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The Effects of The Government Spending Threshold on Economic Growth in the Arab Maghreb Countries: An Econometric Study for the Period (2000-2022)

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Abstract

This study aims to measure the government spending threshold and determine its relationship with economic growth in the Arab Maghreb countries, by estimating the government spending threshold during the period 2000-2022 using a set of economic variables, and using the panel threshold regression model (PTR). The study concluded that there is an effect of the threshold government spending on economic growth in the Arab Maghreb countries, as the results indicated a threshold level of 29.22%, and government spending rates below the threshold level has a positive impact on economic growth, while government spending rates greater than the threshold level have a negative impact on economic growth in the Arab Maghreb countries.

Keyword: Government spending threshold, economic growth, the panel threshold regression model.

1. INTRODUCTION

The government spending is one of the financial policy tools, through which governments seek to increase production and achieve their economic and social goals. The topic of the effects of government spending on economic growth is still of great interest to researchers in the economic literature for many years, as views differed in highlighting this effect. Some of them believe that government spending has a positive effect on growth, while others think that the effect is negative. There are also those who believe that the relationship between government spending and economic growth can be linear, and others who say that it is non-linear. From Keynesians' point of view, government spending is a part of effective aggregate demand, therefore it positively affects the national product, while the neoclassical theory assumes that there is a strong and negative impact of government spending on national product.

The financial situation in the Maghreb countries witnessed a significant development, especially during the study period, due to the rise in oil and gas prices, and the political transformations that these countries witnessed, as all Maghreb countries resorted to increasing public spending by increasing wages and salaries, social allocations, and current spending as a whole. Increasing government support, they also implemented an expansionary policy in order to accelerate economic growth. Therefore, government spending in these countries is used as an important tool in financial policy in order to increase economic growth and achieve economic stability

1.1.Problem of the study

In order to determine the nature of the relationship between government spending and economic growth in the Maghreb countries, and to determine the ways in which spending policies can be directed correctly to achieve high growth rates, we attempt to answer the following problem:

What is the impact of government spending on economic growth in the Maghreb countries?

1.2. significance of the study

The importance of this research lies in its contribution in highlighting one of the important methods in econometrics modeling represented by the Panel Threshold Regression (PTR) model, which differs from previous studies that were limited to traditional linear modeling. It allows to determine a threshold for government spending beyond which economic growth will be negatively

affected. Therefore, the purpose is to guide policy makers in Maghreb countries to make appropriate decisions in regards of monetary policy and economic growth.

1.3.objective of the study

The study aims to build a standard model to determine the impact of government spending on economic growth in the Arab Maghreb countries for the period (2000-2010) through a non-linear model (Panel Threshold Regression (PTR)), and to determine the threshold level, the form and direction of the relationship between government spending and economic growth below and above it.

2-THEORETICAL BACKGROUND AND LITERATURE REVIEW

The Economic literature indicates that there is a relationship between government spending and economic growth. This relationship has received the attention of many economic experts and researchers over the years, but it is still the subject of intense controversy as there are many views. The classics considered that economic growth occurs automatically without state intervention in Economic activity, but after the global crisis of 1929, Keynes published his general theory in 1936, and explained that the state must intervene in the economy by adopting a budget policy. After World War II, many countries adopted an expansionary financial policy by doubling their public expenditures, which led to significant economic growth (Nouira R & Kouni M ,2018), Therefore, the Keynesian approach assumes that the relationship between government spending and national income extends through its ability to create new incomes. There are neoclassical growth models proposed by Solow (1956), which assume that the accumulation of capital, labor force, and technical progress affect economic growth, while government policy has no effect on economic growth in the long run (Chekouri & al, 2022), and the second hypothesis is the hypothesis The endogenous growth models presented by Romer (1986) and Barro (1990) say that government policy has an important role in determining long-term economic growth through its role in managing fiscal policy. There is an important contribution, which is the U curve hypothesis that supports the inverted relationship. Between government spending and economic growth, according to Rahm (1986) and Armey (1995), there is a non-linear relationship between the two variables, which indicates a positive relationship up to a certain threshold and a negative relationship beyond this (Ayad Hicham,2020), There is also the BARS curve which stands for the initials of Barro (1990), Armey (1995), Rahne and Fox (1996), and Scully (1995). In other words, an increase in government spending is beneficial up to a certain point but beyond this level the effect on growth is

Negatively (Asimakopoulos & Karavias,2016), These assumptions and opinions have been validated in many studies, including:

(Asimakopoulos & Karavias,2016): The researchers conducted this study on a sample of 129 countries for the period 1980-2009 in order to study the relationship between government spending and economic growth. They concluded that the threshold level is equal to 18.0%.and they find an asymmetric impact of government spending on economic growth in both developed and developing countries around the estimated threshold.

(Aydın C, Akıncı M, & Yılmaz Ö,2016): In a study conducted by the two researchers on the Turkish economy for the period 1998:Q2 - 2015:Q2 using threshold autoregressive (TAR) model, they reached a threshold level equal to 0.1322, as it became clear that if government spending under threshold level, low government spending has significantly negative impact on economic growth.

(Nouira R & Kouni M ,2018): This study used the ARDL methodology on a sample of 36 countries divided into 15 countries from the MENA countries, and 21 developing countries for the period (1988-2016), to test the relationship between economic growth and government spending. The study found a non-linear relationship between the two variables, and that The ceiling of spending ranges between 10% and 30% for the entire sample of countries.

(Ayad Hicham,2020): The study analyzes the causal relationship between government spending and economic growth for a selected sample of MENA countries for the period (1987-2017). He concluded that economic growth and government spending develop independently, and that the study supports Wagner’s law.

(Chekouri & al, 2022): The study investigates the growth of government spending in Algeria and its impact on economic growth for the period (1973-2020), using Hansen's (2017) model. The results indicated an estimated government size of about 30.4% of the gross domestic product, and the results confirmed the validity of Armey's hypothesis in Algeria.

(Dobrescu, E., 2015): This study focuses on the Romanian economy through the use of statistical data for the period between 1990 and 2013. The researcher found consistency in the proposition presented by BARS on the Romanian economy at an optimal level of government spending within the limits 31%.

(Jain M & al,2021): This study examines the relationship between the size of government spending and the economic growth of the countries of South Asia, the BRICS group, and other emerging countries for the period (2007-2016). The results were proof of the Armey curve (1995), and the threshold levels for total government spending reached 24.3% .It has been observed that a rise in the public spending (size) resulted in a substantial increase (decrease) in the growth rate when the public spending was before (after) the optimal threshold level.

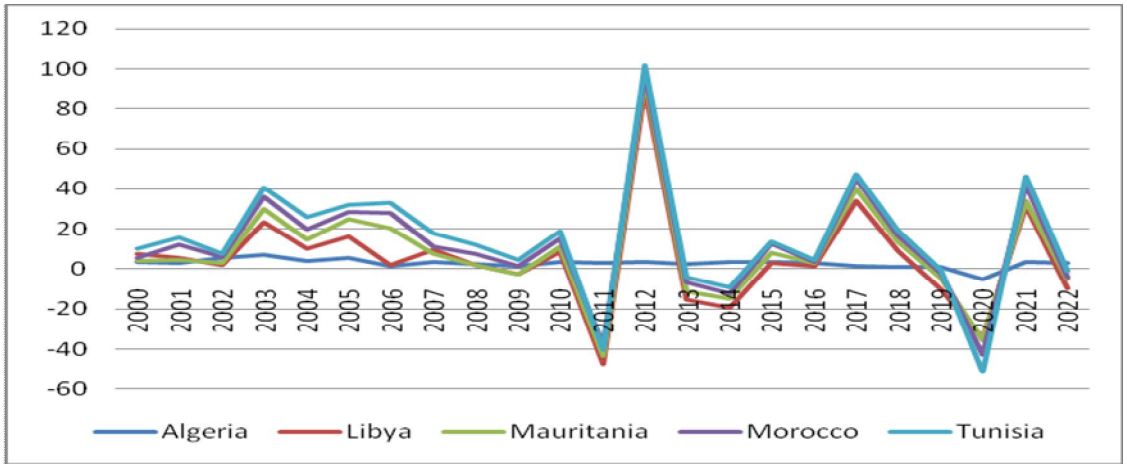
Several econometrics models have been used to determine the government spending threshold in the countries, especially the Wagner model, Armey curve and BARS curve. Perhaps the most important feature of this research is its use of the Panel Threshold Regression (PTR) model to determine the government spending threshold, which enables us to move between two different systems, as it indicates: A certain level at which the direction of the impact of government spending on economic growth changes from positive to negative or vice versa.

3.Overview of government spending and economic growth in the Maghreb countries

Government spending rates in the Maghreb countries during the period 2000-2010 were relatively stable, with an average spending reaching 32%, as shown in Figure (1). In both Algeria and Libya, this is due to the growth of financial assets during this period due to the rise in oil revenues. This increased pressure on the two governments. As for Tunisia, Mauritania and Morocco, the need to reduce the high levels of unemployment and poverty led to an increase in government spending, and in order to raise spending levels to support the growth of internal demand. The end of this stage was known as averages The rate of spending increased several times. In 2008 and 2009, the rate of spending in Algeria rose to 40% and 44%, respectively, and in Libya, public spending rose to 41% in 2008 and to 60% in 2009, driven by the continued rise in oil and natural gas prices, during which the volume of activity increased. Economically, in Morocco, Tunisia, and Mauritania, public spending rates remained at their levels, recording 28%, 24%, and 19%, respectively. During the period 2011-2022, public spending rates witnessed varying fluctuations among the Maghreb countries. In Libya, the public spending rate decreased to about 39% in 2011 and 2012 due to the internal political crisis it went through. As for Tunisia, it was not greatly affected by the political changes as it maintained its spending rates within the range of 27%. Mauritania also recorded a decrease that reached 17%, and the rest of the countries maintained their spending levels. Until the end of the stage, spending rates will rise again in 2022 in most Maghreb countries as a result of several factors, the most important of which is the rise in internal demand

after the start of economic recovery from the effects of the closure due to the Covid-19 pandemic in countries of the world as a whole.

Fig.1. Evolution of the government spending percent of GDP in Maghreb countries



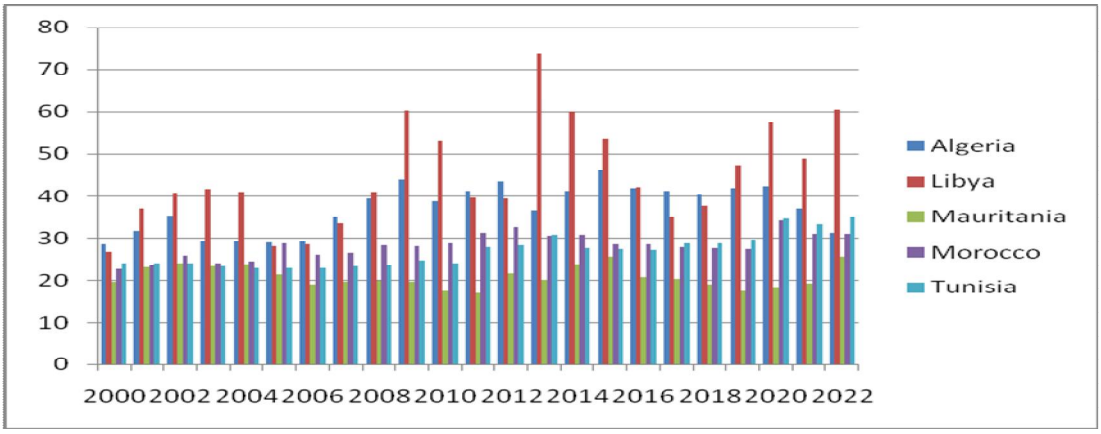
Source: Made by author based on the data from the World Bank (2023)

Figure (2) shows that the economic growth rates during the study period witnessed some fluctuations starting from the year 2000 to the year 2002, where the GDP rate witnessed a significant decline in both Libya and Mauritania, where it reached levels less than zero, and then returned to an increase to reach the year In 2004, it reached a limit of 5% in all Maghreb countries, and despite the beginning of the spread of the negative effects of the global financial crisis, Tunisia, Algeria, and Morocco achieved moderate growth rates. Tunisia recorded about 4.2%, Morocco 5.9%, while Algeria recorded about 3%, and this was reflected in A positive increase in the level of per capita income in terms of GDP reached an average of $5,858 in 2008, and growth in both Libya and Mauritania declined to below zero.

The Economic growth was affected in the years 2011 and 2012 as a result of internal circumstances and popular revolutions in both Libya and Tunisia, as Libya recorded negative growth estimated at -50%, and Tunisia recorded -2.04%, then from 2014 to 2017, in addition to the above reasons, the oil-producing countries were affected. It is also a result of the decline in oil prices, and during the years 2021 and 2022, the gross domestic product witnessed a significant increase as a result of the economic recovery after the Covid-19 pandemic, as it rose in Algeria by about 3% compared to the year 2020, where it recorded -5%, benefiting from the return of oil production to pre-pandemic levels. Tunisia recorded 2.4% in 2022, and this is due to the progress achieved in financing conditions, economic reforms, and the improvement of the business environment. As for Morocco, it recorded 1.2% in the economic growth rate due to the increase in

local demand, an improvement in agricultural incomes, and an increase in foreign remittances from expatriates, and Libya achieved a positive rate of growth. Driven by the continued improvement of internal conditions and the rise in its oil exports.

Fig.2. Evolution of of economic growth in the Arab Maghreb countries



Source: Made by author based on the data from the World Bank (2023)

4.ECONOMETRIC METHODOLOGY AND DATA

4.1. Data

To estimate the relationship between government spending and economic growth in the Maghreb countries during the period (2000-2022), The Panel Threshold Regression (PTR) was used, relying on the following set of variables: the growth rate of domestic product (GDP), the growth rate of government spending (DEP), and the inflation rate (INF).), population growth rate (POP), trade openness index (OPEN), investment growth rate (INV), and were collected from the World Bank database (2023).

4.2.Model

To analyze the impact of inflation on economic growth at the threshold level in the selected Arab countries, we rely on the (Khan and Senhadji, 2001) model as one of the Panel Threshold Regression (PTR) models.The econometric model takes the following form:

$$GDP_{it} = \beta_{0t} + \beta_1(1 - d_{it})(dep_{it} - dep^*) + \beta_2 d_{it}(dep_{it} - dep^*) + \beta_3 INF_{it} + \beta_4 POP_{it} + \beta_5 OPEN_{it} + \beta_6 INV_{it} + \varepsilon_{it}$$

$$d_{it} = \begin{cases} 1 & if \quad dep_{it} > dep^* \\ 0 & if \quad dep_{it} \leq dep^* \end{cases}$$

where:

d_{it} : A dummy variable that takes the value one at spending rates above the threshold level, and takes the value zero otherwise

4.3. Econometric Methodology

4.3.1. Homogeneity test (Hsiao test)

The purpose of this test is to study the behavior of individuals in terms of the suitability of the model to all units from an economic standpoint. From a standard standpoint, its aim is to test the equality of the coefficients of the theoretical model in its cross-sectional dimension (Boulabbas, 2018). The results were as follows:

Table 1. Results of homogeneity test for (Hsiao)

Hypothesis	F-Stat	P-Value	Decision
H1	**4.537529**	**1.40E-07**	**refuse**
H2	**1.302378**	**0.274197**	**accepte**
H3	**4.981224**	**9.1E-08**	**refuse**

Source: Made by author based on the program Eviews

By comparing the value of the calculated Fisher test with the tabular value, we find that, $F_1 = 4.537 > F_{Tab}^{0.05} = 1.751$ therefore, we reject the null hypothesis H_0 and accept the alternative hypothesis H_1, which says that the fixed terms are not equal and the coefficients of the explained variables are not equal for all countries, meaning the pooled model is rejected, and from there we pass to the second stage.

As $F_2 = 1.302 < F_{Tab}^{0.05} = 1.682$ we accept the null hypothesis H_0 and reject the alternative hypothesis H_1, which says that the coefficients of the explanatory variables are not equal for all countries.

As $F_3 = 4.981 > F_{Tab}^{0.05} = 2.458$ we reject H_0 and accept the alternative hypothesis H_1 that says that there is a difference in the fixed limits, that is, the presence of individual effects, and therefore the most appropriate model is the **individual effects model**.

4.3.2. Panel Unit Root Test

Before estimating the Panel Threshold Regression (PTR) model, it is necessary to first examine There is no unit root, as the lack of this property may lead to false results, and then verify the presence of Co-integration, as one of the conditions of this model is that the series be stable in level, and the first contributions in this field were in 1993 by Levin and Lin, who designed a test very similar to the augmented Dickey-Fuller test. There are several tests used for this purpose, but the most important and most widely used are (Levin, Lin and Chu test: 2002) and the (Im, Pesaran and Shin test:2003). We find that unit root tests for panel data outperform unit root tests for time series because they include the cross-sectional and temporal information content together. Which leads to more accurate results (Al-Abdali, 2010). After carrying out the testing process using appropriate tests, we obtain the following results:

Table 2. Unit Root Test Results

variables	LLC-TEST		IPS-TEST	
	Stat	**p-value**	**Stat**	**p-value**
GDP	-3.98641	0.0000	-384834	0.0001
DEP	-4.53822	0.0000	-4.29315	0.0000
INF	-2.24032	0.0125	-5.32491	0.0000
POP	-4.43588	0.0000	-3.98284	0.0000
OPN	-3.49726	0.0002	-3.35600	0.0004
INV	-5.06094	0.0118	-5.68383	0.0407

Source: Made by author based on the program Eviews

Through the test results, it is clear that all variables do not contain a unit root at the 5% level of significance, and this is after comparing them to the probability value, where we find that all of them are less than 5%, and therefore we conclude that all variables are stable at the level, and are integrated from the zero degree, and thus achieve Threshold Model Conditions (PTR).

4.3.3. Co-integration Panel Test

Pedroni's Co-integration tests propose 11 statistics to test the null hypothesis, which states that there is no Co-integration, against two alternative hypotheses: the homogeneity hypothesis for all items,

which is called the internal dimension test, and includes four weighted and unweighted statistics, and the heterogeneity hypothesis for each item separately, which is called the inter-dimension test. It includes three statistics (El-doakly, 2022), and the ruling is based on the result of a majority, and Table (03) shows the results of the Pedroni tests:

Table 3. Co-integration Test Results

Tests	Unweighted statistic		weighted statistic	
	Stat	p-value	Stat	p-value
Panel v-Statistic	-0.190590	0.4244	-0.950642	0.8291
Panel rho-Statistic	-2.853002	0.0022	-2.652860	0.0040
Panel PP-Statistic	-12.53957	0.0000	-5.754408	0.0000
Panel ADF-Statistic	-5.128478	0.0000	-0.660316	0.2545
between items				
Group rho-Statistic	-2.177679	0.0147		
Group PP-Statistic	-8.964388	0.0000		
Group ADF-Statistic	-2.030665	0.0211		

Source: Made by author based on the program Eviews

From the results above, we find that there are seven statistics out of eleven Reject the null hypothesis which states that there is no Co-integration at a 5% significance level. Therefore, we say that there is Co-integration, meaning that there is a long-term relationship between the variables of the study.

4.3.4.Determine the value of the government spending threshold

Based on the methodology of (Khan and Senhadji, 2001), which relies on the conditional least squares method in determining the threshold, the model is estimated at all possible levels of government spending, which we specified from 1 to 40, and the threshold is determined at the level at which the sum of the squares of the residuals is least It is possible, after the estimation process, we obtain a threshold level value of approximately 29.22% as shown:

$$dep^{*} = min\{S_1(dep), \quad dep = 1, \ldots\ldots\ldots, 40\} = 29.22\%$$

4.3.5.Test of statistical significance for the threshold level

To test the statistical significance of the threshold value, the Hansen statistic was used to test the null hypothesis that there is no effect of the threshold. The statistic and its significance were calculated using the following two relationships (Belmokadem, 2018):

$$LR_0 = \frac{(SCR_0 - SCR_1)}{\sigma^2} = F_1$$

$$P_{value} = 1 - \left[1 - exp\left(\frac{-1}{2}F_1\right)\right]$$

The results concluded:

Table 4. Threshold significance test

Threshold value	Hansen statistic	P-value
29.22%	18.05	0.0001

Source: Made by author

From the table above it is clear that the value of the Hansen statistic was significant at the level of 5%. This means accepting the alternative hypothesis that there is an effect of the threshold at an expenditure level equal to 29.22%.

4.3.6.Estimation of panel models:

Estimation is done using the following three Panel Threshold Regression (PTR)models: the pooled regression model(PRM), the fixed effects model(FEM), and the random effects model(REM). Then a comparison is made between them to choose the best model using the LR statistic and the Hausman statistic. The results led to the following:

Table 5. Test results of Likelihood Ratio and Hausman

Tests	Stat	P-value
LR	36.65282	0.0258
Hausman	3.699759	0.5934

Source: Made by author based on the program Eviews

Through the results of the table above, we notice that the probability value of the likelihood ratio is completely smaller than the significance level of 1% and 5%. Therefore, the null hypothesis that the pooled regression model is appropriate is rejected, and the alternative hypothesis is

accepted, which means that the fixed effects model is appropriate, we also note that the probability value of the Hausman test is greater than the 5% level of significance, and therefore the null hypothesis is accepted that the random effects model is appropriate, that is, the random effects model is the appropriate model.

4.3.7.The Panel Threshold Regression (PTR) model estimation results:

The government spending threshold (PTR) model is given according to the table below:

Table 6. Results of estimating the PTR model using the random effects model

Variables	coefficient	t-Stat	p-value
$(1-d_{it})(dep_{it}-dep^{*})$	0.529551	1.978423	0.0473
$d_{it}(dep_{it}-dep^{*})$	-0.613506	-3.735962	0.0003
INF	-0.491308	-2.392564	0.0185
POP	-1.273228	-2.835659	0.0055
OPN	1.224348	0.435468	0.6641
INV	0.110257	1.158373	0.2493
C	6.879984	1.387726	0.1681
The threshold 29.22%			
$R^2 = 0.7118$			

Source: Made by author based on the program Eviews

Through the results in Table (6) and using the calculated Student statistic and comparing it to the tabulated one, it was found that the model parameters were significant at different levels of significance. Some of them showed statistical significance at $\alpha = 0.01$, and others at $\alpha = 0.05$ a significant level. Therefore, we accept the model parameters statistically except for the trade openness rate parameter and the Investment growth were insignificant.

The coefficient of determination also means $R^2 = 0.7118$ that the explanatory power of the model is strong. In other words, we say that the variables included in forming the random effects model explain 71.18 % of the changes in the GDP growth rate, and therefore we can say that the explanatory power of the model is acceptable.

What enhances the explanatory power of the model is the confirmation of its overall statistical significance, and this is according to Fisher's test, by comparing the probability value of Fisher's calculated statistic (F_{Cal}), which is equal to 0.0000, less than 5%, which leads us to reject the null hypothesis and accept the alternative hypothesis, meaning that the model's coefficients differ from zero. This confirms the overall significance of the model parameters, meaning that all explanatory variables have an effect on the dependent variable.

5. RESULTS AND DISCUSSION

Government spending rates less than the threshold level estimated at 29.22% were statistically significant at 5% level of significance. This means that government spending less than the threshold level has a positive impact on economic growth rates in the Maghreb countries, as increasing government spending by 1% leads to increase economic growth rate by 0.52%. However, above the threshold level, the effect of government spending turns negative, as increasing government spending by 1% leads to a decrease in the economic growth rate by 0.61%, and this means that rationalizing government spending and directing it towards effective sectors, This would lead to an increase in local demand and investment projects, which in turn would increase productivity to meet this demand, and thus lead to increased rates of economic growth.

We also found that the inflation rate parameter is statistically significant and has a negative impact on economic growth rates, as a 1% increase in the inflation rate leads to a decrease in economic growth of 0.49%. From an economic standpoint, an increase in inflation rates would lead to a deterioration in purchasing power and thus a decrease in demand. Likewise, It leads to an increase in production costs, which affects local production, and leads to a decrease in demand, which affects economic growth.

We found also that the parameter of population growth rates has a negative impact on economic growth rates and is significant at a 5% level of significance, as an increase in the population growth rate by 1% will lead to a decrease in economic growth rates by 1.27%, and the reason could be in the Maghreb countries' dependence on the public services sector. More than productivity in directing work demands, lack of interest in training the human element, and great pressure on the natural resources available in these countries.

We concluded that the rate of trade openness and the rate of investment growth do not have a significant impact on economic growth in the Maghreb countries, despite the great importance of these two factors in driving economic growth. The commercial openness of the Maghreb countries to each other can contribute to their benefiting from natural resources. Employment, exchange of knowledge and technology, and diversification of supply and demand, and all of this will further enhance economic activity, leading to a rise in economic growth levels, as expanding investment will lead to increased productivity and increased job opportunities, which in turn leads to a higher rate of economic growth.

6. CONCLUSION

Through this study, we tried to measure the impact of the government expenditure threshold on economic growth using the immediate transition (PTR) threshold model on the Maghreb countries for the period 2000-2022. The variables were chosen based on economic theories and what has been used in previous studies.

Through the estimation results, we concluded that the government spending threshold in the Maghreb countries is equal to 29.22%, and that government spending less than the threshold level has a positive impact on economic growth rates, while the impact is negative on economic growth rates in the Maghreb countries if the spending rate exceeds it. The government has the estimated threshold level, and the results also show a negative effect of inflation, and population growth rate on economic growth rates.

Based on the results obtained, we suggest some recommendations:

- The necessity of working to develop strong and purposeful plans for economic and social reform, which help to achieve economic growth in the Maghreb countries.

- The need to encourage local production, private and direct investments, especially in the agricultural sector, and diversify the local economy in the Maghreb countries.

- The enhancement of trade openness due to its positive impact on economic growth.

- Reducing current expenditures that limit capital spending, which enhances productivity and economic growth.

- Rationalizing government spending to reduce further financial deficit that declines the development process.

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