Can be Explained the Moroccan Growth of Public Spending by the Demand Approach?

El Mustapha Kchirid

Professor de Cadi Ayyad University - Marrakech

Lakhdar Adouka

Professor Mascara University

Aissa Darraji

Professor Khémis-Miliana University

Mohamed Kerbouche

Professor Mascara University

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Abstract *The objective of this paper is to explain the growth of public spending by the approach of the demand for public goods in Morocco from 1970 to 2010, to test the veracity of Wagner's law for the Moroccan economy by an approach demand, to verify the positive effect between the share of public expenditure to GDP ratio and the following variables: the per capita income, population, urbanization, degree of economic openness, the effect of Baumol and macroeconomic stability. We concluded from our study that Wagner's law holds for the Moroccan economy. Our model confirms the positive effect between the share of public expenditure to GDP ratio and the following explanatory variables: per capita income, the degree of economic openness, the effect of macroeconomic stability and the effect of Baumol ..We also concluded from our study that there is a feedback relationship between public spending and per capita income using the Granger causality test.*

Keywords: *Wagner law, government spending, growth, stationarity, VECM*

1. Introduction

Until around 1960, government spending was a relatively neglected area of the Survey of public finances. Since then, considerable attention is paid to different aspects of public spending in trying to redress the imbalance resulting from the emphasis in the past on the role of taxation in the economy. This is how many ideas were put forward to explain the growth of public spending. Lying in a perspective of supply and demand, not from a historical perspective, some authors have explained the growth of public expenditure by economic agents demand for public goods. Others argue instead that the idea that public spending growth is due to the level of supply of public resources. The fact that there is not a market where demand for public goods and the provision of public resources are found, some more recent authors hypothesize to use the approach where the imbalance of supply and demand adjust themselves at the same time and the level of public spending are situated either on supply or on demand. It appears essential in this paper to focus on explaining the growth of public spending by the approach of demand of economic agents in Morocco during the period 1970 to 2010. For this purpose, in this work we asked the follows recurring question:

Can be explained the growth of public spending by the approach of demand?
This main question is divided to the auxiliary questions:
Is that Wagner's law holds for the Moroccan economy?
What are the determinants of demand function?
Public spending stimulates economic activity?
What are the income effect and the productivity effect on growth of public spending?

The objective of this paper is to explain the growth of public spending by the approach of the demand for public goods in Morocco from 1970 to 2010, to test the veracity of Wagner's law for the Moroccan economy.

To achieve our objective, the paper was organized into three sections. The first is a brief presentation of the model of the demand approach; the second section focuses on macroeconomic indicators that are used in this model. Finally, in the third section, we try applying empirical and econometric analysis of this model to the Moroccan economy.

2. The theoretical framework of the model

The growth in public spending are explained either by the approach of the demand, either by the approach of the supply.
In the first approach the growth of public spending is explained by:
Wagner's law (1909),
the median voter theorem of Black (1948)
the median voter theorem of Meltzer and Richard (1981, 1983)
Theorem redistribution of income to interest groups of Buchanan and Tullock (1962).
In the second approach, the growth of public spending is explained by:
The difference in productivity (Baumol's thesis)
The displacement effect (Peacock and Wiseman)
The elements of the theory of bureaucracy (Niskanen) (1971)
The demand approach is inspired by the work of economist Adolf Wagner (1835-1917) who formulated a law that links public spending and economic growth "law of increasing expansion of public activity."
Wagner's hypothesis stipulates a relationship between the public sector development and the level of economic development.
Referring to the study of Romuald sostaine, we can see five versions of Wagner's law and that several researchers have interpreted on their own way after they have tested theme empirically:
public expenditure should grow faster than GNP in the growing economies, the ratio of public consumption / national income rises.
For a country facing growth accompanied by development, the public sector activities are increasing at a rate which, when converted to costs, must exceed the growth rate of GNP per capita.
there would be a rise from the ratio of government expenditure / GDP when a country moves from low to high levels of per capita income the per person number of government employees increases with per capita income
Empirically Wagner's law has been verified and validated in two ways:
By the elasticity of public spending over the level of economic development.
By examining the temporal relationship between public sector size and income using the techniques of time series using the Granger causality
The formulation most commonly used for empirical testing of Wagner's law is that given by the model of Musgrave (1969). The latter is written as follows:

$$G_t = \alpha + \beta \, Y_t + \varepsilon_t \qquad (1)$$

With:
G : denotes government spending relative to GDP in real terms
Y : denotes per capita GDP in real terms
According to Musgrave, it is necessary that the income elasticity is positive when Wagner's law is verified.
Empirical, verification of this law can also be done by the approach in terms of Granger causality. This approach examines the reciprocal relationship between public spending and economic growth.
The mathematical representation of Wagner's law by adopting an approach in terms of Granger causality is as follows:

$$G_t = \sum_{i=1}^{k} \alpha_i G_{t-1} + \sum_{i=1}^{k} \beta_i Y_{t-1} + \varepsilon_t$$
$$Y_t = \sum_{i=1}^{k} \alpha_i Y_{t-1} + \sum_{i=1}^{k} \beta_i G_{t-1} + u_t \qquad (2)$$

Referring to the study of Elkhider and al, we discuss in this section a different version under consideration of the validity of Wagner's law. This version has focused on the aspect disaggregated (by industry) in public spending and its effects on economic growth using two models:
The first type of model is concerned about the efficiency of public spending on health and education, by adopting the following formulation:

$$S_t = C + \beta_1 \, G_t(0) + \beta_2 \, E_t + \beta_3 \, H_t + v_t \qquad (1)$$

With:
S : Represents the social indicators
G : Represents the initial level of development
E : Represents the public expenditure on education
H : Represents the expenditure of health

The second model examines the link between public capital and economic growth. This model is written as a function of Cobb-Douglass type as follows:

$$Y_t = K_t^{\alpha} K_t^{'\beta} \; H^{\tau} DO^{\lambda} IP^{\upsilon} \qquad (2)$$

With:
Y : Is the GDP K : Is the public capital
K' : Is the public-private capital H : Represents the human capital
DO : represents the degree of openness
IP : the index of total factor productivity in the U.S.

Empirical application of the model

3.1 Model Specification

In this study, we will explain the underlying growth of public spending in Morocco between 1970 and 2010 by a demand model of economic agents; the model can be written as follows:

$$DP_t = \alpha_0 + \alpha_1 U_t + \alpha_2 \log P_t + \alpha_3 Y_t + \alpha_4 RID_t + \alpha_5 DO_t + \alpha_6 D_t + \varepsilon_t \qquad (3)$$

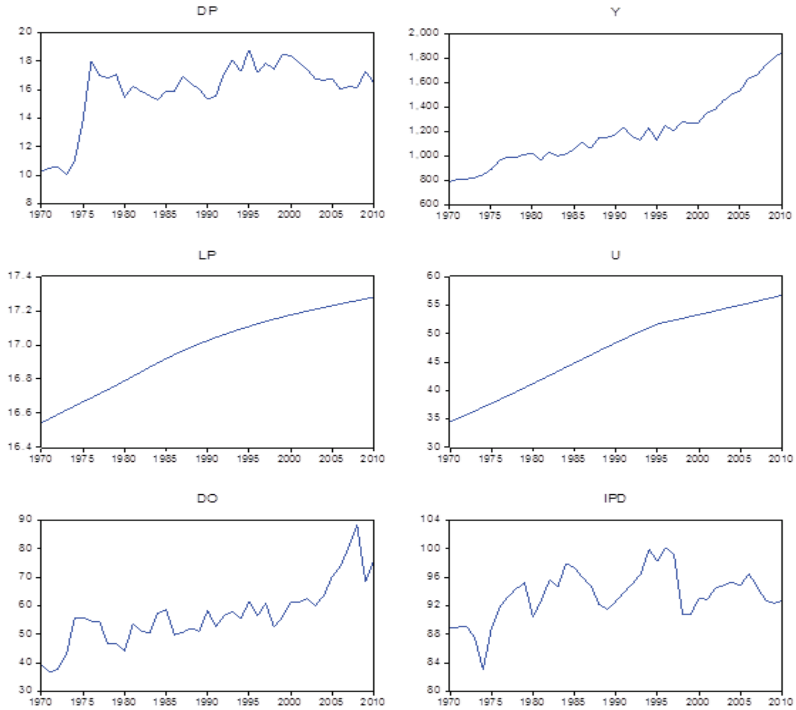
With:
DP: Share of total expenditure in GDP
U: the proportion of urban population in total population
P: the total population
Y: real per capita income at constant prices
RID: the relationship between the index of consumer prices and the GDP deflator
DO: the degree of openness
D: Dummy variable represents macroeconomic stability

We expect a positive sign for all coefficients of the model:
A positive sign for the first three variables (U, Y and LOG(P)) because they positively influence the demand for public spending. The population increase has a positive effect on demand for goods provided by government.
We expect a positive sign for the deflated price index (RID), this variable reflects the effect of Baumol. This indicates that there is an increase in the relative price of public good with an inelastic demand to price
The degree of openness (DO) in the economy represents the distribution of income to pressure groups; we also expect a positive sign.

3.2 The statistical data

We wish to estimate, in the case of the Moroccan economy, equation (3) on a sample of annual data covering the period 1970 -2010. Data are from International Financial Statistics of IMF, WDI : World Bank.
The graphs of six variables (the ratio of public expenditure, the proportion of urban population in total population, total population, the per capita GDP, the index of consumer prices deflated and degree of openness are given below) show the presence of a trend for each variable. This makes the stationarity of the series in question.

Graph 1: the evolution of the variables of interest



3.3 Testing of unit root

There are many unit root tests. The pioneering work in this area are those of Fuller (1976) and Dickey and Fuller (1979.1980). The Dickey-Fuller tests are parametric, this tests highlight the character of a stationary or not of a chronic with identifing ,a deterministic trend or stochastic . These tests are based on an estimate of an autoregressive process. Dickey and Fuller consider three basic models for the series:

Model (1) model without constant or deterministic trend

$$X_t = \rho X_{t-1} + \varepsilon_t$$

Model (2): model with constant and non-trend

$$X_t = \rho X_{t-1} + b + \varepsilon_t$$

Model (3): model with constant and trend

$$X_t = \rho X_{t-1} + at + b + \varepsilon_t$$

In all three models, we assume that $\varepsilon_t \longrightarrow BB(0, \sigma_\varepsilon^2)$

The test principle is:

$H_0 : \rho = 1$: Presence of a unit root; the series is non-stationary

$H_0 : |\rho| < 1$ Absence of unit root; the series is stationary

If $H_0 : \rho = 1$ is accepted in one of these three models, then the process is non-stationary.

The test strategy is sequential; we start from the model (3) to the model (1).

In our study we will apply the ADF test and we determined the number of lags using partial autocorrelation function . The application of this method based on the study of correllogramme for different variables in equation(3), we obtained the lags for all variables.

After we determined the lags for each variable, we adopted the strategy of sequential ADF test to examine the stationarity of the study variables. The following table summarizes our application:

Table 1: Augmented Dickey-Fuller Test

variables	Lag	ADF	Order of integration
DP_t dDP_t	1 1	0.52 -5.83	I(1) I(0)
LP_t	1	-4.41	I(0)
U_t dU_t d^2U_t	1 1 1	-0.11 -1.01 -6.08	I(1) I(1) I(0)
Y_t dY_t	1 1	5.29 -2.47	I(1) I(0)
DO_t dDO_t	1 1	0.64 -7.92	I(1) I(0)
D_t dD_t	1 1	-1.51 -6.62	I(1) I(0)
RID_t $dRID_t$	1 1	0.14 -6.09	I(1) I(0)

By comparing the ADF statistic (Table 1) with the critical value of ADF for a significance level of 5%. This comparison shows that the null hypothesis of nonstationarity is accepted for the variables in level (government spending, GDP per capita, the degree of economic openness, the index of consumer prices deflated and macroeconomic stability and urbanization), by cons we see that the hypothesis null is rejected for the same variables in first differences (Table 1) except for urbanization. The series (DP_t, Y_t, RID_t , DO_t, DA_t) are then integrated of order 1, since the first difference of each of these variables is stationary I (0).

We also see from Table 1 that the hypothesis is rejected for the variable in level (total population) at a significance level of 5%. Hence the variable is stationary and is then integrated of order 0. We see from Table 1 that the urbanization variable is integrated of order 2. The variables total population and the proportion of urban population relative to the total population will be eliminated from our study because they do not fulfilled the conditions of application of error correction models (ECM)

3.4 Cointegration tests

We recall, for a long term relationship between several variables, two conditions must be met; first the variables must be non-stationary and integrated into the same order. Secondly their stochastic trends must be linked.

The ADF tests suggest therefore assume the existence, of a cointegration relation between government spending, GDP per capita, the Degree of economic openness, the index of consumer prices deflated and macroeconomic stability.

To investigate the existence of a long-term relationship between the variables in the model, we applied two methods:

the general method of maximum likelihood (Johansen, 1988, 1991, Johansen and Jueslius, 1990).

The two-step method of Engle and Granger (1978)

3.4.1 The Johansen test

The applied of the trace test, we can detect the number of cointegration vectors. The hypothesis of this test is:

H_0 : There are at most r cointegrations vectors

H_1 : There are at least r cointégations vectors

When the statistical Trace is below the critical values at a significance level, we accept H_0 ; otherwise we reject H_0 .
This test is applied sequentially from r = 0 to r = k-1.

Table 2. The Johansen Test

Eigen values	Likelihood ratio (trace statistic)	critical value	Hypothesis on the number of EC
0,55	76,5	69,81	None
0,31	44,53	47,85	At least one
0,31	29,58	29,79	At least two
0,26	15 ,10	15,49	At least three
0 ,07	2,92	3,84	At least four

First we test the hypothesis that the number of cointegration vectors is strictly zero (r = 0) (column Likelhood ratio,Table 2 We note that the statistics of the Trace for r = 0 (76.5) is greater than the critical value (69.81), which leads us to reject H_0.

We then test the hypothesis that the number of cointegration vectors is strictly equal to one (r = 1). Statistics of Trace for r = 1 (44.53) is lower than the critical value (47.85), which brings us therefore to accept H_0.

With The tests trace of the Johansen, we conclude that there is a cointegration relationship between the five variables.

3.4.2 Application method of Engle and Granger

The notion of cointegration assumes that if two variables X and Y are integrated of order one (I (1)), and there exist a stationary linear combination of these variables I (0), then one can conclude that X and Y are cointegrated of order (1,1). We have already shown that the series are nonstationary and integrated of the same order. It remains, then, to test if the residual of this linear combination is stationary. In the case where, the deviations from the equilibrium value tend to cancel in time then, a long-term relationship exists between the variables.
We estimate in a first stage, with OLS, the long-term relationship:

$$DP_t = -19,88 + 0.02DO1_t + 0,002Y_t + 0,34RID_t + 0,38DA_t + \varepsilon \quad (4)$$

We deduced from the estimate of the relationship(4):

-If the residues are non-stationary, the estimated relationship of long-term(4) is a spurious regression
-If the residues are stationary, the estimated relationship of long-term (4) is a cointegraton relationship

To test the stationarity of residues, we will use the critical values tabulated by Engle and Yoo (1987) in applying the ADF test
The results from applying the ADF test on residues of the relationship between public spending and GDP per capita, the degree of economic openness, the index of consumer prices deflated and macroeconomic stability; given in Annex.
It is found that the estimated ADF statistic (-3.12) is less than the tabular value of Engle and Yoo at the 5% (-2.67), this allows us to reject the hypothesis of non stationarity of residues, where the residuals from the relationship between public spending, GDP per capita, the degree of economic openness, the index of consumer prices deflated and macroeconomic stability are stationary. Therefore, the variables public expenditure and GDP per capita, the degree of economic openness, the index of consumer prices deflated and macroeconomic stability are cointegrated. It is then possible to estimate the error correction model.

3.5 Estimation of ECM

After we examined the stationarity of the series and cointegration among the variables, we turn to the estimation stage of the model coefficients, but prior to this step, we must verify that the single cointegration relationship is an equation of public spending and thus the other variables are weakly exogenous. For this purpose, we performed a simple test for exogeneity from the estimated VECM model using the Johansen method. This test is carried out through adjustment coefficient associated with the cointegration vectors.

From Table of VECM (Table 4 In annex), we find that the adjustment parameters associated with the vector cointegration (speed adjustment) are not significant except for the variables index consumer price deflated and economic openness, this allows us to say that the variables GDP per capita and economic stability are weakly exogenous. By the variables against, the index consumer price deflated and economic openness are not weakly exogenous. The weak exogeneity test, we cannot therefore say that the equation (5) above is an equation written in public spending.

By opposite, the index consumer price deflated and economic openness are not weakly exogenous. The weak exogeneity test, say that the equation(3) above, is an equation written in public spending.

After the test of weak exogeneity, we address the step of estimating the parameters of the equation of public spending, according to Engle-Granger (1987) ; the simple method of estimating the long-term relationship between public spending , and the variables GDP per capita, the degree of economic openness, the index of consumer prices deflated and macroeconomic stability is to apply the method of ordinary least squares (OLS) regression to the following:

$$\mathrm{DP_t} = \alpha_0 + \alpha_3 Y_t + \alpha_4 RID_t + \alpha_5 DO_t + \alpha_6 D_t + \varepsilon_t \quad (5)$$

With $\alpha_0, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ represent the long-term coefficients

The estimated parameters of equation (5) by OLS are biased and super convergent because the variables are cointegrated (Davidson and Mackinnon, 1993). To improve estimates, we apply the correction of Stock and Watson (1988); equation (5) becomes:

$$\mathrm{DP_t} = \alpha_0 + \alpha_3 Y_t + \alpha_4 RID_t + \alpha_5 DO_t + \alpha_6 D_t + \sum_{i=-p}^{p} \Delta \mathrm{Y}_{t-i} + \sum_{i=-p}^{p} \Delta RID_{t-i} + \quad (6)$$

$$\sum_{i=-p}^{p} \Delta \mathrm{DO}_{t-i} + \varepsilon_t$$

We estimate the coefficients of the long-term relationship of the equation of public expenditure as follows:

$$\begin{aligned} DP_t &= 15,95 - 0,002Y_t - 1,14RID_t - 0,06DO_t + 0,35DA_t + \\ &0,01\Delta Y_t(+1)0,01\Delta Y_t - 0,001\Delta Y_t(-1) + \\ &0,08\Delta RID_t(-1) + 0,10\Delta RID_t - 0,13RID_t(+1) - \\ &0,19\Delta DO_t(-1) - 0,15\Delta DO_t - 0,09\Delta DO_t(+1) + \varepsilon_t \end{aligned} \quad (7)$$

From Table (2) in annex and according to the test of student; we find that all the coefficients of the differential equation(7) are not significant in level except for the present economic openness.

The study of the relationship of short-term through ECM, allows us to analyze , in one hand, the speed of convergence of real exchange rate towards its equilibrium level of long term and, in other hand, the contribution he contribution of the fundamentals to the short-term dynamics. This brings us to test the significance of the equation parameters following short-term.

$$\Delta \mathrm{DP_t} = \phi z_{t-1} + \sum_{i=0}^{p} a_i \Delta \mathrm{Y}_{t-i} + \sum_{i=0}^{p} \Delta RID_{t-i} + \sum_{i=0}^{p} c_i \Delta \mathrm{DO}_{t-i} + DA_t + \varepsilon_t$$

With

$$Z_{t-1} = \mathrm{DP_{t-1}} - (-19,88 + 0.02\mathrm{DO1_{t-1}} + 0,002Y_{t-1} + 0,34RID_{t-1} + 0,38DA_{t-1} + \varepsilon)$$

With Z_{t-1} is the residual of the cointegration relationship, and the error correction term (the adjustment term).

Model the expenditure based on residues from the previous period, the expenditure of a lag period, the GDP per capita and this lag for a period of economic openness and this lag one period of the index of consumer prices deflated and now lag by a period and macroeconomic stability.

The ECM of the equation of our model by the approach of Granger:

$$\Delta DP_t = 0,46 - 0,33e_{t-1} + 0,24\Delta DP_{t-1} - 0,24DA_t - 0,009\Delta Y_t + 0,16\Delta RID_t - 0,02\Delta DO + \varepsilon_t$$

We find that the coefficient associated with the restoring force is negative (0.33) and significantly different from zero at 5%. There is therefore a mechanism for error correction. This mechanism indicates the convergence of trajectories of the series of public spending towards long-term target. Thus, the impact on public spending of Morocco is correct to 33% by effect of feedback.

The calculation of the duration of convergence can be achieved by the following formula:

$$(1 - \delta) = (1 - |\varphi|)^{\mathrm{T}}$$

With T, φ and δ are respectively the number of years, the error correction coefficient and the percentage of shock. We used the inverse of the coefficient of restoring force to calculate the convergence time and we concluded that: Shock observed during a given year is completely eliminated within three years and three months and a half.

We have found by the table of the ECM Granger approach (Appendix Table 3) that all coefficients of variables that explain the growth of public expenditure are not significant except per capita income and economic openness, this allows us to say that there is no relationship of short term between public expenditure and the index of consumer prices deflated and macroeconomic stability. By cons, i a relationship exists between short-term public spending, GDP per capita and the degree of economic openness.

The method of Johansen (Appendix Table 4), shows that there is not a short-run relationship between public spending and the explanatory variables of our model. We interpret our long-term equation obtained by the OLS:

$$\mathrm{DP_t} = -19,88 + 0.02\mathrm{DO1}_t + 0,002Y_t + 0,34RID_t + 0,38DA_t + \varepsilon$$

We see the Table 1 in annex; that all the coefficients of the equation are not significant at 5%, except the deflated price index is significant and the signs of the coefficients obtained are consistent with economic theory:

The variable GDP per capita has a positive sign (the expected sign is positive) and it is not significant, it allows us to say that our model satisfies the law of Wagner

The openness of the economy, captured in our model by the share of exports and imports in GDP, has a positive influence on public spending but not significant.

The Baumol effect, reflected by the increase in the relative price of public good with an inelastic demand to price, has a positive influence that reflects a positive relationship between public spending and the index of consumer prices deflated. This result is consistent with the theory of Baumol productivity. The Student's test confirms the significance of the coefficient at 5%

To implement the robustness tests on residuals, stability coefficients, we taken the following steps:

i) using the Chow test for testing the stability of the coefficients (equalities between the coefficients). This test can be practiced only after determining the sub-periods.

To this end, we'll take two sub-periods:

First Period: 1970-1986, which 17 observations

Second Period: 1987-2009, which 23 observations.

We recall that this test is based on the following statistic:

$$\mathrm{Chow} = \frac{RSS - RSS_1}{RSS_1}\frac{T_1 + T_2 - 2K}{2K} \rightarrow F(K\ ,\ \mathrm{T}_1 + T_2 - 2K)$$

RSS is the sum of squared residuals for all observations (40 observations), RSS_1 is the sum of squared residuals for the first sub-period and K : the number of variables.

Under H_0 : equal coefficients against H_1 : instability of the coefficients,

The application of this test gives us the following result:

$$\mathrm{Chow}^c = 66,86 > F'(4\ ,\ 32) = 5.74$$

According to the Chow test, we can conclude that the coefficients are unstable.

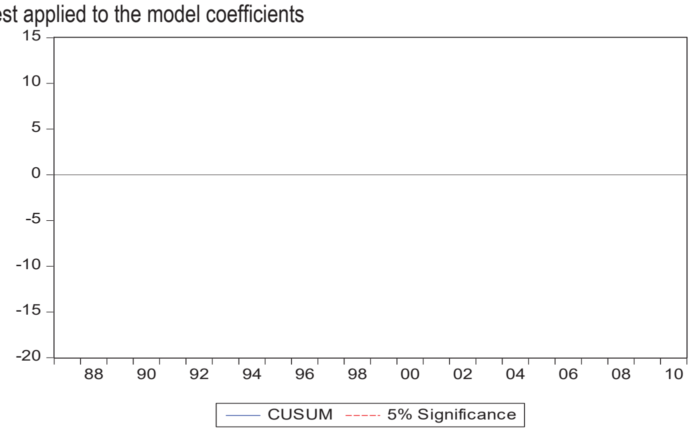
ii) The residues of our empirical model meet four conditions: normality, stationarity. Homoscedasticity and independence between the residues.

The residues are actually distributed as a normal distribution, the Jarque-Bera test Accepts the null hypothesis of normality ($\mathrm{JB} = 0,56 \prec \chi^2_{0,05}(2) = 5,99$)

The ADF test on residuesconfirms the stationarity of the residues using the table as critical values of Engle and Yoo (1987) (ADF = -3.12 estimated is less than the tabulated value which is equal to (-2, 67). The White test (1980) accepts the null hypothesis and the homoscedasticity rejects the alternative hypothesis of hétéroscédasticité (). The Durbin-Watson (DW) confirms the dependence of the errors ($\mathrm{DW} = \breve{d} = 0,64\ ;\ \breve{\mathrm{d}} \prec \mathrm{d_L}$)

iii) To confirm that this relationship is generally stable, several tests can be used: tests of recursive residuals, CUSUM and CUSUM squares. This last test we will apply:

Graph 2: CUSUM test applied to the model coefficients



We observe in Figure 2 that the CUSUM leaves the interior corridor from 2004.
This test allows us to say that the relationship is unstable.

iv) The explanatory power in our model is 52%, This allows us to say that the GDP per capita, the degree of economic openness, the index of consumer prices deflated and macroeconomic stability strongly explain government spending during the study period.

According to the statistical study we have treated, we can conclude that our model is generally satisfactory.

In this section, we will was that if government spending causes growth? Where growth because public spending, where there is a feedback relationship between the two? To answer this question, we will apply the test of Granger causality.

The principle of causality is as follows;

We say X causes Y if the prediction based on knowledge of past joint X and Y is better than the prediction based on knowledge of the single Y

The tests are applied to non-causality which is based on statistics of maximum likelihood:

$$\xi = TC_{X \to Y} \qquad (8)$$

Where T and $C_{X \to Y}$ represents respectively the number of observation and measurement of causality

Under the null hypothesis of no causal expression (8) follows a chi-square of $\tau(T - \tau)p$ degree of freedom with τ is the number of constraints imposed. The decision rule is:

If $\xi < \chi^2_{(\tau(T-\tau)p)}$, we accept the null hypothesis of no causality

If $\xi > \chi^2_{(\tau(T-\tau)p)}$,, we reject the null hypothesis of no causality

The result of the application of Granger causality test is summarized in the following table:

Table 3: Granger causality test

The null hypothesis	F statistic	Prob
The per capita income does not cause public spending	0,15	0,69
government spending does not cause per capita income	0,04	0,83

According to Table 3 of causality, we reject the null hypothesis of no causality, this allows us to say that per capita income cause government spending and government spending cause per capita income, hence there is a relationship feedback.

4. Conclusion

The objective of this paper is to explain the growth of public spending by the approach of the demand for public goods in Morocco from 1970 to 2010, to test the veracity of Wagner's law for the Moroccan economy by an approach demand to see the positive effect between the share of public expenditure to GDP ratio and the following variables: the per capita income, population, urbanization, degree of economic openness, the effect of Baumol and macroeconomic stability.

We concluded from our study that Wagner's law holds for the Moroccan economy. Our model confirms the positive effect between the share of public expenditure to GDP ratio and the following explanatory variables: per capita income, the degree economic openness, the effect of macroeconomic stability and Baumol ..

We also concluded from our study that there is a feedback relationship between public spending and per capita income using the Granger causality test.

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Annex

Table 1

Dependent Variable: DP
Method: Least Squares
Date: 05/21/12 Time: 20:13
Sample: 1970 2010
Included observations: 41

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-19.88018	7.252111	-2.741295	0.0095
IPD	0.342050	0.081669	4.188259	0.0002
DO	0.021596	0.049884	0.432916	0.6677
DA	0.385149	0.652310	0.590438	0.5586
Y	0.002132	0.001913	1.114406	0.2725

R-squared	0.529119	Mean dependent var	15.95603
Adjusted R-squared	0.476799	S.D. dependent var	2.287372
S.E. of regression	1.654517	Akaike info criterion	3.958744
Sum squared resid	98.54732	Schwarz criterion	4.167717
Log likelihood	-76.15426	Hannan-Quinn criter.	4.034840
F-statistic	10.11311	Durbin-Watson stat	0.648236
Prob(F-statistic)	0.000014		

Table2

Dependent Variable: DP
Method: Least Squares
Date: 05/21/12 Time: 16:33
Sample(adjusted): 1972 2009
Included observations: 38 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.95559	0.605298	26.35988	0.0000
D(Y(+1))	0.012412	0.008657	1.433820	0.1631
D(Y(-1))	0.001035	0.007422	0.139387	0.8902
D(Y)	0.010637	0.009618	1.105931	0.2785
D(DO(-1))	-0.194163	0.091754	-2.116122	0.0437
D(DO(+1))	-0.096631	0.056532	-1.709325	0.0989
D((DO))	-0.154226	0.062454	-2.469413	0.0201
D(IPD(-1))	0.086530	0.126347	0.684859	0.4993
D(IPD)	0.106053	0.123005	0.862187	0.3962
D(IPD(+1))	0.138078	0.134616	1.025714	0.3141
DA	0.353419	0.785638	0.449850	0.6564

R-squared	0.336964	Mean dependent var	16.23413
Adjusted R-squared	0.091395	S.D. dependent var	1.974811
S.E. of regression	1.882405	Akaike info criterion	4.340176
Sum squared resid	95.67315	Schwarz criterion	4.814214

Log likelihood	-71.46334	F-statistic	1.372175
Durbin-Watson stat	0.360867	Prob(F-statistic)	0.245146

Table3

Dependent Variable: D(DP)
Method: Least Squares
Date: 05/21/12 Time: 17:08
Sample(adjusted): 1972 2010
Included observations: 39 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.466502	0.213787	2.182085	0.0366
FF(-1)	-0.331567	0.114557	-2.894342	0.0068
D(DP(-1))	0.244854	0.163715	1.495615	0.1446
D(Y)	-0.009711	0.003607	-2.692365	0.0112
D(DO)	-0.026365	0.028659	-0.919972	0.3645
D(IPD)	0.163020	0.067416	2.418108	0.0215
DA	-0.247665	0.378687	-0.654008	0.5178

R-squared	0.354624	Mean dependent var	0.153215
Adjusted R-squared	0.233616	S.D. dependent var	1.110472
S.E. of regression	0.972144	Akaike info criterion	2.942524
Sum squared resid	30.24207	Schwarz criterion	3.241112
Log likelihood	-50.37921	F-statistic	2.930585
Durbin-Watson stat	1.736369	Prob(F-statistic)	0.021536

Table4

Vector Error Correction Estimates
Date: 05/21/12 Time: 22:18
Sample(adjusted): 1972 2010
Included observations: 39 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
DP(-1)	1.000000
IPD(-1)	-2.074392
	(0.46346)
	[-4.47590]
DO(-1)	2.229765
	(0.37886)
	[5.88543]
DA(-1)	5.034965
	(3.13061)
	[1.60830]
Y(-1)	-0.071440
	(0.01403)

	[-5.09287]				
C	135.1014				

Error Correction:	D(DP)	D(IPD)	D(DO)	D(DA)	D(Y)
CointEq1	0.050222	0.138097	-0.285868	0.002396	1.217981
	(0.02158)	(0.05085)	(0.12024)	(0.00505)	(0.87488)
	[2.32757]	[2.71572]	[-2.37743]	[0.47489]	[1.39218]
D(DP(-1))	-0.142872	-0.391887	0.817957	0.023661	5.115831
	(0.21092)	(0.49707)	(1.17537)	(0.04932)	(8.55194)
	[-0.67739]	[-0.78839]	[0.69591]	[0.47978]	[0.59821]
D(IPD(-1))	0.019816	0.068406	-0.320893	-0.018735	-0.086534
	(0.07055)	(0.16625)	(0.39313)	(0.01649)	(2.86035)
	[0.28090]	[0.41145]	[-0.81626]	[-1.13582]	[-0.03025]
D(DO(-1))	-0.039396	-0.203901	0.156347	-0.001506	0.759952
	(0.04557)	(0.10739)	(0.25393)	(0.01065)	(1.84755)
	[-0.86459]	[-1.89875]	[0.61572]	[-0.14138]	[0.41133]
D(DA(-1))	1.103193	-1.411171	1.300784	0.071663	-46.72643
	(0.79057)	(1.86314)	(4.40560)	(0.18485)	(32.0548)
	[1.39544]	[-0.75741]	[0.29526]	[0.38768]	[-1.45770]
D(Y(-1))	0.003541	-0.008644	0.011114	-0.000503	-0.233255
	(0.00420)	(0.00991)	(0.02342)	(0.00098)	(0.17043)
	[0.84244]	[-0.87256]	[0.47447]	[-0.51194]	[-1.36862]
C	0.114735	0.534974	0.482667	0.011583	31.10604
	(0.22133)	(0.52162)	(1.23342)	(0.05175)	(8.97426)
	[0.51838]	[1.02561]	[0.39132]	[0.22382]	[3.46614]
R-squared	0.288461	0.230823	0.247267	0.088583	0.422094
Adj. R-squared	0.155047	0.086603	0.106129	-0.082308	0.313737
Sum sq. resids	33.34246	185.1869	1035.447	1.822835	54815.59
S.E. equation	1.020760	2.405637	5.688384	0.238670	41.38825
F-statistic	2.162154	1.600487	1.751958	0.518358	3.895394
Log likelihood	-52.28237	-85.71578	-119.2796	4.393189	-196.6779
Akaike AIC	3.040121	4.754655	6.475878	0.133683	10.44502
Schwarz SC	3.338709	5.053243	6.774466	0.432271	10.74361
Mean dependent	0.153215	0.094124	1.006082	0.000000	26.53605
S.D. dependent	1.110472	2.517099	6.016606	0.229416	49.96108

Determinant resid covariance (dof adj.)	9533.750
Determinant resid covariance	3545.607
Log likelihood	-436.0756
Akaike information criterion	24.41413
Schwarz criterion	26.12035