The Effect of Fiscal Policy Tools on Economic Growth: Empirical Evidences Based Time Series Data From Algeria. The ARDL Model

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Abstract:
The purpose of this study is to examine the dynamic effect of fiscal policy instruments on economic growth in Algeria over the period 1990-2015. ADF and PP test are applied to test the unit root hypothesis. Using the ARDL Co-integration technique, the study found that there is a significant negative long run relationship between economic growth and government expenditure, and a significant positive long run relationship between economic growth and total public revenues. Finally, the study recommends that the government should reduce its budget deficit and get rid of the circle of debt over hanging problems.

Keywords: Economic Growth, Government Expenditures, Public revenues, ARDL.

I. Introduction:

Fiscal policy refers to the government’s efforts to influence the direction of economy through changes in taxes or expenditures. Optimal fiscal policy in Algeria plays an important role in growth process, it serves as a vital instrument for economic growth, which has still been the area of interest for academicians as well as for the policy makers. The current study examines the link between fiscal policy tools and economic growth for Algeria’s economy over the period 1990-2015 using a dynamic model and different econometric techniques.

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II. Literature Review:

Several studies have been carried out to examine the impact of fiscal policy variables on economic growth as 1:

(Hoopen, 2003) 2, (Castro & all, 2006) 3, (Esau, 2006) 4, which have examined the effect of government spending, tax revenues and budget deficit as variables of fiscal policy on economic growth. The results show a positive effect of government spending on economic growth, whereas shocks to taxes revenues inversely affect economic growth. In other hand, (Balassa, 1988) 5, (Iqbal & Zahid, 1998) 6, (Jafri & all, 2006) 7 find that economic growth rate responds negatively to budget deficit as variable of fiscal policy in the long run. (Mulumb, 2009) examine the Wagner law and the long run relationship between government spending and economic growth for 13 countries in south Africa during the period (1988-2004) using Pedroni panel co-integration test and Kao panel co-integration test, the results show the long run relationship between the government spending and economic growth, and the presence of mono relationship trend from economic growth to government spending which is compatible with Wagner law.

III. Research Methodology:

3.1 Data collection:

Time series data from 1990 to 2015 of the related variables were collected from World Bank data (2014). The variables are: GDP Per Capita (Gross Domestic Product Per Capita) as indicator of economic growth, government expenditure and total public revenues as variables of fiscal policy.

3.2 Model Specification:

In order to examine the effect of fiscal policy tools on economic growth, we estimate the following equation:

\[ GDPPC_t = \alpha_0 + \alpha_1 GE + \alpha_2 TR + U_t \] .............. (1)

where: GDPPC: Gross domestic product

GE: Government Expenditure.

TR: Total public Revenues.

The study based on ADF and PP test for stationarity of time series, and to test the long run relationship, we have used the robust econometrics techniques, Autoregressive Distributed Lag Model (ARDL) popularised by (Pearson & Shin, 1998)\(^1\), and (Pearson & all, 2001)\(^2\). The error correction version of ARDL model is given as:

\[ \Delta GDPPC_t = \beta_0 + \beta_1 \sum \Delta GDPPC_{t-i} + \beta_2 \sum \Delta GE_{t-i} + \beta_3 \sum \Delta TR_{t-i} + \eta EC_{t-I} \] ........... (2)

Where: \( \eta \) error correction term in the model indicates.

The pace of adjustment reverse to long run equilibrium following a short run shock.

In order to cope up with the endogeneity of explanatory variables, and in order to avoid inconsistent results, we use two-stage least square (2SLS) instruments variables techniques.

IV. Results Discussions:
4.1 Stationarity of time series (Unit Root test):

In order to examine the stationarity of time series, we have used the ADF* and PP** test, the following table summarize the results:

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* : Augmented Dickey Fuller test

** : Philips Perron test.

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The results show that each of the variables is integrated of different order: GDPPC stationary at first difference: I(1), each of GE and TR is stationary at level: I(0), which means that there is no long run relationship between variables under study, so we can’t apply any cointegration techniques.

In order to choose a robust model for estimation of growth equation, we estimate different growth equations and select three of them for comparison, these equation have been estimated via ARDL co-integration techniques.

4.2 Lag Selection of ARDL:

After determining the stationarity level of all variables, the ARDL co-integration system is implemented for Algeria using annual time series over the period 1990-2015.

First Step: we have to determine the lag length order obtained through unrestricted vector autoregressive (VAR) via: Schwartz Criterion (SC), Akaike Information Criterion (AIC) and Hannan Quinn Criterion (HQ), as shown in the following table:

<table>
<thead>
<tr>
<th>Order</th>
<th>Lags</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>0.4503</td>
<td>0.5975</td>
<td>0.4893</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>0.43268</td>
<td>0.52327</td>
<td>0.37894</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.3858</td>
<td>0.6312</td>
<td>0.4509</td>
</tr>
</tbody>
</table>

Source: Eviews output

Notes: * indicate the lag order selected by the criterion.
AIC: Information Criterion
SC: Schwartz Criterion
HQ: Hannan Quinn Criterion

Throught the criterion values, the lag length order is (1) as the results show in the table above.

Second Step: to test if there is a long run relationship between variables under study through the (UECM) model using the following equation:
ΔGDPPC_{t}=δ+b_1GDPPC_{t-1}^{+}+b_2GE_{t-1}^{+}+b_3TR_{t-1}^{+}+\sum_{i=1}^{\infty}\Delta GDPPC_{t-i}^{+}+\sum_{i=1}^{\infty}\Delta GE_{t-i}^{+}+\sum_{i=1}^{\infty}\Delta TR_{t-i}^{+}+U_{t}... (4)

To ensure that there is a relationship, we have determined (F–Statistics) through "Wald test" which test the null hypothesis ($H_0$): "that there is no co-integration between variables", which means the absence of long run relationship" as:

$H_0: \beta_1 = \beta_2 = \beta_3 = 0$

$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq 0$

**TABLE 3: Co-integration using Wald test**

<table>
<thead>
<tr>
<th></th>
<th>F calculated</th>
<th>P Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Model</td>
<td>6.622725</td>
<td>0.002182</td>
<td>There is an equilibrium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>long run relationship</td>
</tr>
</tbody>
</table>

**Critical value at K=2**

<table>
<thead>
<tr>
<th></th>
<th>Low Bound I(0)</th>
<th>High Bound I(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1% significance</td>
<td>4.40</td>
<td>5.72</td>
</tr>
<tr>
<td>5% significance</td>
<td>3.47</td>
<td>4.57</td>
</tr>
<tr>
<td>10% significance</td>
<td>3.03</td>
<td>4.06</td>
</tr>
</tbody>
</table>

Source: Microfit 4.0 output

Notes: * : significant at 1%.

K: the number of independent variables.

As shown in the table (3), $F$ calculated is higher than $F$ critical for high bound at 1%, 5%, and 10% and we reject ($H_0$): "no co-integration between variables", which means the presence of equilibrium long run relationship between variables under study.

**TABLE 4: Estimated long run coefficients using ARDL**

<table>
<thead>
<tr>
<th>Dependant Variable</th>
<th>ARDL technique order (0,2,1,1,1)</th>
<th>Coefficients</th>
<th>Low Significant Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPPC</td>
<td>Regressors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE</td>
<td>-0.087</td>
<td>0.007**</td>
<td></td>
</tr>
<tr>
<td>TR</td>
<td>0.397</td>
<td>0.007**</td>
<td></td>
</tr>
</tbody>
</table>

Source: Microfit 4.0 output

Note: ** : significant at 1%

After ensuring the presence of long run relationship, we have measured this relation as shown in table (4), the result shows:
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- The presence of negative effect between GDPPC and GE, it is significant at 1%.
- The presence of positive effect between GDPPC and TR, it is significant at 1%

**Third Step:** for measuring the short run relationship, we have using the error correction model (ECM):

**TABLE 5:** Estimated Short run Coefficients using the (ECM) model

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>ARDL technique order</th>
<th>Low significant level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔGDPPC</td>
<td>(0.2,1,1,1)</td>
<td></td>
</tr>
<tr>
<td>REGRESSORS;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔGE</td>
<td>-0.018</td>
<td>0.13***</td>
</tr>
<tr>
<td>ΔTR</td>
<td>0.97</td>
<td>0.00*</td>
</tr>
<tr>
<td>EC_{t-1}</td>
<td>0.998</td>
<td>0.00*</td>
</tr>
</tbody>
</table>

R^2=0.96, SE=0.005, DW=2.96

Source: Microfit 4.0 output
Note:*,**,***: significant at 1%, 5%, 10%

As show the results above (table 5), the error correction estimator is significant at 1%, which support the presence of long run relationship between variables (EC_{t-1}=-0.99), this means that when the GDPPC deviates from his equilibrium value in the short period (t-I), it correct which was equivalent to (99.8%) of this deviation in the period (t), the results also show the sign of estimators which are compatible with long run period.

V. Conclusion:
In this study, we have examined the dynamic effect of fiscal policy tools on economic growth in Algeria over the period 1900-2015.

5.1 Results:
We can summarize the econometrics results below:
1. The presence of long run relationship between economic growth, government expenditure and total public revenues in Algeria over the period 1990-2015.
2. A significant negative effect between economic growth and government spending.
3. A significant positive effect between economic growth and total public revenues.

5.2 Recommendation:
The study recommends that:
1. The government should reduce its budget deficit.

*: ECM model have two important properties:
- Measure the short run relationship
- Measure quickly the correction to re-balancing the relation in the dynamic model.
2. The government would get rid of the circle of debt over hanging problems because the debt-GDP ratio would increase only if the fiscal deficit (as percentage of GDP) exceeds the real GDP growth rate.

3. The reduction in fiscal deficit must due to reduction in public expenditure rather than an increase in resources.

References:


