

Empirical Investigation of the Impact of Diversification non-hydrocarbon exports on Economic Growth: Evidence from Algeria

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Abstract.

The main purpose of this research paper is to identify the effect of diversification non-hydrocarbon exports on economic growth in Algeria economy. The objective of present study is to empirically examine the short-run and the long run relation between Independent variables and economic growth .over the period from 1980 -2016, by using the autoregressive distributive lag (ARDL) modelling technique based on Pesaran et al. (2001).

The standard study showed the weakness of non-hydrocarbon exports in the period from 1980 to 2016.This is because of the focus on the rent economy. There is a negative relationship between exports outside hydrocarbons and economic growth during the study period, which confirms the lack of diversification strategy in the Algerian economy.

Key words: Algerian Economy, Economic Diversification, GDP Growth, Non-hydrocarbon exports, the model(ARDL).

JEL classification codes: F43, C01, Q0

Résumé .

L'objectif de ce document de recherche est d'identifier l'effet de la diversification des exportations hors hydrocarbures sur la croissance économique de l'économie algérienne. L'objectif de la présente étude est d'examiner de manière empirique la relation à court et à long terme entre les variables indépendantes et la croissance économique. Durant la période 1980-2016, en utilisant la technique de modélisation du décalage distributif autoregressive (ARDL). L'étude standard a montré la faiblesse des exportations hors hydrocarbures entre 1980 et 2016. Cela s'explique par la mise au point sur l'économie de la rente. Il existe une relation négative entre les exportations hors hydrocarbures et la croissance économique au cours de la période à l'étude, ce qui confirme l'absence de stratégie de diversification de l'économie algérienne.

Mots clés : Économie Algérienne, La diversification économique, La croissance économique, Exportations hors hydrocarbures, le modèle (ARDL).

Codes de classification JEL : F43, C01, O0

1. Introduction

Algeria is one of the oil rich countries that may be affected by the so-called natural resource curse. It is one of the most important producers and exporters of hydrocarbon products (oil and gas) in the world. Its exports from this sector represent about 98% of its total exportation. Thus, Algeria is facing the same challenge as other oil rich countries. Algeria is trying to diversify its economy by implementing several programs under different national and international circumstances .

Many countries, such as the BRICS and the Group of Industrial Countries, achieved optimal rates of economic growth by turning to industry. In 1960, China exported 80% of the commodities, and today it has about 80% of industrial products, India, Brazil, Malaysia, Vietnam, Indonesia and Mexico. Most of these new industrial forces have economies based on single raw materials. At present, they are deeply integrated into global production networks across a wide range of sectors, participate in the rapid growth of South-South trade, and in most cases accelerate the development of their export mix and diversify their economies. Malaysia Was the first importer of palm oil from Nigeria and is currently the first source of this oil, Therefore, most rental countries in general, such as Algeria and Nigeria, suffer from high oil prices, which in turn lead to increased consumption expenditure, non-productive projects, diversification of sectors and re-investment of funds in one prosperous sector. In the case of decline, these countries adopt austerity fiscal policy.

This paper tries to make a link between the export non-hydrocarbon diversification and GDP growth in the Algerian economy. This study is divided into four sections: after this brief introduction of the Algerian experience, we provide the literature review, explore the data and methodology used, examine the empirical results, and finally, we conclude with some recommendations.

1.1. Study Problematic

Economic diversification, the ideal strategy of the oil states, whose revenues are dependent on a single source of income to finance their general budget. Based on this, we will try through this research study to answer the following main problem: What is the contribution of economic diversification in the levels of economic growth in Algeria?

1.2. Study hypothèses

In order to answer the problem we have developed a main hypothesis, which is as follows:

- In order to address the previous problem, we will rely on a single hypothesis that the level of economic diversification in Algeria negatively affects economic growth.

1.3. Importance of the study

The study derives its importance from the importance of the subject itself. The importance of this research is that it sheds light on one of the most important problems facing the national economy, which has long been on the table: moving the structure of the national economy from a rent economy to a diversified one. Was not significantly affected by global fluctuations in oil prices.

1.4. Objectives of the study

Through this research, paper we seek to achieve a set of objectives summarized as follows:

- This research aims at measuring the impact of the level of economic diversification on economic growth in Algeria
- Analysis of the relationship between the dependent and independent variables.
- An attempt by the researchers to provide practical value for this subject.

2. Theoretical framework of the study

2.1. Previous studies:

In order to identify the nature of the relationship between the independent variables and the design of empirical model of the

study, the two researchers reviewed the literature on the subject; we present the most important studies in the Following:

The study of (Dessus, S., & Suwa-Eisenmann, A., 1998, p. 11), examines the extent to which the bilateral free trade agreement with the EU has been encouraged to diversify exports and move from the rent economy to a diversified economy. This paper uses a dynamic balance model for forecasting. The researchers concluded that the PTA with Europe. Through technology transfer and pressure from competition. Under these circumstances, the Convention has a similar effect on what can be expected by one State.

The study of (Al-Marhubi, F, 2000, pp. 559-562), used recent theories of growth. This paper provides empirical evidence that export diversification promote economic growth. This result is strong for different growth rates and different measures of export diversification in developing countries. Diversification of exports is also associated with higher investment rates.

The study of (Berthélemy, J. C, 2005, pp. 591-611), discusses the arguments for the policy of economic diversification and examines the benefits of diversification in light of the theory of international trade. Then determine the determinants of diversification, following a comparative study of some developed, emerging and developing countries. It has been shown that economic diversification can be closely linked to new forms of international specialization that are inter-trade and industry. The successful diversification policy must be based on participation in globalization. According to the study conducted by the author (Anyaehe, M. C., & Areji, A. C, 2015, pp. 88-94) shows the extent of investment of oil revenues in Nigeria to develop and diversify the economy.

Study of (Spetan, K. A. A., & Saqfalthait, N., 2013, p. 22) ,one of the most quoted work on export diversification and economic growth used the Ordinary Least square estimation technique to explore the relationship between export diversification and economic growth in Jordan and other selected Arab countries from 1975-2010. The results showed that there is no significant relationship between export diversification and economic growth.

Study of (Herzer, D., & Nowak-Lehmann, D., 2004), found a long-run statistical relation between growth and exports diversification

based on time-series data from Chile. Compatible with this finding, Arip et al. have examined the relationship between exports diversification and economic growth in Malaysia using time-series data. It has been noticed that exports diversification plays significant role to economic growth in Malaysia.

(Kpemoua, 2016) empirically analyzes the effect of exports on economic growth in Togo as well as the existence of a causal relationship between exports and economic growth by applying a model that rely on a production function neoclassical type.

The data cover the period 1960-2014. The methodological approach used is based on cointegration and causality techniques. Empirical results show a positive and significant correlation at the threshold 1% long-term between exports and economic growth and causality in the sense of Toda and Yamamoto, exports to economic growth.

3. Economic Diversification - Concept and Dimensions

3.1. Concepts and definitions :

Economic diversification is a development policy aimed at reducing economic risk; increasing value added; improving income; expanding investment opportunities and strengthening linkages in the economy. Economic diversification efforts usually have three overlapping objectives:

- Stabilization of economic growth
- Expand the revenue base
- Sectoral value added

Diversification, involves reducing dependence on the sole resource, moving to the stage of strengthening the industrial and agricultural economic base and creating a productive base, which means building a healthy national economy that is geared toward self-sufficiency in more than one sector. (Hare, 2008, pp. 12-14) In broad terms, economic diversification means that the country must produce a wide list of goods and services.

From an empirical point of view, (Anyaehe, M. C., & Areji, A. C, 2015, pp. 88-94), the Economic diversification is a process of broadening the range of economic activities both the range of economic activities both in the production and distribution of goods and services. It does not necessarily entail increase in output but it

enhances stabilization of economies by diversifying their economic base.

As for (Bature, B. N. , 2013, p. 06), defines economic diversification as the expansion of economic activities in both the production and distribution of goods and services.

Furthermore, the expansion of the economy to create opportunities for various economic activities on a large scale by providing jobs, and stabilizing the economy against economic fluctuations and maintaining the growth prospects of States.

An economy is said to be diversified if its productive structure is dispersed in a large number of activities different from each other by the nature of the goods and services produced (Berthélemy, J. C, 2005, pp. 591-611).

3.2. Determinants of economic diversification

The main determinants of economic diversification are ((MARÉ, John HE, 2011, pp. 09-11):

- 1. Governance:** An activity carried out by management that relates to decisions that determine expectations, or grants Power, or performance verification, consists either of a separate process or of a specific part of operations Management or leadership, where good governance helps to increase economic diversification.
- 2. Natural resources:** One of the most important determinants of economic diversification, where it can be used In raising productive goods exported, but the well-being of a society is not limited to the extent available Resources, but by optimizing the utilization of those resources.
- 3. Private sector:** The private sector plays an important role in economic diversification, led and managed Innovations and economic activity, for example investment in research and development of activities The private sector faces a set of obstacles, which requires the government to find ways to promote entrepreneurship by developing favorable industrial and trade policies and removing bureaucratic obstacles to private companies. Governments need to be aware of the needs of the private sector, such as improving the business climate through

«Communicate to build constructive partnerships with the private sector.

3.3. Indicators of economic diversification

Economic diversification is measured by several statistical indicators that vary in efficiency and suitability for measurement purposes, some of which depend on the measurement of the dispersion phenomenon such as the difference coefficient and some of them measure the concentration as a genetic index and some on the concept of diversity as (*ERFINDAL- HIRSHMAN*).

The variables that are applied to them are many, including the GDP according to the economic activities in the national accounts, the structure of the GDP output and its distribution between the oil output and the non-oil output, the structure of the exports and their distribution and distribution of the actual revenues of the government between the oil and non-oil. The United Nations Development and Trade the least developed countries determine a criterion for economic diversification consisting of four elements: the contribution of the industrial sector to the GDP, the contribution of labor in industry, the amount of individual consumption of electricity and the concentration of exports.

▪ **Export Diversity Index**

It measures the deviation of the share of exports of a country's major commodities in its total exports from the share of national exports of those major commodities in world exports.

This index ranges from 0-1. The closer this indicator is from zero, the higher the variation in exports. National exports with the structure of global exports and takes the following index (Mohamed benbouziane ,Farah elias elhannani, Aboubakr boussalem, 2018):

$$Hi = \frac{Xi}{\sum_{j=1}^n xj} * \sum_{j=1}^n 1$$

Where:

X_j : exports a certain country,

$\sum X_j$: The total exports of a particular country

H_i : Scale of export diversification.

4. The reality of economic diversification in Algeria

The Algerian economy since independence is facing many challenges, the most important, has been it's the growing dependence on the hydrocarbon sector. Algeria is one of the major exporters of oil and gas in Africa. It is the world's 14th largest oil exporter, the sixth largest producer of gas. Algeria has proven crude oil reserves are estimated at 12.2 billion barrels, as of 1/1/ 2013, which is equivalent to about 20 years of current production. (Chekouri, S. M., Benbouziane, M., & Chibi, A., 2017)

Unfortunately, despite the multiplicity of economic reforms pursued by successive Algerian governments since independence to diversify the economy away from the oil and gas sectors, the Algerian economy maintains the same characteristics of an economy depending primarily on the production and export of oil. Today, the Algerian economy is among the least diversified economies in the world. The figure below show the graph of the historical performance of the exports in Algeria from 1971 to 2016.

Figure (1): Evolution of the exports rate in Algeria from 1971 to 2016.



Source: Author's Computation based on World Bank data.

5. Empirical framework of the study

5.1. Methodology of the study:

The ARDL approach is used to analyze the long run cointegration relationship as well as the short run dynamics, even when the time-series are stationary I (0) or integrated of order I (1). The variables may include a mixture of stationary and non-stationary time-series for ARDL Bounds testing approach proposed by (PESARAN, M. Hashem, 1997, pp. 178-191), (Pesaran, M. H., Shin, Y., & Smith, R. J, 2001, pp. 289-326).

5.2. Study Sample :

The study is going to use time series data for the following variables: GDP: Gross domestic product, exports, H.HEXPO:Non-hydrocarbon exports, oil: prices of oil, CP: Gross Capital and LB: labor force.

The data cover the period (1980-2016) and the study data used to estimate **ARDL** model were obtained from different issues of World Bank database exactly in world development indicators (WDI) and International financial Statistics (IFS).

The model

The estimate of the impact of non-hydrocarbon diversification on economic growth is made from the following growth equation:

$$GDP = f(OIL, LB, CP, HHEXPO, EXPO) \dots\dots\dots (1)$$

The mathematical representation of an ARDL regression model is:

$$GDP(t) = \alpha_0 + \beta_1 GDP(t-1) + \beta_2 OIL_{(t)} + \beta_3 CP_{(t)} + \beta_4 LB(t) + \beta_5 EXPO + \beta_6 H.HEXPO(t) + \varepsilon(t) \dots\dots (2)$$

Where:

α_0 Represent the intercept of the function or we can say the constant, and ε is a random "disturbance" term, and then $\beta_1; \beta_2; \beta_3; \beta_4; \beta_5; \beta_6$ are parameter to be estimated.

4.3. Unit Root Tests for the Variables

Before presenting empirical results of the ARDL model, we apply the following econometric steps of the stationary and non-stationary Tests of the time series data by Augmented Dickey-Fuller (1979) (ADF). (Dickey, D.A. & W.A. Fuller, 1979, pp. 427-431) Test.

The Augmented Dickey-Fuller (ADF) test results for the time series variables are presented in Tables (1) below.

Table (1): results of unit root test (The Augmented Dickey-Fuller test)

Variables	At level		At First Difference		Results
	ADF statistical	Result	ADF statistical	Result	
LGDP	-2.69	No stationary	-5.47	stationary	I(1)
L OIL	-2.02	No stationary	-5.50	stationary	I(1)
LCP	-6.00	stationary	----	----	I(0)
LLB	-2.95	No stationary	-7.37	stationary	I(1)
LEXPO	-1.94	No stationary	-5.37	stationary	I(1)
LH.EXPOR	-0.99	No stationary	-4.81	stationary	I(1)

Source: Constructed by the authors using EViews' output.

In the results, shown in table (1) above, The Augmented Dickey-Fuller (ADF) test statistic of the variables: LGDP, LOIL, LLB, LEXPO, LH.HEXPO are greater than the respective critical values. Thus, we accept the hypothesis of unit roots of this latter, and not significant at 1%, 5%, 10 % level with (MacKinnon 1996).

Moreover, they are unstable at the level.

After taking the first differences, these variables become stationary and significant at 1% 5% 10%, as shown in the table in both The Augmented Dickey-Fuller (ADF) test statistic. Excepting for the variable CP" capital", it is stationary at level I (0).

Therefore, to study the long-term relationship between the variables of the study, we will use the autoregressive distributed lag (ARDL) method, because of a combination of stable time series between, I (0) and order I (1).

Before estimating the ARDL model, we must determine the optimum lags for the model. The choice of the lags according to the following criteria: Akaike, Schwarz and Hannan-Quinn, depending on the lowest statistical value for the criteria that correspond to the acceptable. VAR Lag Order Selection Criteria Were presented in Table (2) below.

Table (2): VAR Lag Order Selection Criteria

Lag	Logl	LR	FRE	AIC	SC	HQ
0	-73.03156	NA	3.89505	6.87230	7.168525	6.94607
1	61.7128	187.4705*	-8.18209*	-1.714161	1.391702	-1.192679
2	106.2797	38.7537	8.5060	-2.45910*	0.359350*	-1.490637*

Source: Constructed by the authors using EViews' output.

* 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

After examining the number of the lags, the results indicate that the number of delay intervals followed by variables is P = two. In

addition, this is because it corresponds to the smallest value for most standards.

5.4. ARDL Bounds test estimation results

To determine the existence of long run relationship among the variables of the study, the (Pesaran, M. H., Shin, Y., & Smith, R. J, 2001, pp. 289-326).

Bound test procedure is used. The bound test results are presented in Table (3) below.

Table (3): ARDL Bounds test results

Test Statistic	Value	K
F-statistic	4.21	5
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.08	3
5%	2.39	3.38
2.5%	2.7	3.73
1%	3.06	4.15

Source: Constructed by the authors using EVIEWS² output.

The result reveals that F-Statistics is ($F= 4.21$), which is greater than the upper I(1) and Lower I(0) critical bound of 4.15 at 1% level, 3.73 at 2.5% level, 3.38 at 5% level and 3 at 10% level. Thus, the null hypothesis can be rejected.

This suggests that there is long run relationship among variables: LGDP, LOIL, LCP LLB, LEXPO, and LH.HEXPO over the period of the study (1980 to 2016).

5.5. Estimated Coefficients using the ARDL approach

The next step of the ARDL approach would be to estimate the coefficients long run relationship of the variables. The results of the long run estimated coefficients are presented in Table (4)

Table (4): ARDL Cointegrating and Long Run Form (Dependent Variable: GDP)

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	P. Value
Short- Run Coefficients				
D(LOIL)	1.05	0.42	2.49	0.02
Coint Eq(-1)	-1.14	0.18	-6.27	0.00
Long -Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	P. Value
LOIL	0.59	0.67	0.88	0.04
LCP	0.20	0.76	0.27	0.78
LLB	-1.88	1.28	-1.47	0.15
LEXPO	0.44	0.22	1.94	0.06
LHXPPO	-0.20	0.19	-1.07	0.29
C	8.09	11.98	0.67	0.50

Source: Constructed by the authors using EViews⁷ output

The results of our estimation confirm that there is a common correlation between the variables of the study in the long- run, because the error correction coefficient, which measures, the speed of return to equilibrium is negative and statistically significant. The error correction coefficient (CointEq = -1.14) indicates that short-term imbalances will be corrected by 114% in the long term for last period.

Long-term estimation results indicate a positive effect of oil prices on economic growth in the study period, so that a 1% increase in prices leads to an increase of 59% in economic growth.

There is a positive effect on the gross capital and exports on growth measured by the gross domestic product, so that the increase of exports by 1% leads to an increase of economic growth by 44%. also the capital increase by 1% lead machine increase in GDP by 20%,

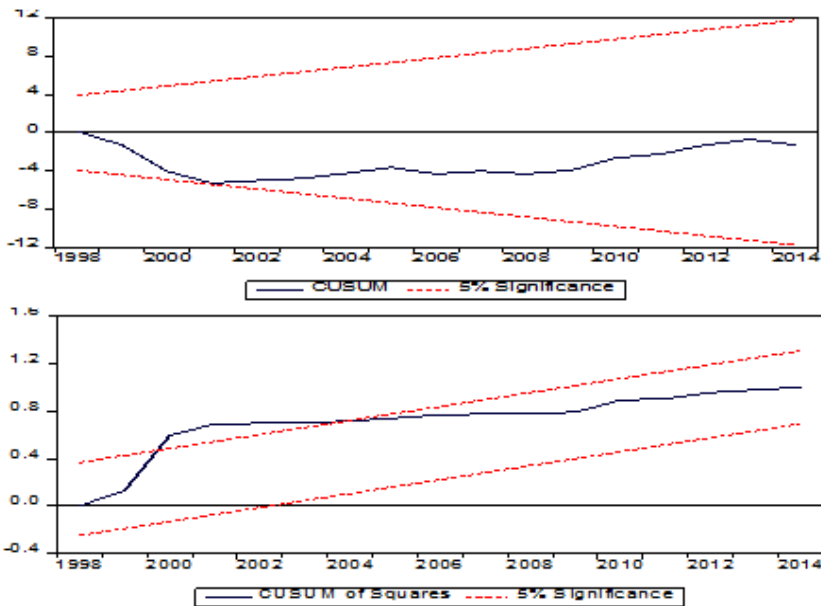
this result is consistent with the theory of economic assumptions that capital accumulation is a key factor in the development process.

5.6. Stability test of the model

To make sure, that the data used in this study, does not contain any structural changes, we should use one of the appropriate tests CUSUM, and CUSUM OF SQUARES. which (Brown , Robert L ,Durbin,James,& EVANS ,James M, 1975, pp. 149-192) , developed in order to clarify the structural change in data ,and the extent of stability and consistency ,of long-term parameters with short-term parameters.

If the plot of CUSUM-SQ and CUSUM statistic stays within 5% significance level, then the estimated coefficients are said to be stable. A graphical presentation of this test for our ARDL model is provided in Figures below.

Figure (2): Plot of CUSUM &CUSUM-SQ showing stability of the Model



Source: Constructed by the authors using EViews' output.

The result in The Figure shows that the curve (**CUSUM**) is located within the critical limits for 5%, but the curve (**CUSUM OF SQUARES**) does not stay within the critical limits for 5%, which explains that the model is statistically acceptable but is stable over time, between 1980 and 2016.

5. Conclusion :

This research paper aims to investigate the effect of diversification non-hydrocarbon exports on economic growth in Algeria. *The Autoregressive Distributed Lag (ARDL)* newly developed approach *has* been employed to capture the long-run cointegration between independent variables which are(labor force, gross capital, oil prices, exports and non-hydrocarbon exports) and economic growth variable. Annual time series data from 1980 to 2016 has been used for analysis.

Through the above, we conclude the following:

- Both variables are tested for unit root and before cointegration test, bound test has employed. Both variables are stationary at first difference and level, which are desirable for running ARDL model,as shown in table 1. Several test has been conducted for stability analysis of model and diagnostic test as shown in table 4,the plots of *CUSUM* and *CUSUM-SQ* test also performed for model stability, results are statistically significant at **5%** significance level, shown in figure 1.
- Table 3 shows the bound test results, these results are statistically significant at 1%, 2.5%, 5%, and 10% significances levels, which shows that suggested there is long run relationship among variables over the period of the study (1980 to 2016).After bound test, we estimate short-run and long-run cointegration tested, our results are showing in table 4. For the ARDL model, we found that labor and exports non-hydrocarbon negatively affect economic growth in the study period in Algeria, so that the increase in the volume of exports non- hydrocarbons out of oil by 1% leads to a

reduction of growth by 20%.

Recommendations:

- ✓ Our study serves as a platform that encourages researchers to undertake further studies to develop this model.
- ✓ Interest to the agricultural sector as one of the most important sectors that can be based on achieving, Self-sufficiency and export abroad, given Algeria's potential in this area, including fertile land and climate and geographical diversity.
- ✓ Focusing on investing in infrastructure, especially hotels, improving services and providing them with affordable prices to customers, converting them from foreign tourism to domestic tourism, thus retaining the hard currency that was draining foreign tourism.
- ✓ The importance of the state intervention to adopt effective strategies depends mainly on activating the role of the private sector alongside the public sector in order to contribute to increasing the establishment of SMEs in various sectors as the main engine of economic recovery.
- ✓ Formulate clear sector strategies according to the priorities of each sector.

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