDL cointegration context. A significant F statistic implies the rejection of the null hypothesis of the regressors' nullity, thus reflecting in long-term causality from all the explanatory variables towards the dependent variable.

4. Empirical results

4.1 Unit roots tests

The first step is to analyse the stationarity of the variables using the Augmented Dickey-Fuller (ADF) test and the (KPSS) tests. The results are presented in table 1.

Analysis of stationarity using first-generation "Dickey-fuller" test and the "KPSS" test indicates that the series are not stationary at the same level. The ADF test shows that the "EX" variable has a unit root, while the KPSS test indicates that it is stationary. Since EX is a series with stochastic tendency, the performance of a parametric test such as the ADF is sensitive to the model in which it is framed. However, it is much more difficult than one would think to disentangle the natural variation of the EX process which is volatile compared to breaks in particular

(Hunter, 2005). Because KPSS is stationary, the numerator of the test statistic includes cu-squared residuals. The statistic is consistent when scaled by a long term variability proprietary measure and refers to a residual which, in the simplest form of the test, simply corrects the mean (Hadri, 2000). The EX variable is integrated of order 0. According to the ADF test and the KPSS test, the DB variable is also stationary at the level. On the other hand, the two tests indicate that the remainder of variables, GDP, IRF, OPEN, POP, UNEMP are I (1).

Table 1. Unit root tests

Variables	ADF		KPSS		Decision at 5%
	Level	Difference	Level	Difference	
<i>lnEX</i>	-2.199	-5.655*	0.095**	-	I(0)
<i>lnGDP</i>	-0.199	-5.685*	0.158	0.128**	I(1)
<i>lnDB</i>	-5.012*	-	0.066**	-	I(0)
<i>lnIRF</i>	-2.157	-7.150*	0.162	0.107**	I(1)
<i>lnOPEN</i>	-3.100	-5.494*	0.150	0.102**	I(1)
<i>lnPOP</i>	1.879	-5.252*	0.224	0.124**	I(1)
<i>lnUNEMP</i>	-1.172	-5.583*	0.166	0.076**	I(1)

*The null hypothesis of stationarity is rejected at the 5% level. ** The null hypothesis of stationarity cannot be rejected at the 5% level.

The ZA test is also applied to testing the stationarity of the variables. It is applied to first check whether they are stationary in the presence of a structural break, and then whether the endogeneity of these variables coincides with the country's macroeconomic shocks. The results are shown in table.2.

Table.2 Zivot Andrews test results

Variables	Year of rupture	t-statistic		Break macroeconomics Correspondence
		Level	Difference	
<i>lnEX</i>	1991	-5.502*	-	Beginning of the backdrop and economic crisis after the first oil shock (1986)
<i>lnIRF</i>	1991	-4.146	-7.350*	Domestic financial system crisis and beginning of the financial reforms
<i>lnOPEN</i>	2009	-4.511	-7.011*	Financial crisis (2008)
<i>lnGDP</i>	2000	-2.933	-8.714*	The oil counter-shock from the year 1999.
<i>lnDB</i>	1991	-5.768*	-	Domestic financial system crisis and beginning of the financial reforms
<i>lnUNEMP</i>	2004	-3.574	-5.902*	Support plan for economic recovery : 2001-2004
<i>lnPOP</i>	1996	-0.928	-8.281*	Security crises and Political instability

*The null hypothesis of the existence of a unit root in the presence of the break at the 5% level is rejected. The critical value at the 5 percent level is -5.08 for the statistic of ZA test (Zivot and Andrews, 1992). Source: Eviews.9

The EX, DB variables are stationary at level in the presence of the structural break. While the OPEN, GDP, POP, UNEMP, IRF variables are stationary in first difference. The years of structural breaks are: 1991, 1996, 2000, 2004, and 2009. Regarding the properties of the series studied, it is interesting to note that the most

significant structural breaks determined endogenously for these variables correspond closely to the country's macroeconomic breaks.

4.3 Bound test

To perform the bounds test, it is necessary to specify an unrestricted general ARDL model and then select the reduced form while respecting the criteria of no autocorrelation, the normality and the absence of ARCH effect.

Table 3. Selection of optimal model

Model	AIC	Autocorrelation	ARCH	Normality
ARDL ₁ (p=q=1)	-0.3065	Yes	Not	Yes
ARDL ₂ (p=q=2)	-0.6359	Not	Not	Yes
ARDL ₃ (p=q=3)	-2.6537	Not	Not	Yes

Source: Established by the author from the results of evIEWS.9

From the table 3, the optimal model is ARDL₃ since it corresponds to the lowest level of AIC criteria.

Table 4. Diagnostic tests results

Model Specification	(3.3.3.3.2.3.3)	Diagnostic Tests	F-statistic	Probability
Adjusted R-squared	91	Breusch-Godfrey Serial Correlation LM test	0.021	0.719
F-statistic	12.62	Ramsey RESET test	0.909	0.41
Prob (F-statistic)	0.011	Heteroscedasticity test ARCH	1.344	0.241
Durbin-Watson	2.10	Jarque-Bera test (χ^2 P)	3.428	0.18

Source: Computed by the author from EvIEWS

The null hypothesis of no cointegration is then tested. The results are shown in the following table.5.

Table 5. Bounds test

F-statistic	9.417			
Critical values of the upper bound	3.23*	3.61**	3.99***	4.43****

*, **, ***, **** Denotes the significant level at 10%, 5%, 2.5%, 1% respectively (Narayan, 2004). The cointegration test within the bound involves comparing the F and t statistics against the critical values of F and t for the ARDL approach.

The calculated F statistic is greater than the critical values of the upper bound. The null hypothesis of no cointegration can be rejected. When the public expenditure variable EX is the dependent variable, the critical values for each lags are lower than F-statistic. The results of the bounds test confirm the existence of a long-term relationship between the EX variable and the independent variables. The estimation of the model's long-run coefficients is presented in table 6. The coefficients of the long-term relationship are significant for the GDP, IRF, DB, POP and BREAK but not significant for the UNEMP and OPEN. In the long run, financial repression, public debt and the urban population have a significant negative impact on public

expenditures. GDP and BREAK variables have a significant positive impact on public expenditures. The ECT coefficient is negative (-0.75) and statistically significant at the 5 percent threshold. This indicates that all variables contribute 75% for that public expenditure to return to the long run equilibrium level.

Table 6. Long-term coefficients

Variables	GDP	OPEN	IRF	DB	POP	UNEMP	BREAK
Coefficient	-0.94*	0.23	-0.92*	-0.49*	-0.6*	0.38	-0.38*
t-statistic	-4.51	0.63	-2.83	-5.49	-6.05	1.31	-2.86

* Denotes the significant level at 5%. Source: evIEWS.9

We obtain the short term dynamic of parameters by estimating an error correction model associated with the long-term estimate.

Table 7. Short-term coefficients

Variables	GDP	OPEN	IRF	DB	POP	UNEMP	BREAK
Coefficients	0.31*	-0.82*	0.89*	-0.93	-0.22*	0.22	-0.93*
t-statistic	3.29	-2.83	3.66	-4.71	-4.98	1.04	-4.46

* Denotes the significant level at 5%

4.4 Causality tests

The non-causality test in Granger's sense identifies a short-term causal relationship between the cointegrated variables. The F statistics on the explanatory variables suggest that at the 5 percent level, the existence of unidirectional causality for all variables. The results are reported in Table.8

In the short term, the causal path seems clearly defined, allowing us to switch to the Wald test to test long-term causality. Using the long-term ARDL mechanism, the Wald test shows that the calculated F statistic is associated with a probability value of 0.007, meaning that we can reject the null hypothesis of non-causality in the long run, all the explanatory variables notably the error correction term cause the EX variable.

Table 8. Granger causality test

	F-statistic								Causality orientation
	EX	GDP	IRF	DB	POP	UNEMP	OPEN	BREAK	
EX	-	2.07	0.18	1.47	1.08	0.45	0.65	1.92	No causal relationship
GDP	2.98*	-	0.05	0.48	0.25	1.29	3.62*	0.37	GDP → OPEN GDP → EX
IRF	8.64*	0.38	-	6.23*	0.07	3.75*	0.32	3.03	IRF → EX IRF → DB IRF → UNEMP
DB	0.66	0.62	0.26	-	0.15	0.04	0.80	2.79*	DB → BREAK
POP	2.97*	1.40	0.85	1.06	-	0.21	0.64	0.64	POP → EX
UNEMP	0.41	0.50	0.08	0.37	3.03*	-	1.65	0.06	UNEMP → POP
OPEN	4.37*	1.43	0.50	0.70	0.24	3.62*	-	1.68	OPEN → EX OPEN → UNEMP
BREAK	2.82*	3.90*	0.66	1.09	0.18	0.61	0.17	-	BREAK → EX BREAK → GDP

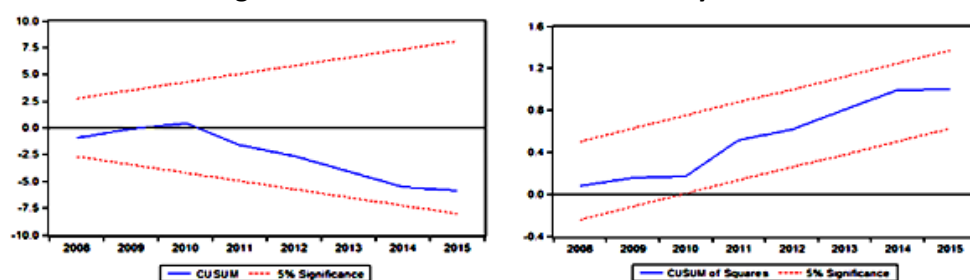
* The null hypothesis of non causality is rejected at 5%. Computed by the author from EvIEWS

Table 9. Wald test

Tests	Value	df	Probability
F-statistic	4.805	(8,4)	0.0073*
Chi-square	38.442	8	0.0000*

* The null hypothesis of the regressors nullity is rejected at the 5% level.

As suggested by Pesaran (1997), the cumulative sum of recursive residues (CUSUM) and the CUSUM of square (CUSUMSQ) tests proposed by Brown et al (1975) can be applied to the residuals of the estimated error correction models to test the constancy of the parameters (Figure.2)

Figure 2. CUSUM and CUSUMSQ stability tests

Source : Eviews.9

4.5 Discussion of the Results

The estimation and short-term causality results show that the Financial Repression Index has a positive effect on public expenditure, suggesting that repressive financial policies positively influence spending programs. In Algeria, this is explained by the intervention of the public authorities in the financing of the banking size deficit, generated by the gap between the borrow interest rates and the loan interest rates. In addition, the financing is stimulated thanks to the implicit taxes generated by the financial repression policy. This is in accordance with the financial repression theory (Giovannini and De Melo, 1991). In the long run, total public expenditure is a decreasing function of the financial repression index. Indeed, the low rates favour private investment, thus causing the government disengagement in terms of capital expenditure. Public debt negatively affects public spending. In effect, in a context of financial repression, the public debt becomes unsustainable; this leads public authorities to reduce public expenditure. Unidirectional causality from Gross Domestic Product to public expenditure is attested by Wagner. In the short term, the income growth leads to an increase in consumption and productivity simultaneously. After the reach critical levels, the consumption and productivity decrease because of rising prices. As a result, declining economic growth requires state intervention in economic activity by increasing public expenditures (Keynes, 1936, Peden and Bradley, 1989). Trade opening has a negative effect on public spending, significant only in short term. In the economic literature, the expansion of trade has the effect of reducing imports of the state into the country. This policy releases the government and leads to lower public spending. Moreover, international integration implies tax competition and for this reason the government have not the ability to increase revenues, especially the capital tax, so that the public sector size is also restricted (Ferris et al. West,

1996). The urban population has a negative effect on public spending in the short and long term. This result highlights the current situation in Algeria. The concentration of population in the city centre limits state intervention in terms public spending in rural areas. In other words, the urbanization leads the government to desertification of rural areas. The unemployment rate is globally significant in the model. We would have chosen to exclude it, but according to the Granger causality test results which show that financial repression causes unemployment, the variable was retained in the model for the interpretation of the results. Indeed, the fall in interest rates leads to a fall in the cost of capital, which encourages private investment and therefore reduces unemployment (Xua and Gui, 2013). A financial repression shock negatively affects the level of expenditure in reason of the financial reforms introduced, which leads to the decrease of non-tax revenues.

5. Conclusion

The aim of this paper is to find the determinants of public expenditure of Algerian State in the short term and long term. The empirical evaluation for the period 1980-2015 in an ARDL cointegration approach allows drawing two main results: (i) The public expenditure are determined mainly by the financial repression level, the Gross Domestic Product, trade openness, public debt as well as the urban population. This study highlights political implications, in particular the contributions of Algerian state decision-makers, since a shock to the financial system is essentially focused on the interest rate, the only instrument that links the two spheres, public finances and the financial system. (ii) Empirical analysis reveals that the unemployment do not directly impact on public expenditure level. But rather it's the State intervention by financial system which reduces unemployment. This intervention is manifested by subsidised rates applied to investment credits for the fight against unemployment. Among the supports programs, we mentions specially: CNAC (National Fund for Unemployment Insurance); ANGEM (National Micro-Credit Management Agency); ANSEJ (National Agency for Support to Youth Employment). Although this research has shown the impact of the financial system's policy on public spending in a developing economy such as Algeria. This study could be extended with new elements of research, which attempt to explain the effect of the structure of the financial system on the distribution of the state budget.

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APPENDIX

Table -A- Description of the Variables

	Mean	Std.dev	Min	Max	Data source
EX	833955	1033736	18347	3692413	(10 ⁶ DA) At constant price (100=1980) from Algerian Ministry of Finance data «Statistical retrospective 1963 – 2015».
IRF	72,57	1,32	55,84	86,24	Calculated by the author
GDP	2144287	2352167	67739	7171779	(10 ⁶ DA) At constant price (100=1980) from Algerian Ministry of Finance data «Statistical retrospective 1963 – 2015». DGPP, 2016.
OPEN	25,83	0,64	18,41	35,95	(%). IMF Government Finance Statistics (GFS).2016
UNEMP	18,48	1,03	9	29,8	(% Labour force). IMF Government Finance Statistics (GFS). 2016
DB	296410	183914	53520	741806	(10 ⁶ DA) At constant price (100=1980) from Algerian Ministry of Finance data « Statistical retrospective 1963 – 2015 ».
POP	42,19	1,38	28	56,46	(% total population). IMF Government Finance Statistics (GFS).2016

Financial repression index

The measure of the degree of financial repression is marked in economic theory by the method of Beim and Colominos (2001). They quantified a composite index based on the consolidation of financial repression instruments. They introduced the monetary and financial variables in order to take into account all the governmental restrictions imposed on the financial markets. They defined the financial repression index (IRF) by estimating the following relation:

$$IRF_{it} = a + 50 * FR_{it} ; FR_{it} = INT_{it} - GOV_{it} ; INT_{it} = M2_{it} / GDP_{it} ;$$

$$a = 50 - b(\text{Mean}(FR_{it})) ; b = 20 / \text{sd}(FR_{it}), \text{sd is the standard deviation}$$

$IRF_{it} = RR_{it} + GOV_{it} - RIR_{it} - INT_{it}$. ; FRI parameter has a normal distribution with a mean of 50 and a standard deviation of 20. RR: reserve requirement ratio. RIR: real interest rate. GOV: share of public borrowing in commercial banks compared to private borrowing near commercial banks. INT: Monetary masses share in Gross Domestic Product: M2/GDP. The index takes the value 0 if the financial repression is weak and 100 for its alternative.

Table –B- Bai-Perron test

Multiple breakpoint tests			
Bai-Perron tests of L+1 vs. L sequentially determined breaks			
Date: 02/05/18 Time: 00:12			
Sample: 1980 2015			
Included observations: 35			
Breaking variables: C EX(-1)			
Break test options: Trimming 0.15, Max. breaks 5, Sig. level 0.05			
Sequential F-statistic determined breaks:			1
Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	14.56889	29.13779	11.47
1 vs. 2	3.573677	7.147355	12.95
* Significant at the 0.05 level.			
** Bai-Perron (Econometric Journal, 2003) critical values.			
Break dates:			
	Sequential	Repartition	
1	1991	1991	

Figure-A- Zivot-Andrew Breakpoints test

