Natural resource rents, fiscal policy and economic growth in Algeria

HAMDI, Helmi and SBIA, Rashid

2012

Natural resource rents, fiscal policy and economic growth in Algeria

Helmi HAMDI[a]*, Rashid SBIA[b]

[a] Aix-Marseille University CERGAM (4525), France
Corresponding author: helmi_aix@yahoo.fr, Tel +973.36003466
[b] DULBEA, Solvay Brussels School of Economics and Management, Belgium.

Abstract

The aim of this paper is to examine the dynamic relationship between natural resource rents, government spending, government revenues and economic growth in Algeria during the period 1980-2011. The empirical results reveal a bidirectional causal relationship between economic growth and natural resource rents and another bidirectional relationship between total revenues and naturel resource revenues. We also find no cointegration between government spending and government revenues.

1. Introduction

Algeria is the largest country in Africa, the Arab world, and the Mediterranean Basin. As an OPEC member, Algeria was ranked in 2010 the fourth largest crude oil producer in Africa with around 1.5 million barrel per/day US (Energy Administration, 2010). Oil and Gas Journal (OGJ) estimates reveals that Algeria held approximately 12.2 billion barrels of proven oil reserves as of January 2012, the third largest reserves in Africa. Further, Algeria was ranked the eighth largest natural gas producer in the world in 2010 and the third largest gas supplier to Europe. In term of labor as factor of production, Algerian labor force reached 11.2 million in 2012 (World development Indicators).

Until today, Algeria remains an enigma for researchers. In fact, despite the huge size of the country and its endowment with abundant naturel resources, including oil and gas, as well as an immense young labor force potential; economic growth and development have never reached the expected level and precisely their potential level. Analyzing the Algeria dilemma is the main contribution of this article. Precisely, we try to examine the dynamic relationship between government spending, government revenues and economic growth by adding natural resources rents in the multivariate framework. This variable is important in the model as roughly 70% of Algerian government revenues is natural resources revenues. This variable also indicates the low weight of private sector in Algeria and the need for further policy reforms. To the best of our knowledge, this issue has never been analyzed yet for Algeria context despite the weight of the country in the global energy market. Therefore, this paper is the first attempt in empirical literature. Our empirical study uses the Granger no-causality framework due to Toda and Yamamoto procedure (1995). The advantage of using the Toda and Yamamoto procedure is that it improves the power of Granger-causality test (Rimbaldi and Doran 1996). Moreover, it is easy to perform as it does not required the several steps required in the basic Granger causality procedure. The main empirical results of the paper show despite the recent efforts of government to diversify the economy, natural resources revenues remain the backbone of the development and the progress of Algeria.

The remainder of the paper is as follows. Section two describes data and methodology, section three provides the empirical results. Section four concludes.

2. Methodology

2.1. Data

The multivariate model includes four variables: real gross domestic product per capita (GDPpc) which is a proxy of economic growth, real total government expenditures (TEX), real total government revenues (TREV) and real natural resource rents (NRR) which include revenues from export of oil and gas. The time series data is annually, it covers the period from 1980 to 2011. The main source of our data is the World Bank's World Development Indicators (WDI, 2012). All the variables are all transformed into log form

2.2. Econometric approach

The first step of our empirical model is to test for stationarity of the variables by the use of Phillips-Perron and Dickey-Fuller unit root tests. The second step is to identify causality between the variables by the use of Toda and Yamamoto procedure. This method aims at estimating the basic VAR by the use of a Modified Wald (MWALD) test for restrictions on the parameters of the VAR (k) model and then estimates a VAR [$k+dmax$], where k is the lag order of VAR and $dmax$ is the maximal order of integration for the series in the model. This procedure is easy and helpful as it does not require knowledge of cointegration properties of the model.

The model is expressed as follows:

$$\ln GDP_t = \alpha_1 + \sum_{i=1}^{k+d\max} \beta_{1i} \ln GDP_{t-i} + \sum_{i=1}^{k+d\max} \beta_{1i} \ln NRR_{t-i} + \sum_{i=1}^{k+d\max} \beta_{1i} \ln TEX_{t-1} + \sum_{i=1}^{k+d\max} \beta_{1i} \ln TREVt_{t-i} + \mu_{1t} \quad (1)$$

$$\ln NRR_t = \alpha_2 + \sum_{i=1}^{k+d\max} \beta_{2i} \ln GDP_{t-i} + \sum_{i=1}^{k+d\max} \beta_{2i} \ln NRR_{t-i} + \sum_{i=1}^{k+d\max} \beta_{2i} \ln TEX_{t-1} + \sum_{i=1}^{k+d\max} \beta_{1i} \ln TREV_{t-i} + \mu_{2t} \quad (2)$$

$$\ln TEX_t = \alpha_3 + \sum_{i=1}^{k+d\max} \beta_{3i} \ln GDP_{t-i} + \sum_{i=1}^{k+d\max} \beta_{3i} \ln NRR_{t-i} + \sum_{i=1}^{k+d\max} \beta_{3i} \ln TEX_{t-i} + \sum_{i=1}^{k+d\max} \beta_{1i} \ln TREVt_{t-i} + \mu_{3t} \quad 3)$$

$$\ln TREV_t = \alpha_4 + \sum_{i=1}^{k+d\max} \beta_{4i} \ln GDP_{t-i} + \sum_{i=1}^{k+d\max} \beta_{4i} \ln NRR_{t-i} + \sum_{i=1}^{k+d\max} \beta_{4i} \ln TEX_{t-i} + \sum_{i=1}^{k+d\max} \beta_{4i} \ln TREVt_{t-i} + \mu_{4t} \quad (4)$$

Where LnGDP is the logarithm of real gross domestic product; LnNRR is the logarithm of real natural resources revenues, LnTEX is the logarithm of real government expenditures and LnTREV is the real logarithm f total government revenues. Basically, the Toda-Yamamoto method is performed in two steps. The first step consists of determining the lag length (*k*) of VAR model and the maximum order of integration (*d*) of the time series variables in the system. After the selection of optimum lag length VAR (*k*) and the order of integration *dmax*, a level VAR is estimated with a total of [*k*+*dmax*] lags. The second step requests the application the standard Wald tests on the first (*k*) VAR coefficient matrix to make Granger causal inference using a chi square (χ^2) distribution.

2. Empirical Results

2.2. Unit root tests

The results of the Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) for the four variables of the model are presented in Table 1. The results show that the null hypothesis cannot be rejected in each series in level where the series contain a unit root. By testing through first difference, the results clearly indicate that the null hypothesis of non-stationary can be rejected. Hence, from all of the tests, the unit roots tests indicate that each variable is integrated of order one.

Table 1. Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*PP*) Unit root tests

	ADF		**PP**		**Order of Integration**
	level	1st diff,	level	1st diff,	
lnGDP	-0.733352	-8.104605***	1.733720	-7.270988***	I(1)
lnNRR	-2.210946	-5.875245***	-2.236562	-5.873774***	I(1)
lnTEX	-1.853621	-4.77835***	-4.77835	-4.832955***	I(1)
lnTREV	-2.021203	-7.279084***	-1.837478	-7.457412***	I(1)

The result of selecting optimal lag length of VAR indicates that lag order of VAR (k) is 2 for multivariate VAR. In the next step we augment the VAR by the maximum order of integration of the series (*dmax*) and then performing the non-Granger causality tests.

3.2. The Granger non-causality tests

The results of the Granger non-causality tests due to Toda and Yamamoto (1995) procedure are presented in Table 2.

Table2. Toda and Yamamoto Granger non-causality tests

	lnGDP	lnNRR	lnTEX	lnTREV
lnGDP	-	4.554 *	3.633	0.832
lnNRR	7.202 **	-	0.799	11.679 ***
lnTEX	16.489**	0.243	-	1.410
lnTREV	5.962 **	4.732 *	0.417	-

Five major conclusions could be draw from the table above.

First, Table 2 shows that the null hypothesis of Granger no-causality from natural resource rents to economic growth can be rejected at the 10 percent level of significance in the Algerian case. Furthermore, the reverse result is also true. Therefore, we can confirm the presence of a bidirectional causal relationship between natural resource rents (lnNRR) and economic growth (lnGDP). This means that when revenues from natural resources increase, Gdp also increase and when Gdp increases, thanks to natural resources rents, the government would invest further in mining[1] and would explore further natural resources and field tankers, especially oil and gas which may in turn create employment opportunities and increase the level of production. This strategy would promote Gdp per capita and improve the Algerian living standards.

Secondly, the F-statistic results for the short-run dynamic reveal the existence of another bidirectional relationship between Total revenues (lnTREV) and Naturel Resource Revenues (lnNRR). This means that when natural resources rent increase, total government revenues increase too. This result is not surprising as like other oil-dependent countries, government expenditure is financed; mostly, though oil and gas exports revenues. Naural resources rents notably hydrocarbons revenues, have long been considered as the main engine of economic development.

Thirdly, from table 2 we can also conclude that Granger no-causality from economic growth (lnGDP) to Total Expenditure (lnTEX) can be rejected at the 5 percent level of significance. That means when Gdp increases, government increases its public spending to improve the infrastructure by building new roads, hospital, schools and universities, etc. Algeria has followed expansionary fiscal policy for long periods. The first important one was in the afterward of the independence to rebuild the country from a long period of conflict and colonization. Second, It is worth recalling that following the terrorism episode of mid-nineties, Algeria has increased significantly the spending in social and economic programs as well as the defense to fight violence and extremism and restore security and confidence. The successive economic development plans with massive government expenditure on education, health, social insurances and welfare services, housing and society development, economic services, and others contributed; largely, to increasing the economic growth rate and improving the life standard of the people.

[1] Most of Algerian territory is desert; hence investment in mining is the preferred strategy for Algerian government.

Fourthly, from table 2 we can also conclude that Granger no-causality from GDP to Total revenues can be rejected at the 5 percent level of significance. This means that when the economy is flourishing, mainly because of windfall of oil revenues, Algerian government collect more tax revenues from foreign enterprises, notably petroleum companies, and from export of hydrocarbon. In the contrary, when the economy is in recession, due to the drop of oil prices, tax revenues decrease and therefore total government revenues decrease automatically. The strong liaison between natural resource revenues and government revenues shows how much Algeria is dependent on oil and how much the it needs structural reforms to diversify its economy.

Finally, from table 2 we observe that government spending and government revenues are not cointegrated. This means that Government expenditure and revenues are both determined by the long run economic growth reflecting the institutional separation between government revenues and expenditure.

3. Conclusion and policy implications

The main purpose of this paper was to investigate the dynamic relationship between natural resource rents, government spending, government revenue and economic growth in Algeria during the period 1980-2011. As explained Algeria has a huge potential to diversify its economy by investing more in Agriculture. Is worth mentioning that Algeria had a very developed agricultural sector before starting the industrial-based strategy in the 70s, which destroyed a big part of agricultural lands. Algeria was called "Al-Bahja" which means the green land and was supplying many Mediterranean countries before becoming an importer of agricultural goods. The tourism sector has also big potentials. With 1400 km cost line, Atlas Mountains and desert Algeria could be an attractive global tourism destination. The Algerian government has to invest more on human capital, education and research and development. With political instability, Algeria has witnessed "Brain Drain" to Europe and USA. The health sector deterioration also needs to be tackled. With high rate of population growth the public sector could not satisfy the demand. Further, with low wage level citizens cannot afford treatment in private sector.

References

African Development Bank (2011), People's Democratic Republic Of Algeria. *Dialogue Note* 2011-2012. African Development Bank Group

African Development Bank (2012). *Algeria Economic Outlook*. African Economic Outlook 2012.

Dickey, D.A. and Fuller, W.A., (1981), Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root, *Econometrika,* 49 (4), 1057 – 1072.

Doran H E and Rambaldi A E (1996) Applying linear time-varying constraints to econometric models: With an application to demand systems. *Journal of Econometrics.* Volume 79, Issue 1, July 1997, Pages 83–95

Johansen, S. (1988), "Statistical Analysis of Cointegrating Vectors", *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen, S. and Juselius, K. (1990) "Maximum Likelihood Estimation and Inference on cointegration with Applications to Demand for Money." *Oxford Bulletin of Economics and Statistics*, Vol.52, May, pp. 169 – 210.

Phillips, P.C.B. and Perron, P. (1988), Testing for a Unit Root in Time Series Regression, *Biometrika* 75 (2) 336-346.

Toda, H.Y. and Yamamoto, T. (1995) "Statistical inference in vector autoregression with possibly integrated processes" *Journal of Econometrics*, 66(1-2), 225-250.

World Bank 2012, *World Development Report*, New York: Oxford University Press.