Theoretical and Applied Economics
Volume XXIV (2017), No. 3(612), Autumn, pp. 125-146

Does fiscal policy spur economic growth? Empirical evidence from Algeria

Amal MATALLAH
University of Abou Bekr Belkaid, Tlemcen, Algeria
amel.matallah@yahoo.com
Siham MATALLAH
University of Abou Bekr Belkaid, Tlemcen, Algeria
siham.maatallah@yahoo.com

Abstract. *The present paper aims to investigate the impact of fiscal policy on economic growth in Algeria over the period 1970-2015, by using Johansen cointegration test and vector error correction model (VECM). The main results reveal that both indirect taxes and productive current expenditures have a significant long-term positive impact on real GDP, while direct taxes, capital and unproductive recurrent expenditures negatively and significantly affect economic growth in the long run. Based on these findings, it could be concluded that sustainable economic growth requires serious policy measures aimed at diversifying the Algerian economy.*

Keywords: fiscal policy, economic growth, Algeria, Johansen cointegration test, vector error correction model (VECM).

JEL Classification: C22, E62, O40, O55.

1. Introduction

Fiscal policy includes deliberate government actions in the area of spending money and levying taxes in order to affect the macroeconomic variables in the desired direction (Khan et al., 2012: pp. 53-82). It has dominated recent public policy negotiations in different economies, especially regarding economic and fiscal issues like high unemployment, insufficient national savings, excessive budget deficits, and increasing public debt burdens (Odhiambo et al., 2013: pp. 306-323). In this context, fiscal policy is a very important tool for achieving macroeconomic stability and attaining sustained economic growth.

According to the neoclassical growth model, fiscal policy can affect only the level of output, not its long-run rate of growth. In other words, the impact of fiscal policy on economic growth is temporary as the economy moves from one steady-state equilibrium to another. Endogenous growth models, by contrast, assert that economic growth depends on endogenously determined factors like physical and human capital accumulation, technical progress, and government economic policy. Thus, these models tend to convert the temporary growth effects of fiscal policy into permanent effects through providing mechanisms by which fiscal policy variables can influence both the level of output and the steady-state growth rate (Easterly and Rebelo, 1993: pp. 417-458; Kneller et al., 1999: pp. 171-190).

Algeria is one of the developing countries that are well endowed with natural resources, further the great dependence of the Algerian economy on oil exports as a major source of hard currency earnings, made economic growth more vulnerable to fluctuations in global oil prices. The deep roots of today's emergency situation in Algeria can be revealed with a glance back at this country’s governance and institutional tissue. Notwithstanding some economic progress has been achieved, blind reliance on oil remains the economic mainstay of Algeria, and what makes matters worse is that the private sector itself is heavily dependent on public expenditure (IMF, 2015). Obviously, non-oil GDP growth seems, at first sight, much more closely tied to the oil price growth, as the hike in oil prices boosts non-oil GDP growth by rising government spending. Emphasis on collecting non-oil revenues really frustrates the flexibility of the Algerian economy and decreases its ability to respond to adverse shocks. Furthermore, non-oil GDP growth rate in Algeria is now even more concentrated in service industries that depend to a large extent on demand expansion resulted from oil sales, and on the other hand non-oil sectors are poorly equipped to deal with plummeting oil prices (IMF, 2014a). Therefore, there exists a dire need to diversify the economic base, underpin public financial management reforms and ensure that capital spending is productive.

In light of daunting challenges that lie ahead in Algeria, this paper thus aims to unearth very interesting and research-worthy aspects of this intractable situation by testing the impact of fiscal policy variables on economic growth in Algeria over the period 1970-2015. For this purpose, the paper is divided into five sections. After introducing the topic in section 1, section 2 presents the theoretical and empirical background of the relationship between fiscal policy and economic growth, section 3 discusses fiscal policy and economic growth in Algeria, section 4 introduces the data, explains the methodology, and analyzes the empirical results and finally section 5 concludes the paper and draws some policy implications.

2. Theoretical and empirical review on fiscal policy and economic growth

An analysis of the relationship between fiscal policy and long-run growth requires identifying the various channels through which tax policy, expenditure policy, and overall budgetary policy could affect growth through their impact on Musgrave's three economic branches, namely: allocation, distribution, and stabilization (Tanzi and Zee, 1997: pp. 179-209).

One of the most important links between tax policy and growth is based on the idea that all taxes are non-neutral except lump-sum levies, which are broadly ineffective as a practical tool. With non-neutral taxes, the allocative decisions of private economic agents will be completely different from those that would be taken in the absence of these taxes (Auerbach, 1985: pp. 61-127; Tanzi and Zee, 1997: pp. 179-209). In general, the existence of such tax-induced distortion leads to inefficiency in the entire economy.

Additionally, it should be noted that the rate of change in the level of taxation represents the appropriate variable that can be used to obtain the actual effects of taxes on long-run growth. Engen and Skinner (1992) pointed out that there is a negative and statistically significant association between taxation and output growth. Similarly, Easterly and Rebelo (1993) used thirteen tax measures in order to determine the significance of various tax rate variables in explaining growth differences across countries, they found that a marginal income tax rate computed by employing a time-series regression of income tax revenue on GDP is the only tax rate variable that is statistically significant. However, Mendoza et al. (1997) showed clearly that reductions in income taxes increase the private investment rate, while consumption tax cuts have a strong negative effect on investment.

On the other hand, the effectiveness of fiscal policy in promoting economic growth depends on whether or not public spending crowds out private spending on investment and consumption. For example, if the government increases its spending without any corresponding increase in public revenue, it results in a deficit budget (Akpan and Abang, 2013: pp. 36-52). Accordingly, if the deficit is financed by issuing domestic debt, it can have an adverse impact on economic growth as a result of rising domestic interest rates, thereby crowding out private sector spending (Kandil, 2006: pp. 463-486). Furthermore, if the increase in spending is financed through money creation, it may lead to higher inflation which, in turn, causes nominal interest rates to go up, thus reducing private expenditure (Wahab, 2011: pp. 574-590). This has the effect of curbing economic activities in the short run and hampering capital accumulation in the long run, thereby leading eventually to a sharp decline in economic growth rates.

The nature of the relationship between public spending and long-run growth should be determined taking into account the rate of change in the level of public spending as a fundamental variable in the model. Indeed, in the context of analyzing the effects of government spending composition, many studies have indicated that public investment spending contributes to increased private capital accumulation, which in turn leads to higher rates of economic growth, while public consumption expenditure has the potential to hinder growth (Grier and Tullock, 1989: pp. 259-276; Barro, 1991: pp. 407-443; Easterly and Rebelo, 1993: pp. 417-458; Hansson and Henrekson, 1994: pp. 381-401; Tanninen, 1999: pp. 1109-1117; Bose et al., 2007: pp. 533-556). As well as, Kneller et al. (1999)

revealed that high levels of productive expenditures significantly foster economic growth for a panel of Organization for Economic Cooperation and Development (OECD) countries, whereas unproductive expenditures have a neutral impact on growth.

According to the neoclassical growth model (Solow, 1956: pp. 65-94; Swan, 1956: pp. 334-361), the steady-state growth rate is determined by two exogenous factors namely, the rate of population growth and the pace of technological advance. Since these factors are independent of the decisions of economic agents, fiscal policy can affect only the level of output, not its long-run rate of growth. In other words, the impact of fiscal policy on economic growth is temporary as the economy moves from one steady-state equilibrium to another (Kneller et al., 1999: pp. 171-190; Erős, 2010: pp. 11-17; Ahmad and Wajid, 2013: pp. 196-215). Endogenous growth models, by contrast, assert that economic growth depends on endogenously determined factors like physical and human capital accumulation, technical progress, and government economic policy (Romer, 1986: pp. 1002-1037, 1990: pp. S71-S102; Lucas, 1988: pp. 3-42; Barro, 1990: pp. S103-S125; Rebelo, 1991: pp. 500-521; Aghion and Howitt, 1992: pp. 323-351; Barro and Sala-i-Martin, 1992: pp. 645-661, 1995). Thus, these models tend to convert the temporary growth effects of fiscal policy into permanent effects through providing mechanisms by which fiscal policy variables can influence both the level of output and the steady-state growth rate (Easterly and Rebelo, 1993: pp. 417-458; Kneller et al., 1999: pp. 171-190). Accordingly, Gemmell (2001) pointed out that the long-run growth effects of fiscal policy can be achieved in several ways, such as production externalities, productivity growth, productivity differences between the public and private sectors, fiscal effects on factor accumulation, crowding-out and redistribution. Also, Dar and Amir Khalkhali (2002) argued that fiscal policy instruments, which mainly include taxation, public expenditure, and aggregate budgetary balance have wide-ranging effects on long-term growth performance through their impact on the efficiency of resource use, the rate of factor accumulation and the pace of technological progress.

In addition, the public-policy endogenous growth models distinguish four main components of the government budget: 1) distortionary taxes (i.e. taxes on income, profits, payroll, and property as well as social security contributions), which dampen incentives to invest in physical/ human capital, thereby slowing down economic growth; 2) non-distortionary taxes (i.e. taxes on domestic goods and services), which do not affect saving and investment incentives, and hence long-run growth rates; 3) Productive expenditures that enter the private production process as intermediate inputs and increase the marginal productivity of capital and labour, thus raising the steady-state growth rate of the economy (e.g. spending on general public services, defense, education, health, housing, transport and communication); and 4) unproductive expenditures that provide direct benefits to households, but do not enter into the private production function, therefore leaving the growth rate unchanged (such as social security and welfare, recreation, and economic services) (Barro, 1990: pp. S103-S125; Barro and Sala-i-Martin, 1992: pp. 645-661, 1995; Devarajan et al., 1996: pp. 313-344; Kneller et al., 1999: pp. 171-190; Angelopoulos et al., 2007: pp. 885-902; Ferreiro et al., 2008: pp. 84-108).

Based on the above classification of fiscal instruments, Kneller et al. (1999) showed that shifting the tax structure from direct taxation to less distortionary indirect taxes is very effective in boosting economic growth, while switching the composition of government spending from productive to unproductive expenditures has a profoundly growth-retarding effect. Further, he argued that productive spending financed by non-distortionary taxation is positively associated with economic growth. However, this relationship is supposed to be ambiguous when distortionary tax finance is employed. On the other hand, financing non-productive expenditures through distortionary taxes exerts a strong negative influence on growth, but when a non-distorting tax system is used to finance these expenditures, the predicted impact on growth rates tend to be neutral.

The impact of fiscal policy variables on economic growth has received a great deal of attention from economists especially in last decades, and the table below summarizes the empirical studies that have investigated this topic.

Table 1. *Empirical evidence on the impact of fiscal policy on economic growth*

Authors	***Sample***	***Empirical approach***	***Results***
Barro (1991)	98 countries 1960-1985	Panel data analysis	Growth is inversely related to the share of government consumption in GDP, but insignificantly related to the share of public investment.
Easterly and Rebelo (1993)	100 countries 1970-1988	Panel data analysis	Public investment in transport and communication has a significant positive impact on growth; general government investment is positively correlated with both growth and private investment; and public enterprise investment is negatively associated with private investment.
Devarajan et al. (1996)	43 developing countries 1970-1990	Panel data analysis	The share of current expenditures in total expenditures is positively and significantly associated with per capita real GDP growth, while the capital component of public expenditure is negatively and significantly related to per capita growth.
Kneller et al. (1999)	22 OECD countries 1970-1995	Panel data analysis	Distortionary taxes have a significant negative impact on economic growth, while productive expenditures positively affect growth. Non-distortionary taxes and unproductive expenditures, on the other hand, have no significant effect on growth.
Kweka and Morrissey (2000)	Tanzania 1965-1996	Engle-Granger cointegration test and error correction model (ECM)	Productive expenditure is negatively related to economic growth, while consumption expenditure is positively associated with growth. In contrast, the correlation between real GDP growth and government expenditure on human capital seems to be statistically insignificant.
M'Amanja and Morrissey (2005)	Kenya 1964-2002	The Autoregressive Distributed Lag (ARDL), Granger causality tests	Productive expenditure has a strong adverse impact on growth, whilst unproductive expenditure and non-distortionary taxes have neutral effects on growth. Further, public investment plays an important role in promoting long-run growth.
Ghosh and Gregoriou (2006)	15 developing countries 1972-1999	The OLS (fixed effects) model, the GMM single equation framework and the GMM system	Current (capital) expenditure has positive (negative) and significant effects on the growth rate.
Bose et al. (2007)	30 developing countries 1970-1990	Panel data analysis	The share of government capital expenditure in GDP is positively and significantly correlated with economic growth, while the growth effect of current expenditure is insignificant.
Enache (2009)	Romania 1992-2013	The ordinary least squares (OLS) technique	Distortionary public revenues are negatively and significantly associated with economic growth, while productive public expenditures are not significantly related to growth. Moreover, the budgetary balance has a significant positive impact on real GDP growth.

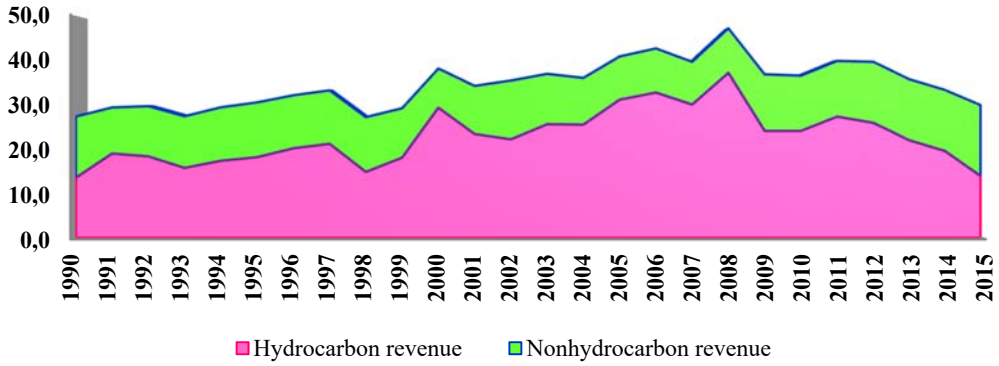
Authors	*Sample*	*Empirical approach*	*Results*
Adefeso et al. (2010)	Nigeria 1970-2005	Johansen cointegration test and Error Correction Model (ECM)	Non-productive expenditures financed by non-distortionary taxes have a neutral impact on economic growth, whereas productive expenditures have a positive growth effect.
Joharji and Starr (2010)	Saudi Arabia 1969-2005	Johansen cointegration test and the VECM approach	Public spending has a significant positive effect on long-run growth. Moreover, current expenditure is more growth enhancing than capital expenditure.
Babalola and Aminu (2011)	Nigeria 1977-2009	Engle-Granger cointegration test, Error Correction Model	There is a positive and statistically significant long-run relationship between productive expenditures and economic growth. Further, distortionary revenue exerts a positive influence on growth.
Scarlett (2011)	Jamaica 1990-2010	The ARDL model and Granger causality tests	Indirect taxes exhibit a positive impact on long-run growth, while direct taxes are negatively linked with per capita GDP.
Olasunkanmi and Babatunde (2012)	Nigeria 1981-2010	Johansen cointegration test and ordinary least squares (OLS) technique	Distortionary taxes, non-distortionary taxes, productive expenditures and fiscal deficit contribute to Nigeria's economic growth.
Hamdi and Sbia (2013)	Bahrain 1960-2010	Johansen cointegration test and vector error correction model (VECM)	Oil revenues and total government expenditures are positively and significantly associated with economic growth. Further, there is a unidirectional causal relationship running from oil revenues to GDP.
Ahmad and Wajid (2013)	Pakistan 1979-2009	The Autoregressive Distributed Lag (ARDL) model	Non- productive expenditures and non-distortionary taxes have neutral impact on economic growth in both the long run and the short run. Productive expenditures are positively and significantly associated with economic growth. While, distortionary taxes have a negative and significant impact on growth.
Madni (2013)	Pakistan 1979-2012	The ARDL approach	Unproductive government spending is negatively associated with economic growth, whereas productive government spending has no significant effect. Also, private investment is positively and significantly related to growth. On the other side, direct and indirect taxes have no significant impact on the pace of economic growth in Pakistan.
Takumah (2014)	Ghana 1986-2010	Granger causality test, Johansen cointegration test and the VECM approach	There is a unidirectional causality running from tax revenue to economic growth. Further, tax revenue has a statistically significant positive effect on economic growth in both the short and long run.
Maşca et al. (2015)	27 EU countries 1995-2011	The least squares method for panel data, fixed and random effects models.	Unproductive expenditures hinder economic growth while productive expenditures enhance it. Further, total taxes and public debt negatively influence the growth rate.
Arin et al. (2015)	28 OECD countries 1990-2009	Bayesian Model Averaging (BMA)	Productive public spending and budget surplus have a strong positive effect on economic growth, while, top corporate tax rates and other revenues have a robust negative impact on growth. Further, top income tax rates, government consumption, other expenditures, and distortionary taxes have no significant effect on economic growth.

Source: Constructed by authors.

3. Fiscal policy and economic growth in Algeria

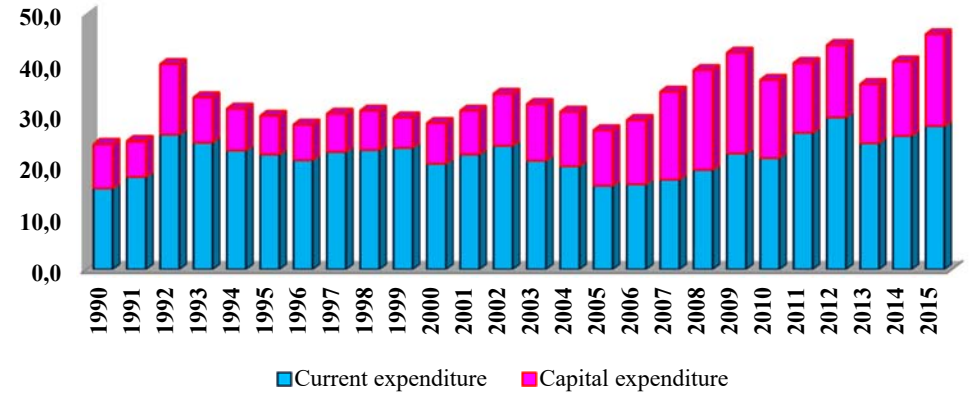
3.1. Fiscal policy and challenges facing Algeria

Figure 1. *Hydrocarbon and nonhydrocarbon revenues (% of GDP) in Algeria, 1990-2015*



Source: The National Statistical Office of Algeria (ONS), Statistical Retrospective 1962-2011 and the Ministry of Finance: General Directorate of Taxes.

Figure 2. *Capital and current expenditures (% of GDP) in Algeria, 1990-2015*

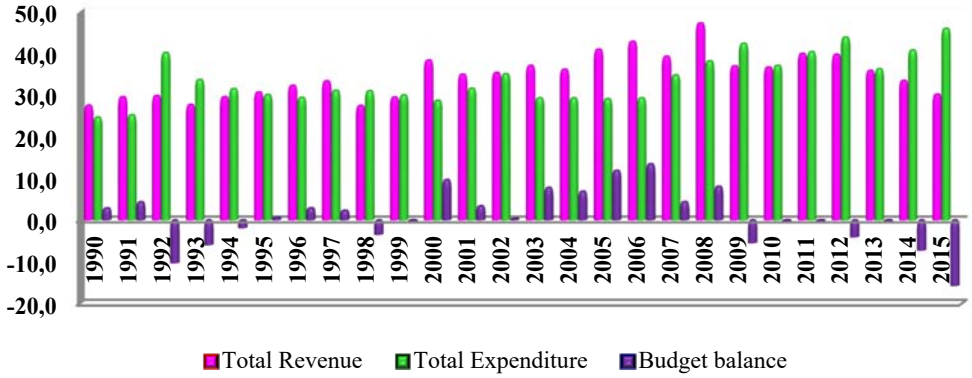


Source: The National Statistical Office of Algeria (ONS), Statistical Retrospective 1962-2011 and the Ministry of Finance: General Directorate of Budget.

According to the Bank of Algeria's 2014 annual report, the hydrocarbon sector remains Algeria's primary growth engine, and, of course, the government spending itself is always waiting for a handout from the oil sector, reflecting the fact that the Algerian economy is still being held hostage to hydrocarbon revenues. This is the harvest of the slothful dependence on oil rents in generating non-shameful growth rates since independence, and this period was long enough for structural distortions to be roosted in the whole economy. The fiscal policy adopted since 2001 led to a significant increase in public expenditure from 47 percent of non-oil GDP in 2001 to 52 percent in 2004. On the other hand, the nonhydrocarbon primary budget deficit increased to about 32 percent of NHGDP in 2004, compared with 29.5 percent in 2003, largely affected by the reduction of import taxes and

the decline in non-tax revenue (IMF, 2005). In 2009, Algeria posted its first overall fiscal deficit of about 8 percent of GDP, mainly due to a sharp fall in hydrocarbon revenues, however, non-oil revenues grew by 20 percent, driven by the further modernization of the revenue administration and higher income tax collections. On the other hand, current expenditure increased by 15 percent in 2009 as a result of additional maintenance costs of new infrastructure and employment support programs, while capital expenditure remained stable in real terms (IMF, 2010). After that, the budget deficit declined to 1.5 percent of GDP in 2013 from 5 percent in 2012, thanks to the consolidation measures adopted by the government in its 2013 budget (IMF, 2014b). However, in 2015, the overall budget deficit rose to about 16.4 percent of GDP as a result of lower oil revenues and increased public expenditure (both current and capital) (IMF, 2016).

Figure 3. *Overall budget balance (% of GDP) in Algeria, 1990-2015*



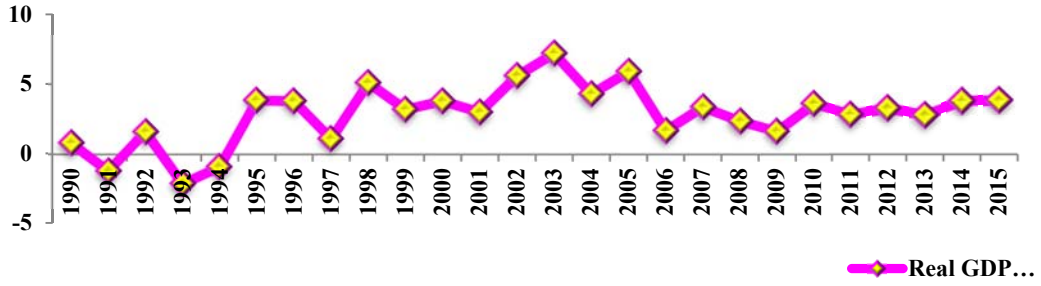
Source: The National Statistical Office of Algeria (ONS), Statistical Retrospective 1962-2011 and the Ministry of Finance: General Directorate of Budget.

Indeed, falling oil prices urge the Algerian government to acclimate to the new situation by abruptly adjusting its expenditure and revenue policies in order to stay the course during tough times. Past omission and lowering the gaze on such situation, stemming from mazes of geostrategic conflicts and hidden financial interests, unearth numerous bets and force the government to undergo austerity and tighten the public spending belt. Efforts should be made to freeze spending on lower priority projects and maintain it in high-priority areas that closely concern those who have limited purchasing power. The Revenue Regulation Fund (RRF) has been almost depleted due to the slump in oil prices; the option of external borrowing will be a solution of last resort, as this looks rather like dancing with one leg suffering from osteoporosis, particularly given high international interest rates. The government should embark on a feasible and publicly palatable privatization scheme, speed up the reform of the state-dominated banking sector, and curb tax evasion. A new World Bank report stresses the longstanding need for economic diversification and urgency of non-oil sector recovery to lift economic growth (World Bank, 2016), because the longer the consumerism and near-total dependence on black gold persist, the greater will be the bitterness of economic adjustment.

3.2. Economic growth in Algeria

Algeria had a strong economic growth during the past decade due to high hydrocarbon revenues and prudent macroeconomic policies broadly adopted since 1990 in the context of increasing oil revenues, and this led to the acceleration of economic growth and the creation of a solid financial position with large external reserves (IMF, 2012). Real GDP growth declined from 2.4 percent in 2000 to 2.1 percent in 2001, largely reflected lower hydrocarbon output owing to reduced OPEC oil quotas, while growth in the non-oil sector increased to 4.5 percent (IMF, 2003). However, in 2003, overall GDP growth rose significantly to about 7 percent because of higher oil production and accelerating activity in services, construction, and industry, as well as the positive effects of the government's Economic Recovery Program that helped push up the growth in the nonhydrocarbon sector (IMF, 2005, 2006). Then, it declined to about 2 percent in 2009 due to lower global demand for hydrocarbons and the significant fall in crude oil prices under the impact of the global financial crisis. On the other hand, nonhydrocarbon GDP growth reached 9 percent in 2009, reflecting strong performance in the sectors supported by the Public Investment Program (PIP) (IMF, 2010). In 2013, real GDP grew by 2.8 percent, held back by the continued decline in hydrocarbon output and the slowdown in public spending. Non-oil GDP growth, however, remained relatively steady at around 7.1 percent, driven by continued strong growth in the agricultural and services sectors (IMF, 2014 b), after that overall GDP growth increased slightly in 2015 to reach 3.9 percent, compared with 3.8 percent in 2014, mainly boosted by high oil production (IMF, 2016).

Figure 4. *Gross domestic product, constant prices (percent change) in Algeria, 1990-2015*



Source: IMF, World Economic Outlook (WEO) database, the data are available online at: http://www.imf.org/ (accessed 24/01/2017).

4. Data and empirical results

4.1. Data description and sources

In the present study, we employ annual data covering the period 1970-2015 to investigate the relationship between fiscal policy and economic growth. The dataset includes the following variables:

GDP: Gross Domestic Product (constant 1980 prices, LCU) is used as a proxy for economic growth, from the World Bank's World Development Indicators (WDI) database.

DT: Direct Taxes (constant 1980 prices, LCU), which refer to those taxes that are levied on the income and profits of individuals and corporations. These taxes are used as a proxy for distortionary taxes and are obtained from the Algerian National Statistical Office and the Ministry of Finance: General Directorate of Taxes.
IDT: Indirect Taxes (constant 1980 prices, LCU), which basically include those taxes and duties that are levied on goods and services. These taxes are used as a proxy for non-distortionary taxes and are obtained from the Algerian National Statistical Office and the Ministry of Finance: General Directorate of Taxes.
PCE: Productive Current Expenditures (constant 1980 prices, LCU), which include current expenditures on education, health, transport and communication, housing, and general public services. Data on these expenditures are obtained from the Ministry of Finance: General Directorate of Budget.
UCE: Unproductive Current Expenditures (constant 1980 prices, LCU), which represent total recurrent expenditures less productive current expenditures, and they mainly include interest payments, subsidies, public administration, and defense expenditure. The data source is the Ministry of Finance: General Directorate of Budget.
GCE: Government Capital Expenditures (constant 1980 prices, LCU) are used as a proxy for public investment and are obtained from the Ministry of Finance: General Directorate of Budget.
PINV: Private Investment (constant 1980 prices, LCU), which represents gross fixed capital formation of the private sector, and it is obtained from the World Bank's World Development Indicators (WDI) database.
LF: denotes total labor force, from the World Bank's World Development Indicators (WDI) database.

4.2. Model specification and estimation methods

This study examines the impact of fiscal policy variables on economic growth in Algeria over the period 1970-2015 using the following model:

$$\mathrm{LNGDP_t} = \beta_0 + \beta_1 \mathrm{LNDT_t} + \beta_2 \mathrm{LNIDT_t} + \beta_3 \mathrm{LNPCE_t} + \beta_4 \mathrm{LNUCE_t} + \beta_5 \mathrm{LNGCE_t} +$$

$$+\beta_6 \mathrm{LNPINV_t} + \beta_7 \mathrm{LNLF_t} + \varepsilon_t$$

where LNGDP represents the natural log of gross domestic product, LNDT and LNIDT are natural logs of direct taxation and indirect taxation, LNPCE and LNUCE are natural logs of productive current expenditures and unproductive current expenditures, respectively, LNGCE stands for the natural log of government capital expenditures, LNPINV is the natural log of private investment, LNLF denotes the natural log of labor force, and ε_t is a white noise error term with zero mean, constant variance and no autocorrelation.

The purpose of taking the natural logarithm is to normalise the data and linearise the relationship between variables.

We use the Johansen and Juselius cointegration test (1990) (which is based on two likelihood ratio test statistics, namely the trace and the maximum eigenvalue statistics) in order to investigate the existence of long-run relationships among the variables included in the model, then we employ a Vector Error Correction Model (VECM) to identify the long-

run and short-run dynamic relationships that exist between the various time series. Finally, we apply both impulse response functions and variance decomposition to examine the dynamic interactions among the variables in the system, through employing Eviews 8.0 software package.

4.3. Analysis of empirical results

4.3.1. Phillips Perron unit root test

Table 2. *Phillips Perron unit root test*

	Level			First Difference		
	Intercept	Trend & Intercept	None	Intercept	Trend & Intercept	None
LNGDP	-1.515816 (-2.928142)	-2.090876 (-3.513075)	5.235178 (-1.948313)	-8.473323* (-2.929734)	-8.873289* (-3.515523)	-5.792176* (-1.948495)
LNDT	0.043084 (-2.928142)	-1.116246 (-3.513075)	2.822549 (-1.948313)	-5.187905* (-2.929734)	-5.171102* (-3.515523)	-4.403179* (-1.948495)
LNIDT	-1.201664 (-2.928142)	-1.891038 (-3.513075)	2.610601 (-1.948313)	-6.419397* (-2.929734)	-6.380145* (-3.515523)	-5.559596* (-1.948495)
LNPCE	0.105088 (-2.928142)	-1.516636 (-3.513075)	4.620532 (-1.948313)	-5.259727* (-2.929734)	-5.175001* (-3.515523)	-4.067398* (-1.948495)
LNUCE	-1.131889 (-2.928142)	-2.959026 (-3.513075)	3.753304 (-1.948313)	-7.051644 (-2.929734)	-7.167617* (-3.515523)	-5.934486* (-1.948495)
LNGCE	-1.120178 (-2.928142)	-2.238164 (-3.513075)	2.486153 (-1.948313)	-5.553407* (-2.929734)	-5.468213* (-3.515523)	-5.029046* (-1.948495)
LNPINV	-0.725474 (-2.928142)	-1.914202 (-3.513075)	2.156391 (-1.948313)	-4.823106* (-2.929734)	-4.742100* (-3.515523)	-4.569316* (-1.948495)
LNLF	-1.247546 (-2.928142)	-1.175574 (-3.513075)	4.455234 (-1.948313)	-6.295140* (-2.929734)	-6.436177* (-3.515523)	-4.764745* (-1.948495)

** indicates statistically significant at 5% level of significance. (Test critical values at 5% level of significance).*
Source: Author's computation using Eviews 8.0.

According to the table above, the Phillips Perron value is greater than the critical t-value at the 5% significance level for the following variables: LNGDP, LNDT, LNIDT, LNPCE, LNUCE, LNGCE, LNPINV and LNLF. Thus, null hypothesis of a unit root is accepted and these variables are not stationary at their levels. Then again, after first differencing the previously mentioned variables, the null hypothesis of a unit root in the PP test can be rejected at the 5% level, so these variables are integrated of the order one I(1). Hence, we can now proceed with the Johansen-Juselius cointergation test.

4.3.2. Johansen cointegration test

4.3.2.1. Lag-Length Selection

Before using Johansen's cointegration approach to investigate the existence of a long-run relationship between fiscal policy variables and economic growth, we determine the optimal lag length by employing VAR lag order selection criteria. The results indicate that one (1) lag is the suitable lag length for our model (Appendix 1).

4.3.2.2. Trace and maximum eigenvalue tests

Table 3. *Results of the Johansen cointegration test*

Null Hypothesis	Eigenvalue	Trace Statistic λ_{trace}	0.05 Critical Value	Prob.	Max-Eigen Statistic λ_{max}	0.05 Critical Value	Prob.
$r = 0$	0.729873	200.2811*	159.5297	0.0000	57.59005*	52.36261	0.0134
$r \leq 1$	0.640361	142.6911*	125.6154	0.0030	44.99685	46.23142	0.0674
$r \leq 2$	0.530256	97.69423*	95.75366	0.0365	33.24493	40.07757	0.2397
$r \leq 3$	0.461611	64.44930	69.81889	0.1245	27.24368	33.87687	0.2505
$r \leq 4$	0.375437	37.20561	47.85613	0.3379	20.71091	27.58434	0.2941
$r \leq 5$	0.219365	16.49470	29.79707	0.6770	10.89652	21.13162	0.6576
$r \leq 6$	0.100519	5.598182	15.49471	0.7424	4.661230	14.26460	0.7838
$r \leq 7$	0.021069	0.936951	3.841466	0.3331	0.936951	3.841466	0.3331

Source: Author's computation using Eviews 8.0.

As can be seen from Table 3, the Trace test and the Maximum Eigenvalue test yield different results regarding the number of cointegrating vectors. The Trace test successively rejects the null hypothesis of zero, at most one, and at most two cointegrating vectors because the Trace statistic is greater than the critical value at the 5% significance level, while the null hypothesis of at most three cointegrating vectors cannot be rejected. Hence, the Trace test confirms the presence of three cointegrating equations between the following variables: LNGDP, LNDT, LNIDT, LNPCE, LNUCE, LNGCE, LNPINV and LNLF. The Maximum Eigenvalue test, on the other hand, accepts the null hypothesis of one cointegrating equation because the Maximum Eigenvalue statistic is less than the critical value at the 5% significance level. Thus, there exists a long-run relationship between the variables under study.

Despite these conflicting results, we rely on the Maximum Eigenvalue test results because Johansen and Juselius (1990) have argued that the Maximum Eigenvalue statistic might perform better than the Trace statistic (Herzberg, 2015). Enders (2010) has also stated that the Maximum Eigenvalue test has the sharper alternative hypothesis and it is usually preferred to identify the number of cointegrating vectors (Hertrich, 2013).

4.3.2.3. Cointegrating equation

$$\text{LNGDP} = -0.112326\ \text{LNDT} + 0.594369\ \text{LNIDT} + 0.180019\ \text{LNPCE} - 0.144427\ \text{LNUCE}$$
$$(0.05249) \qquad (0.08929) \qquad (0.06875) \qquad (0.05318)$$
$$-0.054599\ \text{LNGCE} - 0.029065\ \text{LNPINV} + 0.402464\ \text{LNLF} + \text{e}_\text{t}$$
$$(0.03150) \qquad (0.03449) \qquad (0.04507)$$

$(\cdot) =$ Standard errors.

The cointegrating equation shows that long-run economic growth is significantly adversely affected by direct taxes, since these taxes reduce incentives to invest in physical and human capital, and thus hinder economic growth. Likewise, indirect taxes have a significant long-term positive impact on real GDP, indicating that such taxes do not discourage investment in physical and human capital, because they are considered as non-distortionary with

respect to economic activity and growth; hence, this type of tax revenue may represent a better method of financing public investment. Productive current expenditures display a significant positive effect on long-run economic growth, and this is consistent with theory, that highlights the crucial role of productive public spending in raising the marginal product of private capital, thereby promoting economic growth. By contrast, there is a statistically significant negative association between real GDP and unproductive current expenditures, this can be explained by the fact that these expenditures are often ineffective, since they mainly include spending on general public administration, defense and internal security; hence, they do not lead to any increase in the marginal product of private capital. On the other hand, government capital expenditures exert a significant negative effect on economic growth at the 10% level of significance, reflecting that most public investment projects have not achieved the desired results, especially with regard to future growth plans. This result is consistent with those obtained by Devarajan et al. (1996) and Ghosh and Gregoriou (2006), who find that the capital component of public expenditure is negatively associated with economic growth. Also in contrast to the theoretical prediction, the estimated coefficient of private investment has a negative sign but is not statistically significant even at the 10% level. This suggests that the overall level of private investment in Algeria is still relatively low and is not sufficient to generate long-term growth. Finally, labor force has a positive and highly significant impact on real GDP, highlighting the fact that more skilled and trained labor produces more output.

4.3.3. Vector error correction model

The VECM equation (where D(LNGDP) is a dependent variable) has been estimated using the least squares method in order to obtain the p-value for each coefficient.

Table 4. *OLS Estimation Results for the Vector Error Correction Model*

Dependent Variable: D(LNGDP) Method: Least Squares Sample (adjusted): 1972 2015 Included observations: 44 after adjustments				
D(LNGDP) = C(1)*(LNGDP(-1) + 0.112326497002*LNDT(-1) - 0.594368829775*LNIDT(-1) - 0.180019372846*LNPCE(-1) + 0.144426838665*LNUCE(-1) + 0.0545989662006*LNGCE(-1) + 0.0290651963356*LNPINV(-1) - 0.402464181428*LNLF(-1) - 9.7474792248) + C(2)*D(LNGDP(-1)) + C(3)*D(LNDT(-1)) + C(4) *D(LNIDT(-1)) + C(5)*D(LNPCE(-1)) + C(6)*D(LNUCE(-1)) + C(7) *D(LNGCE(-1)) + C(8)*D(LNPINV(-1)) + C(9)*D(LNLF(-1)) + C(10)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.456687	0.058560	-7.798601	0.0000
C(2)	-0.267407	0.076482	-3.496336	0.0013
C(3)	0.043401	0.026234	1.654384	0.1073
C(4)	-0.102825	0.056168	-1.830668	0.0759
C(5)	-0.065500	0.033688	-1.944338	0.0602
C(6)	0.025128	0.021172	1.186862	0.2435
C(7)	0.064532	0.020846	3.095712	0.0039
C(8)	0.042555	0.027393	1.553472	0.1296
C(9)	-0.145501	0.066389	-2.191632	0.0354
C(10)	0.050954	0.005447	9.355008	0.0000
R-squared	0.780944			
F-statistic	13.46790			
Prob(F-statistic)	0.000000			

Source: Author's computation using Eviews 8.0.

The VECM equation (where D(LNGDP) is a dependent variable) is as follows:

D(LNGDP) = **- 0.456687296457***(LNGDP(-1) + 0.112326497002*LNDT(-1) - 0.594368829775*LNIDT(-1) - 0.180019372846*LNPCE(-1) + 0.144426838665*LNUCE(-1) + 0.0545989662006*LNGCE(-1) + 0.0290651963356*LNPINV(-1) - 0.402464181428*LNLF(-1) - 9.7474792248) - 0.267406934413*D(LNGDP(-1)) + 0.0434007321932*D(LNDT(-1)) - 0.102824830442*D(LNIDT(-1)) - 0.0654999725001*D(LNPCE(-1)) + 0.0251282563605*D(LNUCE(-1)) + 0.0645324914557*D(LNGCE(-1)) + 0.0425545664311*D(LNPINV(-1)) - 0.145501034483*D(LNLF(-1)) + 0.0509543738934

4.3.3.1. The long run causality

According to Table 4, the coefficient of the error correction term C(1) is negative and highly significant at 1% level of significance, and this emphasizes the existence of a long-run relationship between the dependent variable (LNGDP) and the independent variables (LNDT, LNIDT, LNPCE, LNUCE, LNGCE, LNPINV and LNLF).

4.3.3.2. The short run causality

Government capital expenditures exhibit a positive and statistically significant influence on economic growth in the short run. Likewise, direct taxes, unproductive current expenditures and private investments have a positive but insignificant impact on real GDP. In contrast, labor force, indirect taxes and productive current expenditures display a significant negative short-term effect on economic growth.

- **The short run causality of direct taxes**

The p-value of the Wald test chi-square statistic (0.0980) exceeds 0.05. Thus, the null hypothesis (which indicates that LNDT does not cause LNGDP in the short term) has been accepted (Appendix 2).

- **The short run causality of indirect taxes**

The Wald test chi-square statistic is statistically insignificant at the 5% significance level. Hence, the alternative hypothesis has been rejected and indirect taxes do not cause economic growth in Algeria (Appendix 2).

- **The short run causality of productive current expenditures**

The p-value of the Wald test chi-square statistic (0.0519) is greater than 0.05. Therefore, the null hypothesis (which indicates that LNPCE does not cause LNGDP in the short term) cannot be rejected (Appendix 2).

- **The short run causality of unproductive current expenditures**

The Wald test chi-square statistic is not significant at the 5% level of significance. Thus, the null hypothesis has been accepted, which means that unproductive current expenditures do not cause real GDP in the short term (Appendix 2).

- **The short run causality of government capital expenditures**

The p-value of the Wald test chi-square statistic (0.0020) is less than 0.05. Hence, the alternative hypothesis has been accepted, in other words there is a short-run unidirectional causality running from LNGCE to LNGDP (Appendix 2).

- **The short run causality of private investment**

The p-value of the Wald test chi-square statistic (0.1203) exceeds 0.05. Thus, the null hypothesis (which indicates that LNPINV does not cause LNGDP in the short run) has been accepted (Appendix 2).

- **The short run causality of labor force**

The p-value of the Wald test chi-square statistic (0.0284) is smaller than 0.05. Therefore, the null hypothesis has been rejected and labor force causes economic growth in the short term (Appendix 2).

4.3.4. Diagnostic tests of Vector Error Correction Model (VECM)

Table 5. *Diagnostic tests of Vector Error Correction Model (VECM)*

Test	*Obs*R-squared*	*Prob. Chi-Square*	*Probability*
Heteroskedasticity Test: Breusch-Pagan-Godfrey	23.09768	0.1111	
Heteroskedasticity Test: ARCH	0.218294	0.6403	
Breusch-Godfrey Serial Correlation LM Test	0.280784	0.5962	
Jarque Bera Normality Test			0.9436

Source: Author's computation using Eviews 8.0.

The table above summarizes the main results of the diagnostic tests. Breusch-Pagan-Godfrey test confirms the assumption of homoscedasticity, since the Prob. $Chi^2 = 0.1111$ that accompanies the amount ($Obs*R^2$) exceeds 0.05. Moreover, ARCH test asserts the absence of ARCH effect (Prob. $Chi^2 = 0.6403 > 0.05$). Furthermore, The Breusch-Godfrey Serial Correlation LM test reveals that there is no serial correlation, because the Prob. $Chi^2 = 0.5962$ is greater than 0.05. Also, The Jarque Bera normality test accepts the null hypothesis which indicates that the residuals are normally distributed, since the Prob. (Jarque-Bera) = 0.9436 exceeds 0.05. All these diagnostic tests indicate that the Vector Error Correction Model is well specified.

4.3.5. Impulse response of LNGDP to one standard deviation innovations (Appendix 3)

- **The Response of LNGDP to One Standard Deviation LNDT shock**

A positive LNDT shock causes a rise of 0.0025 units in LNGDP in the second year, then it decreases and becomes negative with a value of -0.00098 units in the next fifth year, after that it continues declining to reach its lowest value of -0.0026 in the next tenth period.

- **The Response of LNGDP to One Standard Deviation LNIDT shock**

By giving one standard deviation LNIDT shock, LNGDP rises to 0.0143 units in the second year, then it continues to increase in the positive direction, reaching its highest value of 0.0377 units in the next tenth year.

- **The Response of LNGDP to One Standard Deviation LNPCE shock**

By giving one positive LNPCE shock, LNGDP becomes negative for one-time during the ten years with a value of -0.00043 units in the second year, then it rises slowly to its maximum positive value (0.0212 units) in the next tenth period.

- **The Response of LNGDP to One Standard Deviation LNUCE shock**

A positive LNUCE shock has an immediate negative impact on LNGDP which reaches -0.0034 units in the second year, then it continues to decrease smoothly, reaching its lowest value of -0.0157 units in the next tenth period.

- **The Response of LNGDP to One Standard Deviation LNGCE shock**

A positive LNGCE shock leads to rise LNGDP by 0.0051 units in the second year, and it witnesses a slight fall to 0.0047 units in the third year but it increases again to reach its highest value of 0.0069 units in the next tenth year.

- **The Response of LNGDP to One Standard Deviation LNPINV shock**

LNGDP rises to 0.0024 units in the second year as a result of giving one standard deviation LNPINV shock, then it enters to the negative field with a value of -0.00072 units in the next third year and it decreases continuously to reach its lowest value of -0.0012 units in the next fifth period, after that it increases slightly again to -0.00018 units in the next tenth year.

- **The Response of LNGDP to One Standard Deviation LNLF shock**

By giving one positive LNLF shock, LNGDP rises to 0.0018 units in the second year, then it continues to increase in the positive direction, reaching its highest value of 0.0128 units in the next tenth year.

4.3.6. Variance decomposition analysis (Appendix 4)

The forecast error variance in LNGDP reaches 0.0212 units in the first period, then it sees a slight increase to 0.1263 units in the tenth period and this is due to the combination of the following independent variables LNDT, LNIDT, LNPCE, LNUCE, LNGCE, LNPINV and LNLF.

In the short term (the second year), 67.97% of the forecast error variance of LNGDP is explained by its own innovations, followed by LNDT (0.78%), LNIDT (25.36%), LNPCE (0.02%), LNUCE (1.50%), LNGCE (3.24%), LNPINV (0.73%) and LNLF (0.40%).

In the medium term (the fifth period), 27.42% of the variability in LNGDP is explained by its own shocks, while 0.17% is due to LNDT's shocks, 47.64% of LNIDT's shocks, 9.81% of LNPCE's shocks, 8.92% of LNUCE's shocks, 2.68% of LNGCE's shocks, 0.20% of LNPINV's shocks and 3.15% to LNLF's shocks.

In the long term (the tenth period), 15.26% of innovations in LNGDP is caused by its own past values, followed by LNDT (0.20%), LNIDT (52.81%), LNPCE (14.73%), LNUCE (9.51%), LNGCE (2.14%), LNPINV (0.06%) and LNLF (5.29%).

These results indicate that indirect taxes explain the largest proportion of the forecast error variance of LNGDP, while productive current expenditures represent the second key determinant of LNGDP, whereas unproductive current expenditures, labor force, government capital expenditures, direct taxes and private investment play a minor role in interpreting the forecast error variance of LNGDP.

5. Conclusion

The present paper examines the impact of fiscal policy on economic growth in Algeria over the period 1970-2015, by using Johansen cointegration test and vector error correction model (VECM). The main findings indicate that there is a long run equilibrium relationship between economic growth and fiscal policy variables and the VECM confirms the existence of this relationship. It is also revealed that both indirect taxes and productive current expenditures have a significant long-term positive impact on real GDP, while direct taxes, capital and unproductive recurrent expenditures negatively and significantly affect economic growth in the long run.

In the light of the results obtained from this study, it could be concluded that the government should hedge against the mounting risks and challenges by underpinning public financial management reforms, strengthening supervisory and transparency practices, improving tax administration, and fighting tax evasion. There is also a pressing need to seek more sources of non-oil revenue by embarking on a feasible and publicly palatable privatization scheme, speeding up the reform of the state-dominated banking sector, lessening the bureaucratic burden that weighs heavily on private entrepreneurship, and developing a dynamic business environment. On the other hand, the limited financial resources available to Algeria should be wisely used in order to stay the course by restraining discretionary spending, keeping a watchful eye on public sector wages, phasing out energy subsidies, containing social transfers and better targeting them toward categories that lack the purchasing power. Furthermore, it is worthwhile to note that sustainable economic growth requires serious policy measures aimed at diversifying the Algerian economy.

References

Adefeso, H.A., Haheem, M. and Salawu, B., 2010. Fiscal Policy and Economic Growth in Nigeria: Testing the Prediction of the Endogenous Growth Model. *Journal of Economic Theory*, 4(2), pp. 37-43.

Aghion, P. and Howitt, P., 1992. A Model of Growth through Creative Destruction. *Econometrica*, 60(2), pp. 323-351.

Ahmad, K. and Wajid, S., 2013. What Matters for Economic Growth in Pakistan: Fiscal Policy or its Composition?. *Asian Economic and Financial Review*, 3(2), pp. 196-215.

Akpan, U.F. and Abang, D.E., 2013. Does Government Spending Spur Economic Growth? Evidence from Nigeria. *Journal of Economics and Sustainable Development*, 4(9), pp. 36-52.

Angelopoulos, K., Economides, G. and Kammas, P., 2007. Tax-spending policies and economic growth: Theoretical predictions and evidence from the OECD. *European Journal of Political Economy*, 23, pp. 885-902.

Arin, K.P., Braunfels, E., and Doppelhofer, G., 2015. Taxes, Spending and Economic Growth: A Bayesian Model Averaging Approach. Paper presented at the 9th Norwegian-German Seminar on Public Economics, CESifo Conference Centre, Munich, 6-7 November.

Auerbach, A.J., 1985. The Theory of Excess Burden and Optimal Taxation. In A.J. Auerbach and M. Feldstein (Eds.). *Handbook of Public Economics*, Vol. 1, North-Holland, Amsterdam, pp. 61-127.

Babalola, S.J. and Aminu, U., 2011. Fiscal Policy and Economic Growth Relationship in Nigeria. *International Journal of Business and Social Science*, 2(17), pp. 244-249.

Bank of Algeria, 2015. Rapport annuel de la banque d'Algérie 2014. Algiers, Algeria: Bank of Algeria.

Barro, R.J. and Sala-i-Martin, X., 1992. Public Finance in Models of Economic Growth. *Review of Economic Studies*, 59(4), pp. 645-661.

Barro, R.J. and Sala-i-Martin, X., 1995. Economic Growth. McGraw-Hill, Inc., New York.

Barro, R.J. 1990. Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy*, 98(5), pp. S103-S125.

Barro, R.J. 1991. Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics*, 106(2), pp. 407-443.

Bose, N., Haque, M.E., and Osborn, D.R. 2007. Public Expenditure and Economic Growth: A Disaggregated Analysis for Developing Countries. *The Manchester School*, 75(5), pp.533-556.

Dar, A.A. and AmirKhalkhali, S. 2002. Government size, factor accumulation, and economic growth: evidence from OECD countries. *Journal of Policy Modeling*, 24, pp. 679-692.

Devarajan, S., Swaroop, V. and Zou, H. 1996. The composition of public expenditure and economic growth. *Journal of Monetary Economics*, 37, pp. 313-344.

Easterly, W. and Rebelo, S. 1993. Fiscal Policy and Economic Growth: An Empirical Investigation. *Journal of Monetary Economics*, 32, pp. 417-458.

Enache, C. 2009. Fiscal Policy and Economic Growth in Romania. Annales Universitatis Apulensis *Series Oeconomica*, 11(1), pp. 502-512. Available at: <http://oeconomica.uab.ro/upload/lucrari/1120091/50.pdf> [Accessed 18/01/2017]

Enders, W. 2010. Applied Econometric Time Series. 3rd edition. John Wiley & Sons, Hoboken, NJ.

Engen, E.M. and Skinner, J. 1992. Fiscal Policy and Economic Growth. *NBER Working Paper,* No. 4223. National Bureau of Economic Research, Cambridge, Massachusetts.

Erős, A. 2010. Long Run Growth Effects of Fiscal Policy – a Case Study of Hungary. *Club of Economics in Miskolc: Theory, Methodology, Practice*, 5, pp. 11-17. Available at: <http://tmp.gtk.uni-miskolc.hu/volumes/2010/01/TMP_2010_01_02.pdf> [Accessed 18/01/2017]

Ferreiro, J., García-del-Valle, M.T. and Gómez, C. 2008. Fiscal Adjustment and Composition of Public Expenditures in the EMU. In J. Ferreiro, G. Fontana, and F. Serrano (Eds.). *Fiscal Policy in the European Union*, Palgrave Macmillan, London, pp. 84-108.

Gemmell, N. 2001. Fiscal Policy in a Growth Framework. *UNU/WIDER Discussion* Paper No. 2001/84, Available at: <https://www.wider.unu.edu/sites/default/files/dp2001-84.pdf> [Accessed 18/01/2017].

Ghosh, S. and Gregoriou, A. 2006. On the Composition of Government Spending, Optimal Fiscal Policy, and Endogenous Growth: Theory and Evidence. *Economics and Finance Discussion Papers No. 06-19*, Brunel University, Middlesex, United Kingdom.

Grier, K.B. and Tullock, G. 1989. An Empirical Analysis of Cross-National Economic Growth, 1951-80. *Journal of Monetary Economics*, 24, pp. 259-276.

Hamdi, H. and Sbia, R. 2013. Dynamic relationships between oil revenues, government spending and economic growth in an oil-dependent economy. *Economic Modelling*, 35, pp.118-125.

Hansson, P. and Henrekson, M. 1994. A new framework for testing the effect of government spending on growth and productivity. *Public Choice*, 81, pp. 381-401.

Hertrich, C. 2013. Asset Allocation Considerations for Pension Insurance Funds: Theoretical Analysis and Empirical Evidence. *Springer Gabler*, Stuttgart, Germany.

Herzberg, A. 2015. Sustainability of External Imbalances: A Critical Appraisal. *Springer Gabler*, Düsseldorf, Germany.

IMF, 2003. Algeria: 2002 Article IV Consultation- Staff Report; Staff Statement; and Public Information Notice on the Executive Board Discussion. *IMF Country Report*, No. 03/68, Washington, DC: International Monetary Fund.

IMF, 2005. Algeria: 2004 Article IV Consultation- Staff Report; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Algeria. *IMF Country Report*, No. 05/50, Washington, DC: International Monetary Fund.

IMF, 2006. Algeria: 2005 Article IV Consultation- Staff Report; Staff Statement; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Algeria. *IMF Country Report*, No. 06/93, Washington, DC: International Monetary Fund.

IMF, 2010. Algeria: 2009 Article IV Consultation- Staff Report; and Public Information Notice. *IMF Country Report*, No. 10/57, Washington, DC: International Monetary Fund.

IMF, 2012. Algeria: 2011 Article IV Consultation- Staff Report; Public Information Notice. *IMF Country Report*, No. 12/20, Washington, DC: International Monetary Fund.

IMF, 2014 a. Regional Economic Outlook: Middle East and Central Asia. Washington DC: International Monetary Fund.

IMF, 2014 b. Algeria: 2014 Article IV Consultation- Staff Report; Press Release; and Statement by the Executive Director for Algeria. *IMF Country Report*, No. 14/341, Washington DC: International Monetary Fund.

IMF, 2015. Regional Economic Outlook: Middle East and Central Asia. Washington DC: International Monetary Fund.

IMF, 2016. Algeria: 2016 Article IV Consultation-Press Release and Staff Report. *IMF Country Report*, No. 16/127, Washington, DC: International Monetary Fund.

Johansen, S. and Juselius, K. 1990. Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52, pp. 169-210.

Joharji, G.A. and Starr, M.A. 2010. Fiscal policy and growth in Saudi Arabia. *Review of Middle East Economics and Finance*, 6(3), pp. 24-45.

Kandil, M. 2006. Variation in the effects of government spending shocks with methods of financing: Evidence from the US. *International Review of Economics and Finance*, 15, pp.463-486.

Khan, M.A., Khan M.Z. and Zaman, K. 2012. Measuring the Impact of Fiscal Variables on Economic Growth in Pakistan: New Light on an Old Problem. *Journal of Economic and Social Research*, 14(2), pp. 53-82.

Kneller, R., Bleaney, M.F. and Gemmell, N. 1999. Fiscal policy and growth: evidence from OECD countries. *Journal of Public Economics*, 74, pp. 171-190.

Kweka, J.P. and Morrissey, O. 2000. Government Spending and Economic Growth in Tanzania, 1965-1996. *CREDIT Research Paper No. 00/6*, Center for Research in Economic Development and International Trade, University of Nottingham.

Lucas, R.E. 1988. On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22, pp. 3-42.

M'Amanja, D. and Morrissey, O. 2005. Fiscal Policy and Economic Growth in Kenya. *CREDIT Research Paper No. 05/06*, Center for Research in Economic Development and International Trade, University of Nottingham.

Madni, G.R. 2013. Instrumental Effects of Fiscal Policy for Pakistan Economy. *Romanian Economic Journal*, 16(50), pp. 27-50.

Maşca, S.G., Cuceu, I.C., and Văidean, V.L. 2015. The Fiscal Policy as Growth Engine in EU countries. *Procedia Economics and Finance*, 32, pp. 1628-1637.

Mendoza, E.G., Milesi-Ferretti, G.M. and Asea P. 1997. On the ineffectiveness of tax policy in altering long-run growth: Harberger's superneutrality conjecture. *Journal of Public Economics*, 66 (1), pp. 99-126.

Odhiambo, O.S., Momanyi, G., Lucas, O. and Aila, F.O. 2013. The Relationship between Fiscal Deficits and Economic Growth in Kenya: An Empirical Investigation. *Greener Journal of Social Sciences*, 3(6), pp. 306-323.

Olasunkanmi, O.I. and Babatunde, O.A. 2012. Fiscal Policy Variables-Growth Effect: Hypothesis Testing. *American Journal of Business and Management*, 1(3), pp. 100-107.

ONS (Office for National Statistics). Statistical Retrospective 1962-2011. Algiers, Algeria. <www.ons.dz> [accessed 24/01/2017]

Rebelo, S. 1991. Long-Run Policy Analysis and Long-Run Growth. *Journal of Political Economy*, 99, pp. 500-521.

Romer, P.M. 1986. Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(5), pp. 1002-1037.

Romer, P.M. 1990. Endogenous Technological Change. *Journal of Political Economy*, 98(5, Part 2), pp. S71-S102.

Scarlett, H.G. 2011. Tax Policy and Economic Growth in Jamaica. Research Services Department, Research and Economic Programming Division, Bank of Jamaica, Kingston, Jamaica.

Solow, R.M. 1956. A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70(1), pp. 65-94.

Swan, T.W. 1956. Economic Growth and Capital Accumulation. *Economic Record*, 32, pp. 334-361.

Takumah, W. 2014. Tax Revenue and Economic Growth in Ghana: A Cointegration Approach. *MPRA Paper No. 58532*. Available at: <https://mpra.ub.uni-muenchen.de/58532/1/MPRA_paper_58532.pdf> [Accessed 18/01/2017]

Tanninen, H. 1999. Income Inequality, Government Expenditures and Growth. *Applied Economics*, 31, pp. 1109-1117.

Tanzi, V. and Zee, H.H. 1997. Fiscal Policy and Long-Run Growth. *IMF Staff Papers*, 44(2), pp. 179-209.

Umoru, D. and Anyiwe, M.A. 2013. Tax Structures and Economic Growth in Nigeria: Disaggregated Empirical Evidence. *Research Journal of Finance and Accounting*, 4(2), pp.65-79.

Wahab, M. 2011. Asymmetric output growth effects of government spending: Cross-sectional and panel data evidence. *International Review of Economics & Finance*, 20(4), 574-590.

World Bank, 2016. Global Economic Prospects, January 2016: Spillovers amid Weak Growth. Washington DC: World Bank.

Appendix 1. *VAR lag order selection criteria*

VAR Lag Order Selection Criteria
Endogenous variables: LNGDP LNDT LNIDT LNPCE LNUCE LNGCE LNPINV LNLF
Exogenous variables: C
Sample: 1970 2015
Included observations: 45

Lag	LogL	LR	FPE	AIC	SC	HQ
0	82.78844	NA	4.97e-12	-3.323931	-3.002746	-3.204196
1	388.8814	489.7488*	1.10e-16*	-14.08362*	-11.19296*	-13.00601*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 2. *The short run causality*

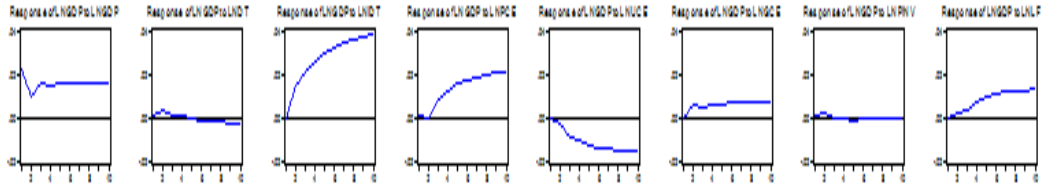
VEC Granger Causality/Block Exogeneity Wald Tests
Sample: 1970 2015
Included observations: 44

Dependent variable: D(LNGDP)

Excluded	Chi-sq	df	Prob.
D(LNDT)	2.736988	1	0.0980
D(LNIDT)	3.351346	1	0.0672
D(LNPCE)	3.780450	1	0.0519
D(LNUCE)	1.408643	1	0.2353
D(LNGCE)	9.583434	1	0.0020
D(LNPINV)	2.413275	1	0.1203
D(LNLF)	4.803253	1	0.0284
All	21.82634	7	0.0027

Appendix 3. *Impulse response of LNGDP to one standard deviation innovations*

Response of LNGDP:								
Period	LNGDP	LNDT	LNIDT	LNPCE	LNUCE	LNGCE	LNPINV	LNLF
1	0.021259	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.009806	0.002504	0.014301	-0.000437	-0.003474	0.005109	0.002419	0.001804
3	0.015552	0.000705	0.020663	0.008184	-0.009859	0.004733	-0.000729	0.003692
4	0.014244	0.000298	0.025358	0.011933	-0.011134	0.005941	-0.000947	0.006676
5	0.015582	-0.000985	0.029537	0.015251	-0.012993	0.006089	-0.001264	0.008976
6	0.015236	-0.001502	0.032123	0.017164	-0.013750	0.006339	-0.000826	0.010399
7	0.015551	-0.002002	0.034350	0.018683	-0.014565	0.006496	-0.000639	0.011402
8	0.015489	-0.002264	0.035808	0.019763	-0.015064	0.006669	-0.000397	0.012020
9	0.015602	-0.002501	0.036973	0.020613	-0.015496	0.006804	-0.000285	0.012479
10	0.015615	-0.002659	0.037781	0.021239	-0.015788	0.006913	-0.000183	0.012802



Appendix 4. *Variance decomposition analysis*

Variance Decomposition of LNGDP:									
Period	S.E.	LNGDP	LNDT	LNIDT	LNPCE	LNUCE	LNGCE	LNPINV	LNLF
1	0.021259	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.028397	67.97165	0.777621	25.36417	0.023691	1.496434	3.237066	0.725968	0.403402
3	0.040944	47.12154	0.403648	37.66947	4.006610	6.517696	2.893197	0.380921	1.006917
4	0.053568	34.59954	0.238919	44.41478	7.303051	8.128095	2.920410	0.253773	2.141426
5	0.067130	27.41962	0.173648	47.64225	9.811506	8.921966	2.682379	0.197036	3.151595
6	0.080034	22.91491	0.157386	49.62738	11.50210	9.228737	2.514571	0.149268	3.905644
7	0.092547	19.96072	0.164477	50.89048	12.67723	9.378760	2.373252	0.116405	4.438678
8	0.104397	17.88769	0.176280	51.75758	13.54612	9.452518	2.273130	0.092925	4.813760
9	0.115683	16.38676	0.190305	52.36598	14.20707	9.492389	2.197176	0.076287	5.084027
10	0.126384	15.25576	0.203693	52.81019	14.72715	9.513492	2.140046	0.064124	5.285542