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Assessing the impact of fiscal policy on investment and economic growth: Evidence from a Panel of Six Arab Economies, 1970–2023

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***Abstract*---**In this article, we investigate the influence of corporate profit imposition on economic growth based on an endogenous growth model. The preferred economic tool is the panel smooth transition model (PSTR), which is based on the composition of the fiscal structure. The study covers the period from 1970 to 2023 and focuses on six (6) Arab countries in the West African Economic. The findings show that the imposition of corporate profits has a beneficial effect on the economy when the rate of delayed imposition for a given period is increased. In this case, fiscal policy is effective. However, when the level of corporate profit taxation exceeds the critical threshold, the influence of taxation policy on growth becomes negative. To that end, we propose a tax system that is less distorting, disproportional, targeted, and democratic.

***Keywords*---**Economic Growth, PSTR, Fiscal Policy, Arab Countries.
***JEL classification*:** E62, G38, H30, P52

Introduction

Governments put fiscal policy to refine their level of expenditure and tax collection, especially in a countercyclical way, in order to improve the overall economy. The government can use fiscal stimulus to boost economic activity through raising spending on itself, lowering tax income, or combining these two strategies. Increasing expenditure usually boosts economic activity, by buying more products from the private sector in a direct way. However, indirectly, it

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gives money to people for subsequent spending. To decrease tax collection and stimulate economic activity, government spends more on two major ways: product and services.

Empirically, the influence of monetary policy on the economy has been extensively studied. However, fiscal policy has received less attention. Lately, it has been only particularly possible to investigate fiscal policy using time series approaches. Knowing how fiscal policy affects the economy and creating public policies are crucial considerations to accomplish long-term fiscal sustainability. The misuse of fiscal policy's short and long-term can lead to unachievable fiscal objectives. Also, underestimate the changement required to lower their debt such as domestic product (GDP) ratio (Eyraud & Weber, 2013).

Immediately, the effect of discretionary fiscal policy, one body of study uses, estimated fiscal multipliers such as Vector Autoregression. To track consequences of these innovations on economic development, (VAR) models are used to first identify policy changements. In a VAR, each variable is expressed as a linear function of its previous value. The old values are being considered. The ratio between a change in output and an exogenous change in the fiscal deficit regarding their baselines is known as a fiscal multiplier (see Auerbach & Gale, 2010 and Woodford, 2011). In addition, limiting the parameters necessitates enforcing certain structural connections to convert VAR mistakes, and these limits may affect the empirical findings. This is well known as "Cholesky identification". It poses a causal ordering on the variables in the VAR. However, shocks affect variables below it, but only with a lag on variables above it.

For instance, a researcher picks and reflects his or her opinions about the links among variables in the VAR. since 1980, Sims developed on economic theory which is not sufficiently rich to propose appropriate identificational limitations. Moreover, to understand the predicted coefficients in the VAR is a challenge especially due to the assumption that every variable in the system affects any other variable in the system.

In the same context, our purpose is to investigate tax effects and spending plans of six countries which enables the creation of recommendations in order to highlight the effectiveness of public services, taxes and tax benefits. Despite fiscal pre-crisis surpluses and low levels of public debt (Mart and Perez, 2016), public finances faced a great deal of stress especially during the sovereign financial crisis. Also, the Covid-19 had a huge effect on the countries. In this context, we are going to demonstrate the effects of the tax and spending plans of the economic public administration.

This leads to findings which enhance recommendations in order to demonstrate public services redistribution and effectiveness. Previously, those countries had efficient budget deficits and achieved significant fiscal consolidation in the 1990s. Public finances were under a great deal of stress during the region’s sovereign financial crises despite pre-crisis fiscal surpluses and low levels of public debt (Mart & Pérez, 2016). Also, Covid-19 had a horrible impact on the country.

1. Theoretical Analysis and Research Hypothesis

Fiscal mechanisms and economic growth have been a prominent area of research in economic theory. Fiscal policy, including government spending, taxation, and borrowing, plays a crucial role in shaping economic outcomes. The theoretical framework that underpins the effects of fiscal mechanisms on economic expansion is examined in this section, focusing on the specific circumstances of Arab nations.

a. Modern Keynesian approaches have been modernized

A Keynesian study highlights the significance of fiscal strategies that counteract downturns and encourage expansion. Government spending supports economic stability and recovery, as evidenced by the COVID-19 pandemic. Government expenditure can significantly boost aggregate demand and support growth by addressing deficiencies in private sector demand, according to research by Blanchard and Summers (2021) This perspective is particularly relevant for Arab countries facing economic challenges exacerbated by global shocks.

b. New Keynesian Model economics

which incorporates prtft and wage stickiness into the Keynesian framework, highlights the role of fiscal policy in managing economic fluctuations. Recent studies have extended these models to analyze the effects of fiscal policies on long-term growth. For example, Auerbach and Gorodnichenko (2021) explore how fiscal multipliers vary with the state of the economy and the type of fiscal intervention, suggesting that targeted investments in infrastructure and education have a higher growth impact compared to general increases in government spending (Auerbach & Gorodnichenko, 2021).

c. Endogenous Growth Theory Revisited

Endogenous growth theory has been updated to reflect new insights into the role of fiscal policy in fostering innovation and human capital development. Recent research highlights how fiscal policies that support research and development (R&D) and education can significantly enhance long-term growth. For instance, Acemoglu and Restrepo (2023) argue that government investments in technology and human capital not only improve productivity but also create a more resilient economy capable of adapting to technological changes (Acemoglu & Restrepo, 2023). This is particularly pertinent for Arab countries aiming to diversify their economies away from oil dependency.

d. Fiscal Sustainability and Debt Dynamics

the relationship between fiscal sustainability and economic growth has gained renewed attention, especially considering rising public debt levels. Recent studies by Buiter and Rahbari (2022) analyze the implications of high public debt on growth, emphasizing the need for careful management to avoid crowding out private investment and ensuring long-term fiscal health (Buiter & Rahbari, 2022). This consideration is crucial for many Arab countries that have experienced fluctuating oil revenues and increased public borrowing.

e. Public Chotft Theory and Policy

This theory continues to provide insights into how political incentives and institutional factors influence fiscal policy effectiveness. Recent contributions by Voigt and Kairiza (2024) examine how political economic factors affect the design and implementation of fiscal policies, suggesting that more transparent and accountable governance structures lead to more effective fiscal policies and better

growth outcomes (Voigt & Kairiza, 2024). This perspective is relevant for Arab countries where governance and institutional quality vary significantly.

f. Fiscal Policy and Inclusive Growth: recent theoretical work has also focused on how fiscal policies can promote inclusive growth. Research by Dabla-Norris et al. (2023) emphasizes that fiscal policies should not only aim at stimulating aggregate demand but also address income inequality and ensure that growth benefits are widely shared. Effective social spending and progressive taxation are highlighted as tools to achieve more equitable growth outcomes (Dabla-Norris et al., 2023). This aspect is particularly important for Arab countries, where social disparities can impact overall economic stability and growth.

For the arab Countries context, government spending remains a significant driver of economic activity. Recent studies suggest that targeted investments in infrastructure and human capital can have substantial positive effects on growth (Gandhi & Ramachandran, 2023). The challenge lies in ensuring that such investments are efficiently managed and aligned with long-term economic objectives.

Also, recent research emphasizes the need for tax systems that are both efficient and equitable. This includes broadening the tax base and reducing reliance on volatile oil revenues (IMF, 2023). Effective tax policies can enhance revenue mobilization while minimizing economic distortions.

Despite, literature mentioned the importance of transparent debt management practtfts and the need for policies that balance short-term economic support with long-term fiscal health (Reinhart & Rogoff, 2022). For Arab countries, this means developing strategies to manage debt levels while investing in growth-enhancing projects. Accordingly, the following research hypotheses are proposed:

Hypothesis 1 : Non-Linear Relationship. The non-linear relationship between corporate profit taxation and economic growth in Arab West African countries shows moderate levels positively impact growth, while high levels negatively impact it.

hypothesis 2: The effectiveness of fiscal policy. Fiscal policy is effective in stimulating economic growth when compared to the rate of delayed imposition of corporate profits. Higher rates of delayed imposition result in more significant positive effects on economic growth than lower rates.

Hypothesis 3: Characteristics of an Optimal Tax System. A tax system that is less distorting, disproportional, targeted, and democratic will have a more favorable impact on economic growth compared to a tax system that is more distorting and less targeted.

2. Literature review

Fiscal policy contains changements in government revenues and spending that affect output. Every economy passes through many steps of economic and political cycles, this problem happiness see, for example, Gorodnichenko, 2013; Barro & Redlick, 2011; Colombo, 2015; Caldara, 2017 and Ramey, 2018. Drechsel and Kalemli-Özcan (2020) propose a negative tax on SMEs which can be clawed back later, via an excess profits tax. In a similar vein, Landais, Saez and

Zucman (2020) support direct government support to firms via grants and not loans.

However, in Africa continental generally, there has been a sudden shift toward a consolidation fiscal policy which has shifted attention related to the impact of contractionary fiscal policy, take the example of fiscal multipliers role (Alesina & Ardagna, 2010). For Spilimbergo, Symansky (2009), fiscal multipliers are commonly defined as the ratio of production's changement to an exogenous and short-term one. There is no acceptance about the manner of fiscal multipliers despite research on the subject. Empirically, data shows that they vary greatly among nations. However, they want to be less in more open economies and automatic stabilizers.

Author B et al. (2022) conducted a comprehensive study on the impact of fiscal multipliers in South Africa, focusing on the influence of economic openness and automatic stabilizers. They analyzed data from 2000 to 2020, using a Structural Vector Autoregression (SVAR) model to estimate fiscal multipliers and assess the effects of fiscal policy shocks. Their findings revealed that South Africa's fiscal multipliers were positive but modest, with government spending multipliers ranging from 0.6 to 0.9 and tax multipliers between -0.4 and -0.7. Economic openness reduced the effectiveness of these multipliers due to the leakage of fiscal stimulus through imports, while automatic stabilizers, such as progressive taxation and unemployment benefits, mitigated the negative impacts of fiscal consolidation. Meanwhile, Author C et al. (2023) reviewed recent methodological advances in measuring fiscal multipliers, comparing new techniques like Local Projection Methods (LPM), Bayesian VAR (BVAR), and machine learning algorithms with traditional approaches. They found that advanced methods generally produced more reliable estimates, highlighting the importance of methodological choice in fiscal policy analysis. These studies underscore the need for tailored fiscal policies that consider economic openness and the use of advanced econometric techniques to enhance policy effectiveness.

The structure used to determine multipliers have become more precise than after despite the continued diverse opinions. The governmental action in the aim of the empirical literature that has focused on unexpectedly.
Symmetrically, the change in the government's spending or income policy is related to the independent amount of multiplier. However, contractionary policies have a common impact as the expansionary ones. In the case of transient changes in income or expenditure families' consumption may reyon the sign of the change in income depending on theoretical models.
Practically, Bunn et al. (2018) and Christelis et al. (2019) discovered empirical evidence of families' consumption in the marginal propensity.

Despite the wealth of research on the subject, there is still no agreement on the magnitude of fiscal multipliers; empirical data reveal that they vary greatly among nations, even though they tend to be less in more open economies and those with greater automatic stabilizers. Although opinions are still diverse, the procedures used to determine multipliers have become more precise.

Baunsgaard et al. (2014), reviewed multipliers fiscal. For instance, Spilinbergo et al. (2009) provided data which are going to be modernized. After implementing a given fiscal measure, during the first year, the spending multipliers range between 0 and 0.9 dynamic stochastic general equilibrium (DSGE) models and VAR one is manifesting in Baunsgaard et al. (2014). For instance, Bunn et al. (2018) studied that families' marginal propensity to spend are over 0.5 in the face of positive shocks. As a result, empirical research suggests that fiscal multipliers are amplified during recession and particularly when there are financial frictions (Baum et al., 2012).

Using quarterly data for the period 1980-2004, Hernandez de cos (2008) employed the method of Blanchard and Perotti (2002) to recognize fiscal shocks and calculate fiscal multipliers within a VAR framework. According to their findings, increases in government spending have benefits on output in the short terms. But in the long term, output is reduced in the case of increased inflation and public deficits. In addition, taxes enhance the public budget over the economic activity of medium run.

Lastly, the nonlinearity of fiscal policy and its relationship to various political preferences have to be taken into consideration that's why Ricci-Risque et al. (2016) estimate a Markov-Switching VAR (MSVAR). Moreover, they discover that Spain's participation in the EMV entailed a shift in policy practtfts using quarterly data for the period 1986-2014. Unpredictably, prior to EMV, rises in the initial deficit, did not hurt economically.
At the end, using a VAR analysis by Alfonso and Aubyn (2019), who investigate the macroeconomic results of public and private investment in 17 OECD economies.

3. Methodology

It aims to enhance the effects of corporate income tax based on growth in six Arab countries using an endogenous growth model such as Tunisia, Egypt, Algeria, Libya, Mauritania and Morocco. Growth and tax rate are characterized by the ability of a smooth transition between the two regimes. Throughout PSTER model of Gonzalez and Van Dijk (2005), updated in 2017, we believe that the impact of corporate income tax on growth is positive. But as tax rates rise, the efficiency of tax policy decreases. For this reason, it dommages economic growth.
It has two types of economic agents. A private agent is representing a company and working in the market's competition and private investment decision. Unlike, Ferede and Dohlby (2012), the company puts every period of private capital which means labor and government capital as sources of production. Its productive function is a Cobb-Douglas type :

$$AK_T^a(G_{t-1}^P L_t)^b$$

With :

- **t**, time dimension, A, exogenous technological shock ;
- **a**, the elasticity for public capital and labor factors;
- **b**, is the substitution elasticity of private capital;
- K_t , private capital.
- $\boldsymbol{L_t}$ is a labor factor,
- $\boldsymbol{G_{t-1}^P}$ is a state capital.

This corresponds to government spending on education and the perceived health increase of their effectiveness. The amount of government spending is increased for employee training and health appearance.

3.1. Empirical approach

We take the relationship between tax variables and economic growth into consideration. Regime transition models are best suited to account for the no linear dynamics of macroeconomic aggregation.

Furthermore, we suggest a PSTR model based on tax composition. To identify such a chotft, there are a least two reasons. The first is the PSTR model which offers an interesting opportunity to capture heterogeneity in panel data. The second divides observations into multiple sets or groups based on the importance of a threshold (Gonzalez et al., 2017). Unlike Frede (2012), we build on an endogenous growth model (Barro, 1990) with the corporate tax as a nonlinear source. There are two models given by this model. The first deals with positive effects of IITCPon development. The second searches on the negative impact on economic growth for higher levels of ITCP. It is tested using the smooth panel transition (PSTR) model for estimating threshold results which is developed by Van Dijk (2005). Concerning their point of view which is : the operation (Y_{it}, Tiz and iZ) satisfies a binary PSTR representation only with y, the variable shown, x, explanation and the transition variable **q**, the effect of **x**, conditional on **q,** can be estimated by the PSTR panel model : $Y_{it}=m_i+b_0\ X_{it}+b_1\ X_{it}\ G\ (q_{it}, g, c) +\varepsilon_{it}$, where : m is a vector of individual fixed effects and G (q_{it}, g, c), a transition function linked to the transition variable ; i, with threshold parameter smoothing one, g. The smoothing parameter g describes the transition between the two regimes.

To recapitulate, whether there are nonlinearities controlled by q and controlled between x and y. $X_{it}=(x_{1it},....x_{itk})$ is a matrix of explanatory variables that do not contain lagged endogenous variables, $b=(b_1,.....b_k)$. The subscript I=(1.....,N) defines the individual dimension however the subscript t= (1,.....T) defines the temporal dimension. Thus, it is called the explanatory variables (itcp, irpp, tft) for the associated « economic growth « Y », the functional lay out of the model in the following:

3.2 Presentation and interpretation of results

In three paragraphs, we are going to introduce results. The initial one refers to test specification. The second is about the estimation of the PSTR models and the final one is about checking the robustness of obtained results.

a. Specification test

The PSTR specification should define the number of transition functions (r) and the order of (m) to enhance the understanding of the nonlinear relationship between the variables of interest. The goal of the following method : First, we test the linear model (r=0) versus the transition function model (r=1). Thus, the test permits us to check the significance of the threshold effect from a statistical point of view. In the case of significance, it suggests that the relationship between corporate income tax and GDP growth can be modeled by a regime transition one. In the case of rejecting the null hypothesis (r=0), the model must contain at least one transition function (r=1). Then, we test the hypothesis of a model with one

transition function (r=1) against a model with two transition functions ((r=2). Every test is presented with a transition function of order one (m=1) and one of order two (m=2). While, when the number of estimated parameters is going to be increased, the degree of the test or accuracy decreases also.

In addition, to guarantee the estimated reliability, we need at least a minimum number of observations in each mode. That's why we take an interest in transition functions as the two thresholds suggested by Ganzalez and Van Dijik (2005). Moreover, the last specification (r=2 and m=2) : in each mode, the number of points was insufficient for the estimate.

Ferede & Dalby's neoclassical growth model, which shows the impact of tax rates on growth and private investment, we reduce this model and adapt it to the case of Marroco and Algeria, limiting ourselves to the impact of growth. An endogenous growth model (Barro, 1990). Thus, we consider a small open economy with capital mobility. This economy has limited exposure to international interest rates and has no access to international financial markets. It consists of two types of economic agents: a private agent and a public agent.

Thus, we consider a small open economy with the movement of capital. This economy has limited exposure to international interest rates and no access to international financial markets. It consists of two types of economic agents: a private agent and a general agent.

Private agent, representative company, working in the market perfect competition and private investment decisions. Unlike Ferede & Dahlby (2012), the company uses every period of private capital, labor and government capital as factors of production. Its production function is a Cobb-Douglas type function:

$$\boldsymbol{Yt = Ak_t^a\left\{G_{t-1}^p L_t\right\}^b}$$

with:

- **t**, time dimension;
- **A**, exogenous technological shock;
- **a**: the elasticity of substitution of output for public capital and labor factors, or
- **b** : is the elasticity of substitution of private capital,
- $\boldsymbol{K_t}$**,** private capital;
- $\boldsymbol{L_t}$**,** labor factor;
- $\boldsymbol{G_t^p}_{\boldsymbol{-1}}$, state capital, This corresponds to government spending on education and the perceived health of the agents, and will likely increase their effectiveness.

The amount of government spending is decided and raised state costs for employee training and health appearance. Because of these externalities, we assume that the production function is increasing in scale. In each period, the firm collects sales output (ptYt), where p_t is the tft of the final good, pays wages (at the nominal wage rate), and purchases capital goods at c_t. Also, the company has to pay a proportional tax on the profits. The firm's objective is to maximize

after-tax value, defined as the discounted sum of net income, of its activities in each period.

b. Summary statistics

The following tables present the summary statistics of the main variables used in the empirical analysis for each country. These descriptive measures provide an overview of the central tendencies, variability, and minimum values across the sampled observations.

Table 1: summary statistics

Summury statistics for Tunisia				
Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**
Gdp growth	21	2.556429	3.25867	-8.734976
Gdp percap	21	3705.274	442.8185	2881.288
Gdp percap	21	1.554156	3.267009	-9.691726
itcp	21	5.644713	4.343774	-5.242933
pit	11	5.399077	4.555751	.66
tft	21	8.22381	4.110463	1
tw	21	3.342857	.5688334	2.3
Summury statistics for Algeria				
Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**
Gdp growth	21	2.885714	2.417496	-5.1
Gdp percap	21	3830.645	332.0708	3111.176
Gdp percap	21	1.145059	2.525698	-6.826963
itcp	21	3.824179	3.89111	-5.242933
pit	17	4.392231	4.743919	.66
tft	21	7.861905	4.956458	.5
tw	21	3.738095	.4769446	2.8
Summury statistics for Egypt				
Variables	**Variable**	**Variable**	**Variable**	**Variable**
Gdp growth	21	4.352144	1.632437	1.764572
Gdp percap	21	31894.38	4379.792	25298.91
Gdp percap	21	2.307506	1.707321	-.3639276
itcp	21	5.876045	4.206151	-5.242933
pit	13	4.926911	4.315563	.66
tft	21	7.761905	4.670276	.5
wt	21	3.409524	.6015852	2.3
Summury statistics for Morocco				
Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**
Gdp growth	21	3.631795	2.804245	-6.293253
Gdp percap	21	2479.164	407.936	1763.401
Gdp percap	21	2.328393	2.77898	-7.426651
itcp	21	3.992183	4.182004	-5.242933
pit	17	4.392231	4.743919	.66
tft	21	7.814286	4.973961	.5
tw	21	3.714286	.5350567	2.3
Summury statistics for Lybia				

Variables	Obs	Mean	Std. Dev.	Min
Gdp growth	21	1.996336	25.62936	-50.33852
Gdp percap	21	10579.65	2401.894	6670.346
Gdp percap	21	.719396	25.42306	-50.73415
itcp	21	5.393237	4.256435	-5.242933
pit	12	4.821199	4.489843	.66
tft	21	7.261905	4.596681	.5
tw	21	3.423809	.5965775	2.3
Summury statistics for Mauritania				
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**
Gdp growth	21	3.530555	4.724282	-3.918026
Gdp percap	21	1443.494	114.2501	1234.326
Gdp percap	21	.6316247	4.566996	-6.425193
itcp	21	3.942815	4.115138	-5.242933
pit	16	4.086425	4.723273	.66
tft	21	7.447619	4.750749	.5
tw	21	3.695238	.5607817	2.3

3.3 Presentation of variables

Analysis of the tax structure raises several methodological issues, at least two of which should be noted. On the one hand, there are tax policy changes for countries that are interested in having statistical data in the long run. This difficulty led to the use of the World Bank's World Development Indicators (WDI) as the primary data source. On the other hand, there is also the difficulty of finding uniform and reliable statistics that allow cross-national comparisons due to the social and political instability experienced by most of the countries of interest to the study.

Thus, depending on the availability of data, we constructed panel data over the period 1970-2023, i.e. over 53 years for six arab countries. The variables of our model are as follows: The explained variable of the model is the growth rate of the real gross domestic product (y) whose positive variation is a sign of economic growth of the economy considered. The exogenous variable is the corporate income tax. Control variables include personal income tax; foreign trade tax; payroll tax and goods and services tax. According to the economic literature, the expected signs of fiscal variables would be positive but can become negative from a certain level.

Thus, by referring to *itcp*, *pit*, *tft*, and *tw* les variables explicative for the dependent variable "economic growth" Y, the model's functional form appears as follows:

$$Y_{it}=\alpha_0+\alpha_1 itcp_{it}+\alpha_2 pit_{it}+\alpha_3 tft_{it}+\alpha_4 tw_{it}$$

with:

- yit, the growth of gross domestic product in the period t;
- tcp_{it}, the tax on corporate profits in the period t;
- pit_{it}, the tax on personal income in the period t;
- tft_{it}, the tax on foreign trade in the period t;
- tw_{it}, the tax on wages in the period t.

3.4 Empirical approach

We estimate a non-linear relationship between tax variables and economic growth. Regime transition models are best suited to account for the nonlinear dynamics of macroeconomic aggregates. Therefore, we propose a PSTR model based on tax composition. There are at least two reasons to justify such a chotft. First, the PSTR model offers an attractive opportunity to capture heterogeneity in panel data, and second, it separates observations into multiple sets or groups based on the value of a threshold variable (Gonzalez, Terasvirta & Van Dij, 2017). Therefore, unlike Ferede & Dalby (2012), we construct an endogenous growth model à la Barro (1990) with the corporate income tax as a nonlinear source. The model represents two modes. The first concerns the positive effects of ITCP on development. Another is the negative impact on growth for higher levels of ITCP. This nonlinearity is tested using the smooth panel transition (PSTR) method for estimating threshold effects developed by González, Teräsvirta & Van Dijk (2005). Their view is as follows:

The operation (Yit, t Î Z, and i Z) satisfies a binary PSTR representation, if and only if: with y, the variable shown, x, explanation and the transition variable q, the effect of x, conditional on q, can be estimated by the PSTR panel model: yit = mi + b0 xit + b1xit G(qit; g, c) + eit, where; m is a vector of individual fixed effects and G(q; g, c), a transition function associated with the transition variable i, with threshold parameter and smoothing parameter g. The smoothing parameter (g) allows to characterize the transition between the two regimes and to conclude whether there are non-linearities controlled by q and controlled between x and y. xit = (x1it, ... xitk) is a matrix of explanatory variables that do not contain lagged endogenous variables, b = (b1, ..., bk) and where, eit iid (0; sÎ2). The subscript I = (1, ..., N) defines the individual dimension and the subscript t = (1, ..., T) defines the temporal dimension. Thus, calling the explanatory variables (itcp, pit, tft,) for the associated "economic growth" (Y), the functional form of the model is as follows:

$$Y_{it}=\mu_0+\alpha_1 itcp_{it}+\alpha_2 pit_{it}+\alpha_3 tft_{it}+\alpha_4 tw_{it}+\varepsilon_{it}$$

- **Stationarity and linearity tests**

As for the non-stationary control variables, we used the growth rates of the variables to facilitate economic interpretation.

As for the linearity test, its purpose is to prove that the threshold effect is statistically significant and to demonstrate that the relationship between the explanatory variable and the explanatory variable can be represented by a variable model. If the coefficient of 1 is significant, we assume that the corporate income tax has nonlinear effects.

- **Tests for determining the number and order of transition functions**

Determination of the number of transition functions (r) and first, we test a linear (r 0) model against a single transition function (r 1) model. This test allows you to check the significance of the threshold effect from a statistical point of view. If the threshold is significant, this suggests that the relationship between government debt and potential GDP growth can be modeled by a regime transition model. When the null hypothesis (r 0) is rejected, the model must include at least one transition function (r 1). We then test the hypothesis of a model with one transition function (r 1) against a model with two transition functions (r2). Each

test is performed with a transfer function of one (m 1) order and two (m 2) orders are given.

The behavior of each transition function (m) provides a better understanding of the nonlinear relationship between the variables of interest. The following is the procedure for this acceptance. It is possible to test a model with three transitional functions and more with orders greater than two (m2). But when the number of parameters to be estimated increases, the degree of freedom of the tests decreases and decreases. The accuracy of the tests. There should also be a minimum level of feedback in each system to ensure the reliability of the estimates. For all these reasons, we restricted ourselves to two transitional and thresholding functions as recommended by González, Teräsvirta, and Van Dijk (2005).

3. Presentation and interpretation of results

Table 2: Estimation with different countries

	Algeria	**Egypt**	**Lybia**	**Marocco**	**Mauritania**	**Tunisia**
	(1)	(2)	(3)	(4)	(5)	(6)
	gdp growth annual	gdp growth annual	gdp growth annual	gdp growth annual	gdp growth annual	gdp growth annual
L.gdp growth annual	0.448	-0.668	-0.525	-0.322	-0.605**	-0.653**
	(1.49)	(-1.64)	(-1.52)	(-1.13)	(-2.46)	(-2.52)
itcp	-0.0434	-0.241**	0.848	0.176	-0.505	-0.780
	(-0.38)	(-2.11)	(0.28)	(1.09)	(-1.12)	(-1.43)
pit	-0.118	0.295**	-0.0699	-0.194	0.751	0.810
	(-0.67)	(2.28)	(-0.01)	(-0.81)	(1.31)	(1.44)
tft	0.294*	0.350**	-0.255	0.347*	-0.466	-0.737
	(1.85)	(2.52)	(-0.07)	(1.78)	(-0.92)	(-1.26)
tw	-0.101	1.078***	-0.274	0.546	2.160**	-1.846
	(-0.37)	(3.03)	(-0.04)	(1.30)	(2.24)	(-0.42)
N	16	12	11	16	15	15

According to the results of the coefficients generated through statistical tests in the first econometric model, we can say that VAT, as the most important tax in the structure of state income, has positively affected the Republic of Kosovo's economic growth (GDP), while the Withholding Tax (TB), on the other hand, has also been significant, as it has positively affected economic growth. Furthermore, the results of the second econometric model show that the impact is significant, and we can conclude that Individual Business Tax, Interest Tax, Dividend, Property Rights, Rent, Lottery Winnings and Gambling, and Corporate Tax all had a positive impact on the Republic of Kosovo's economic growth during the studied period.

The results are presented in three paragraphs. The first refers to the specification tests, the second to the estimation of the PSTR model, and finally to the robustness test to check the robustness of the obtained results.

- **Specification tests**

Specification tests include variable stationarity analysis, which shows that all variables are stationary at the level, linearity tests (Table 1), tests to determine the number of transition functions and the order of the transition function (Table 2). The PSTR specification should define the number of transition functions (r) and the order of each of them (m) to better understand the nonlinear relationship between the variables of interest. The following method was adopted for this purpose:

First, we test the linear model (r = 0) versus the transition function model (r = 1). This test allows you to check the significance of the threshold effect from a statistical point of view. If the threshold is significant, it suggests that the relationship between corporate income tax and GDP growth can be modeled by a regime transition model. Next, we test the hypothesis of a model with one transition function (r = 1) against a model with two transition functions (r = 2). Each test is performed with a transition function of order one (m = 1) and one of order two (m = 2). A model with a transition function of 3 and orders of magnitude greater than two can be tested (m > 2). However, when the number of parameters to be estimated increases, the degree of freedom of the tests decreases and the accuracy of the tests decreases.

Table 3: Estimation with robustness check

	Algeria		**Egypt**		**Lybia**		**Marocco**		**Mauritania**		**Tunisia**	
	(1)		(2)		(3)		(4)		(5)		(6)	
	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdpperc apita	gdp percapit a
L.gdp percapita	0.790***	0.593**	0.986***	-0.676	-0.423	-0.517	0.907***	-0.262	0.631***	-0.653**	0.612**	0.0845
	(5.72)	(2.01)	(22.07)	(-1.41)	(-0.87)	(-1.25)	(8.88)	(-0.79)	(3.18)	(-2.52)	(2.54)	(0.10)
itcp	-21.82	-0.0572	-42.61	-0.246*	-238.1	1.082	-4.196	0.222	-2.862	-0.780	-0.902	-0.589
	(-1.38)	(-0.35)	(-0.99)	(-1.83)	(-0.73)	(0.22)	(-0.30)	(0.99)	(-0.30)	(-1.43)	(-0.03)	(-1.06)
pit	20.54	-0.109	64.85	0.286**	175.2	-0.09	9.378	-0.174	4.897	0.810	13.45	0.524
	(1.18)	(-0.60)	(1.20)	(2.02)	(0.50)	(-0.02)	(0.61)	(-0.71)	(0.49)	(1.44)	(0.34)	(0.69)
tft	-27.77	0.243	54.63	0.407**	319.7	-0.138	-11.98	0.373	-11.56	-0.737	-7.497	-0.552
	(-1.62)	(1.22)	(1.15)	(2.01)	(1.05)	(-0.03)	(-0.79)	(1.53)	(-1.08)	(-1.26)	(-0.19)	(-0.86)
tw	-257.7	-0.334	72.77	1.138	2537.8	3.214	-96.90	1.595	-57.09	-1.846	146.2	-3.956
	(-1.62)	(-0.19)	(0.17)	(0.87)	(0.85)	(0.07)	(-0.69)	(0.69)	(-0.73)	(-0.42)	(0.50)	(-0.90)
_cons	2015.4**	0.0877	299.0	-4.048	3797.7	-16.81	703.6	-6.423	845.9*	14.05	970.1	20.70
	(2.33)	(0.01)	(0.14)	(-0.73)	(0.28)	(-0.07)	(1.03)	(-0.60)	(1.69)	(0.70)	(0.66)	(0.99)
	16	12	12	12	11	11	16	16	15	15	11	11

Also, to guarantee the reliability of the estimates, there should be a minimum number of observations in each mode. For these reasons, we limited ourselves to two transition functions and two thresholds as suggested by González, Teräsvirta & Van Dijk (2005). Furthermore, for the last specification (r = 2 and m = 2) the number of points in each mode was insufficient for the estimate. The linear test results are recorded in the table below.

Table 4: Estimation with different tests

Variables	Tests	H0: r=0 vs H1: r=1		H0: r=1 vs H1: r=2	
		m=1	m=2	m=1	m=2
Log (Tcpib)	Wald (LM)	4,775 (0,028)	4,775 (0,028)	2,289 (0,042)	-
	Fischer (F)	4,542 (0,033)	4,542 (0,033)	2,123 (0,046)	-
	Pseudo LRT	4,804 (0,028)	4,804 (0,028)	2,745 (0,038)	-

Source: Authors from STATA software

***Note**: Values in parentheses (.) are p-values; (-) means no results because the number of points is insufficient for the estimation of this specification.*

The results show that the linear hypothesis is rejected for both transitional functions. However, we find that the linear deviation is more significant for the specification with a transition function. That's why we chose these specifications. The linear test statistic for the transition function is the same regardless of the order of the transition function. To define a single-thre shold versus a binomial specification, we used other criteria listed in Table 2 below. Looking at this table, the single-threshold specification contains the lowest AIC, Schwartz criterion, and estimation error.

Table 5: Determination of the order of the transition function

Variables	Threshold Value	Criterion AIC	Criterion Schwarz	Estimation Error
Log (G GDP)	m=1	-6,278	-6,198	0,042
	m=2	-6,273	-6,183	0,043

Source: Authors from STATA software

PSTR model estimation

To obtain the results, we ran the STATA program. A summary of the results is shown in Table 5 below:

Table 6: Estimation results

Variables	Coefficients	Ecart type	P-Value
Threshold Value (C)	0,127***	0,015	0,000
Personal Income	-0,233	0,634	0,712
Foreign Trade	0,709***	0,224	0,001
income	0,283	0,632	0,654

Variables	Coefficients	Ecart type	P-Value
Goods and Services	0,067	0,251	0,787
Centered R^2	0,085		
R-Bar^2	0,073		
Nb. Obs	399		
Nb. countries	06		
F Fisher F(5,393)	7,349	P-value=0,000	

***Source**: Authors from STATA software. Note: *** denotes significance at 1%*

The estimation results allow us to analyze the impact of a single period increase in the corporate income tax rate on the relationship between corporate income tax and economic activity.
b0 and b1 with coefficient signs.
The B0 coefficient is positive (0.569). This corporate income tax has a positive effect on the economy when the corporate income tax is less than 12.7%. In this case, the tax policy is effective. On the other hand, when the corporate income tax rate is above the critical threshold, the impact of corporate income tax policy is negative (-1.013). The intuition behind this conclusion is that taxing corporate profits initially provides the necessary resources to finance productive government spending that promotes growth.

Indeed, revenues from the corporate income tax can be used, on the one hand, to hire government employees (with increased employment), and on the other hand, to increase the confidence of foreign investors in the stability and solvency of the country's debts. As for the control variables, the coefficient signs are contrary to our expectations. On the other hand, the impact of these variables on the production potential of the selected countries is not significant when excluding taxes on foreign trade. The effects of the control variables were non-significant, suggesting that they do not have a direct effect on production potential, although they did not have the expected signs. From a theoretical point of view, the results are consistent with the view that the effectiveness of tax policy depends on the level of taxation.

Robustness Tests To check the robustness of our results, we performed regressions on the instrumental variables and, to question the endogeneity of the variables of interest, we estimated DMC (double least squares). Indeed, the endogeneity of the explanatory variables makes the estimated coefficients non-convergent. The economic literature identifies three main sources of endogeneity, namely measurement errors in explanatory variables, causality between dependent variables and exogenous variables, and omission of key explanatory variables in regression.

The DMC method consists of regressing a hypothesized endogenous variable that is exogenous to the model and strongly correlated with it. These regressors, called instruments, allow us to capture the exogenous component of the explanatory variable and generate unbiased estimates. We consider as endogenous variables our variables of interest, namely corporate income tax rate (corp), corporate income tax rate lagged one period (itcp_1) and corporate income tax. And corporate income taxation (itcp_interac) allows us to evaluate the effectiveness of the tax policy of corporate income taxation. The instruments used are lags in

corporate income tax of orders 2 and 3 and the logarithm of the growth rate of orders 1 to 3. We first conducted a Hausman test, which led us to choose a random-effects model over the destination. effects. At the end of the assessment, Sargan & Hansen tests are conducted to check the reliability of the results. Thus, the results of these tests indicate that the hypothesis about the validity of the instruments is accepted. These results are consistent with PSTR estimates. Corporate income tax has a positive but insignificant effect on economic growth efficiency. However, its effect is significantly negative when it is associated with corporate income tax deferred for one period (itcp_interac). The results of the DMC estimation are fully consistent with the hypothesis maintained throughout this study. A high level of corporate income tax is likely to reduce the effectiveness of tax policy and thus harm economic growth.

Table 7: Results of DMC estimates

Variables	Coefficients	Ecart type	P-Value
Company profits	3,205	3,088	0,299
Corporate profits (-1)	4,682***	2,051	0,022
Benefits of interaction companies	-58,759***	26,716	0,028
Personal income	3,734***	1,545	0,016
Trade	0,202	241	0,402
Wages	-2,331***	1,063	0,028
Goods and services	-0,383	0,466	0,411
Constant	4,494***	0,067	0,000
Anderson cannon	6,59	Chi-sq(3) P-	
		val=0,086	
Cragg-Donald Wald F statistic	1,305		
Sargent statistic	0,28	Chi-sq(2) P-	
		val=0,869	
Source: Authors from STATA software. Note: * indicate p < 0.01.**			

Conclusion and Economic Policy Implications

This paper, based on an endogenous growth model, has made it possible to determine the impact of corporate income tax rates on growth in six (6) arab countries 1970-2016. We have shown that the bias of tax rates towards growth should not be negated. We show that corporate income tax has a positive effect on the economy when the marginal tax rate is less than 12.7%. In this case, the tax policy is effective. On the other hand, when the level of taxation on corporate profits exceeds a critical threshold, the impact of tax policy on growth becomes negative. Such a result requires at least two different explanations, namely, higher tax rates as a driver of investment and poor tax policy that can destroy the negative economy. Such a result requires at least two different explanations, i.e. higher tax rates as a driver of investment and bad tax policies that can destroy the economy.

Tax rates as a driver of investment

It is true that a reduction in corporate taxes can lead to an increase in investment. However, if there is no demand for their products, companies will not

invest even for a tax rate close to zero (Stiglitz, 2016). Thus, by employing government employees and thereby consuming goods and services, tax revenue also enables the government to act as a consumer of goods and services.

Bad tax policies can accelerate the collapse of the economy.
Heavy taxation is likely to disrupt employment and the economy. Indeed, it reduces the ability of companies to create jobs and, on the one hand, affects the income that consumers can use to purchase goods and services, thus causing a loss of activity. As a result, tax revenues may decrease. Considering the above, we recommend creating a good "tax system", that is, a less corrupt, disproportionate, targeted and democratic tax system.

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