Economic Diversification and Trade Openness in Algeria

Empirical Investigation

By:

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Abstract:

In the context of globalization, openness to international markets became a necessary element to boost the economies of nations. Thus, this paper tries to show the role of trade openness in diversifying the economies and resource rich countries in particular. The paper provides analytical and empirical explanation for the role of openness in diversifying the Algerian economy as one of the most important oil exporting countries. Using the Herfindahl-Hirschman index of export concentration, we found that the trade openness measured by this index increased the concentration of Algerian exports over the period of 1985-2015. Meanwhile, the foreign direct investment has not played any role in diversifying the national economy. The research uses the two stages least squares to show this relationship.

Key words: trade openness, economic diversification, exports, oil, Algeria.

JEL classification codes : F19, Q0, Q3, F1

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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.

The external trade in Algeria has been strictly controlled by the state during the period of 1970 to 1986. After this date, and the sharp fall of the international oil prices, the Algerian state started to think about opening the economy to the external world; the state opened its market progressively, rather then suddenly. This openness coupled with the political circumstances that existed in Algeria at the time has led to strong economic and social instability. In 1999 and 2000, Algeria fought against the social strife and escaped the black decade. Consequently, the government reconsidered the trade policy and the openness of the market. From 2000-2008, the external trade was characterized by freedom and free exchange zones. In 2009, Algeria reassessed the adhesion to the free exchange zones, and worked on the limitation of imports as one of the tools to boost domestic production (Temmar 2015). Furthermore, Algeria suffers, like other developing countries, from recession investments of various kinds. They are looking for ways to revitalize, so Algeria adopted in the mid-nineties the economic opening-up policy. The policy has the following goals: encourage the flow of foreign capital, develop legislation to approve incentives, attract modern technology to establish industries and strengthen economic growth, and stimulate domestic investment. These are essential elements for economic growth, the diversification out of the hydrocarbon sector, and the achievement of economic and social development. Therefore, these steps could attract the largest number of foreign direct investment and contributes to a more open Algerian economy. (Louail 2015)

This paper tries to make the link between the export diversification and trade openness in the Algerian economy by taking into consideration the role of other economic and institutional determinants of diversification. 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.

Literature Review

"International trade has a very positive effect on economic growth. A sudden shift in trade policy that opens up new trade provides an immediate gain in real per capita income, which, in turn, accelerates technological progress and increases the rate of economic growth permanently" Van der belg and Lewer 2007, P76.

This argument by Belg and Lewer has already been approved 250 years ago by Adam Smith in his absolute advantages theory, and by David Ricardo in his comparative advantages theory. Moreover, many studies have dealt with this issue as one of the main drivers of economic growth and welfare (Hecsher-Holin model), as well as the diversification of the resource rich economies.

As indicated by Van den Berg and Lewer (2007), not only international trade, but also accompanying activities such as international marketing, market research, product planning, and international travel contribute to the transfer of knowledge and technology. Hence, globalization would allow trade, under certain circumstances, to expand knowledge and ideas and by these means, to enhance economic growth.

Recently, a vast number of empirical studies support the hypothesis that, all other things equal, countries open to international trade benefit their residents with higher incomes and higher rates of economic growth. However, some countries are proving the contrary. Because of their natural resource dependence, exporting countries suffer. On the other hand, importers of energy have benefited from the openness of their economies and have shown effectively the relationship between openness, growth and diversification is positive.

Vellinga and Abdelgalil (2007) developed a dynamic computable general equilibrium (CGE) model for Qatar with the goal of getting some insights into the workings of this small, open, oil-dependent economy. The model resulting indicates that the increase of the price of oil and trade liberalization lead to a substantial favorable outcome in term of both GDP and wealth. On the contrary, the introduction of the VAT (value added tax as a simulation of economic diversification) has an adverse impact on both GDP and wealth. Nevertheless, Haddad, Lim and Saborowski (2010) found that trade openness reduces growth volatility only if the product

basket is well-diversified—which reflects the positive relationship between openness and economic diversification. Dogruel and Tekce (2010) investigated empirically the impact of trade liberalization on the export diversification of a set of MENA countries and argued the role of openness as one of the crucial policies to diversify an economy. Huchet-Bourdon, Le Mouel and Vijil (2011) showed clearly in an empirical investigation that countries exporting higher quality products or more diversified products grow more rapidly.

Kurihara and Fukushima (2016) examined whether openness of the economy promotes production diversification or production specialization, and whether or not specialization/diversification spurs economic growth. They focused on the existence of empirical patterns of production of diversification/specialization between international trade and economic growth. They showed that greater openness of the economy does not always mean the greatest economic growth in emerging and developing countries. Economic conditions and market structures related to international trade must be considered carefully to achieve the economic growth.

Regarding the Algerian case, many researchers tried to show empirically the role of trade liberalization on the national economy. Touitou (2016) showed that by reducing tariffs, domestic output increase in almost all the sectors, but government revenue and savings decline significantly. Using the cointegration method, Ghecham (2013)[4]contended that trade liberalization in Algeria could lead to an appreciation of the real exchange rate, which in turn could hamper efforts aimed at diversification of the economy. Serious attention should be paid to institutional settings and the economic structure of the recipient environment. Otherwise, Sorsa (1999) argued that trade protection in Algeria would depreciate the real exchange rate which in turn would improve the competitiveness and incentives to invest in non-oil sectors which leads to diversification.

Data and Methodology

The empirical model of this paper is based on estimating the effect of trade openness on the economic diversification in Algeria over the time period 1985-2015 based on the two stages least squares method. To estimate the effect of trade openness on the economic diversification, we estimate the following equation and takee into account the other determinants of diversification:

$$HHI_t = \alpha_0 + \alpha_1 Openness_t + \alpha_2 oilvolatility_t + \alpha_3 FDI_t + \alpha_4 GCF_t + \alpha_5 ICRG_t$$
$$+ \alpha_6 RGDP_t + \alpha_5 REER_t + \varepsilon_t \qquad (1)$$

The Dependent Variable: is represented by HHI and is used to measure the degree of market concentration, it varies between 0 and 1. The nearer the index is to 1, the more concentrated the market and vice versa.

Herfindahl and Hirschman constructed this index from the following equation

$$H_{ij} = \frac{\sqrt{\sum_{j=1}^{n}\left(\frac{x_{ij}}{X_i}\right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}} \qquad (2)$$

x_{ij}: Exports value for country j and product i

$X_i = \sum_{j=1}^{n} x_{ij}$

n: Maximum number of countries.

The data for this index are taken from the UNCTAD (United Nations Conference on Trade and Development) database and the World Bank.

- The Independent Variables

RGDP is the real gross domestic product per capita calculated in logarithmic terms and the data are taken from the World Development indicators database;

Openness is the rate of trade openness; it is calculated by the sum of exports and imports of goods and services measured as a share of gross domestic product.

Oil price volatility (oilvolatility): In order to estimate the volatility of oil prices we have two methods: either to estimate the conditional standard deviation using the generalized autoregressive conditional heteroscedasticity model GARCH (1, 1), or to calculate the annual standard deviation for monthly series. In this study, we have used the second method of calculating the oil price volatility instead of estimating the conditional variance of the annual data using the model GARCH (1, 1) because of the non-significant results of this model which show its inadequacy in this situation. The volatility is measured by the annual standard deviation of monthly changes (calculated by the logarithm) in international oil prices. (Monthly data for the crude oil price are taken from the United Nations Conference on Trade

and Development (UNCTAD) database.) using the following formulation (Arezki and Gylfason (2011)):

$$\sigma = \sqrt{\frac{1}{12} \sum_{1}^{n=12} (x_i - \mu)^2} \qquad (3)$$

With:

σ: the annual standard deviation;

x_i: the logarithm of monthly oil price;

μ : the mean of twelve observations;

n:12 is the number of observations, in this case it reflects the number of months in a year.

- **FDI** is foreign direct investment inflows as a percentage of GDP, data are brought from UNCTAD database.

- **GCF** is the gross capital formation (formerly gross domestic investment) and consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. The data are brought from the World Bank indicators.

- **ICRG** is the institutional quality variable measured by the political risk index[5];

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[5]This index is taken from the dataset constructed by Political Risk Services (International Country Risk Guide governance indicators, 2013). According to ICRG's definition "*the aim of [the] political risk index is to provide a means of assessing the political stability of the countries*". The political risk rating comprises 12 variables covering both political and social attributes (Government stability, Socioeconomic conditions, Investment profile, Internal conflict, External conflict, Corruption, Military in politics, Religious tensions, Law and order, Ethnic tensions, Democratic accountability, Bureaucracy quality). The ICRG political risk score ranges from 0.00% to 100% , with higher values indicating low risk, and lower scores meaning higher risks .

- **REER** is the real effective exchange rate based on the year 2010 and it is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. The data are brought from the World Bank indicators.

List of Instruments:

To apply the method of two stage least squares, we use a set of instrumental variables in which some of them are the explanatory variables used in the structural equation (FDI; GCF; ICRG; Openness; oil volatility and REER); we used also the lagged endogenous variable (RGDP (-1)). Other economic variables are used, namely the inflation rate measured by the consumer price index (CPI) to control for the monetary policy; the total government expenditure (Govexp) as percentage of GDP to control for the fiscal policy; and the domestic credit provided to the private sector (Private) to control for the development of the financial system.

To get the objective of the econometric study, we have followed these steps:

1. Before estimating the equation and using the TSLS, we verify the identification of the model.

The number of endogenous variables in the model is 2; there are 7 exogenous variables in the equation and11 predetermined variables in the model.

2-1=1 < 2-1+11-7=5 => the model is over-identified so we can use the two stage least squares method.

2. The time series analysis focuses on descriptive statistics of the variables used and testing the stationarity of the series for the different variables used in the model using the Augmented Dickey-Fuller (ADF) and Phillippe-Perron (PP) unit roots tests:

If we reject the null hypothesis because of the t-statistics (with the critical value at 5%)and the series Is not a unit root, then it is stationary (Agung I.G.N; 2009; P447).

3. We estimate the equation below:

$$HHI_t = \alpha_0 + \alpha_1 RGDP_t + \alpha_2 oilvolatility_t + \alpha_3 FDI_t + \alpha_4 GCF_t + \alpha_5 ICRG_t + \alpha_6 Openness_t + \alpha_7 REER_t + \varepsilon_t \dots\dots\dots\dots\dots \quad (4)$$

4. Testing the validity of the model, we check for autocorrelation, heteroscedasticity, normality of the error terms, and multicollinearity.

5. Hypotheses testing: We test the significance of the estimated parameters basing on the following hypotheses:

Hypothesis 1: There is an effect of openness on the export concentration. (HHI) (H_1)

Hypothesis 2: There is an effect of oil price volatility on the export concentration. (HHI) (H_1)

Hypothesis 3: There is an effect of FDI on the export concentration. (HHI) (H_1)

Hypothesis 4: There is an effect of GCF on the export concentration. (HHI) (H_1)

Hypothesis 5: There is an effect of ICRG on the export concentration. (HHI) (H_1)

Hypothesis 6:There is an effect of RGDP on the export concentration. (HHI) (H_1)

Hypothesis 7: There is an effect of REER on the export concentration. (HHI) (H_1)

Empirical Results

Table (1): Descriptive Statistics of the Variables

|	HHI	LRGDP	OILVO LATILI TY	FDI	GCF	ICRG	OPENN ESS	REER
Mean	0.45082	7.91698	0.1228	0.00774	0.3272	54.134	0.5705	156.41
Median	0.51058	7.89197	0.0993	0.00701	0.3076	55.625	0.5871	117.95
Maximum	0.60184	8.10272	0.3581	0.02023	0.4688	64.000	0.7668	446.64
Minimum	0.22766	7.72817	0.0296	1.96E-08	0.2245	41.417	0.3268	96.399
Std. Dev.	0.12945	0.12251	0.0817	0.00678	0.0619	7.2548	0.1145	96.659
Skewness	-0.65929	0.08059	1.3894	0.2791	0.7291	-0.2538	-0.2931	1.9495
Kurtosis	1.78889	1.55128	4.2605	1.77914	2.6616	1.6072	2.2371	5.5167
Jarque-Bera	4.14034	2.7444	12.026	2.3277	2.8946	2.8386	1.1955	27.818
Probability	0.12616	0.25353	0.0024	0.31227	0.2352	0.2418	0.5500	0.0000
Sum	13.97549	245.4265	3.80695	0.240058	10.1439	1678.16	17.6884	4848.75
SumSq.Dev.	0.502734	0.450246	0.20041	0.001381	0.11507	1578.96	0.39361	280287.3
Observations	31	31	31	31	31	31	31	31

Source: Authors' construction using Eviews' Outputs.

The table above (1) displays the descriptive statistics of the variables used in the TSLS equation. Basing on 31 observations, the Jarque-Bera statistic shows that all the variables follow normal distributions except the series of oil price volatility and the real effective exchange rate which are highly leptokurtic to the normal (Kurtosis superior to 3). The means

and medians of all the series are positive which indicates the positive trends of these series. Moreover, Figure (1)) displays the graphs of each variable, and we can notice very clearly the instability of the oil prices from the different spikes showed in the volatility diagram.

Figure (1): Graphical Representation of the Variables' Series
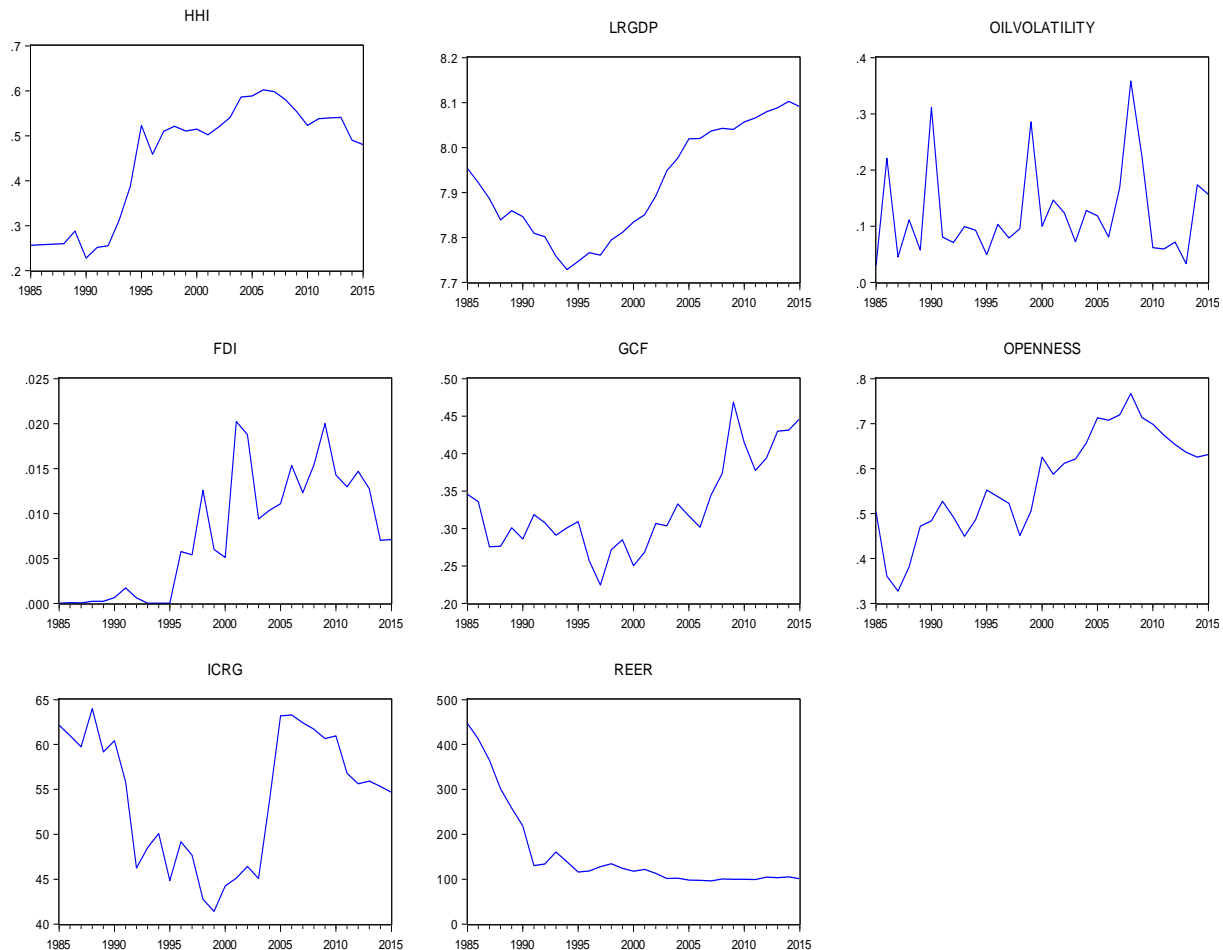
Source: Author's construction using Eviews' outputs.

After controlling for the identification problem and showing that the equation is over-identified, the unit root test for the variables used indicated the non-stationarity of the series in the level under the ADF unit roots test. Meanwhile, the 1st differences are stationary except for the series of oil price volatility which is stationary in the level and the consumer price index which is integrated in order II, which allows us to use these series in the estimation. The results for these tests are summarized in Table (2).

Table (2): Results of the Augmented Dickey-Fuller Unit Root Test for Stationarity

Variables		None	Intercept	Trend and intercept	
HHI	Level	0.5697	-1.5239	-0.63874	I(1)
	1st difference	-5.0002***	-5.086***	-5.4165***	
LRGDP	Level	0.74403	-0.8774	-4.0263**	I(1)
	1st difference	-3.0202***	-3.0854***	-3.19**	
CPI	Level	1.269	-0.31568	-2.7976	I(2)
	1st difference	-1.0871	-2.4346	-2.3911	
	2nd difference	-5.5408***	-5.4630***	-5.3623***	
GCF	Level	0.36672	-0.90815	-2.45556	I(1)
	1st difference	-5.401***	-5.5968***	-5.8487***	
GOVEXP	Level	0.08435	-2.4198	-2.2208	I(1)
	1st difference	-4.058***	-3.9745***	-4.0708**	
FDI	Level	-1.074	-2.0362	-2.5951	I(1)
	1st difference	-6.5523***	-6.5234***	-6.6341***	
Openness	Level	0.1956	-1.2403	-2.4958	I(1)
	1st difference	-5.4152***	-5.49045***	-5.5289***	
Oilvolatility	Level	-2.11256***	-5.3697***	-5.2807***	I(0)
	1st difference	///	///	///	
ICRG	Level	-0.5677	-1.6839	-1.7093	I(1)
	1st difference	-4.8355***	-4.7618***	-4.7399***	
REER	Level	-1.2807	-5.784***	-4.8958***	I(1)
	1st difference	-3.404***	-3.62**	-3.92**	
PRIVATE	Level	-2.405**	-2.166	-1.117	I(1)
	1st difference	-3.879***	-3.941***	-4.490***	

*, ** and *** mean the significance at 10, 5 and 1% levels respectively.

The calculated t-statistics in the table above indicate that all the variables except the oil price volatility and the consumer price index are integrated of order 1. Thus, to avoid fallacious results, we use the stationary series (differenced series) in the regression.

The Validity of the Model

The correlation analysis showed no strong multicollinearity between the independent variables of the equation under study, which allows us to continue our estimation (Table 3).

Table (3): Correlation Analysis Matrix

	D(LRGDP)	OILVOL ATILITY	D(FDI)	D(GCF)	D(ICRG)	D(OPEN-NESS)	D(REER)
	Correlation **Probability**						
D(LRGDP)	1.0000						
OILVOLATI LITY	-0.0600 0.7525	1.000 -----					
D(FDI)	-0.09697 0.6102	0.0653 0.7315	1.0000 -----				
D(GCF)	0.149337 0.4309	0.2952 0.1132	0.2085 0.2687	1.00000 -----			
D(ICRG)	0.116524 0.5397	0.1445 0.4461	0.0857 0.6522	-0.1364 0.4720	1.000000 -----		
D(OPEN-NESS)	0.243600 0.1946	-0.019 0.9204	-0.232 0.2153	0.018765 0.9216	0.226655 0.2284	1.000000 -----	
D(REER)	0.441161 0.0147	0.0323 0.8654	0.0793 0.6770	-0.0073 0.9695	0.125751 0.5079	-0.2645 0.1578	1.000 -----

Source: Constructed by the authorusing EVIEWS' output.

Table (4) summarizes the different tests to show the validity of the model specified:

Table (4): Tests for Model Validity

J-Statistic **Prob. J-stat.**	1.35 0.71
Jarque- Bera Normality	1.25 P= "0.53"
Breusch- Godfrey Auto-correlation	1.092 P= "0.58"
Heteroscedasticity **Breusch-Pagan-Godfrey**	9.649 P= "0.20"

Source: Constructed by the author using EVIEWS' output.

The serial correlation Breusch-Godfrey and the heteroscedasticity Breusch-Pogan-Godfrey tests show neither serial correlation nor heteroscedasticity in the residual terms of the equation (Chi-squared probability > 0.05 (5%) ➜ we reject the null hypothesis). The Jarque-

Bera statistic indicates that the error terms are normally distributed. The J-statistic developed by Hansen reflects the validity of the instruments and the model used (the null hypothesis of the validity of the model is accepted at the significance level of 5%: Prob.J-stat.> 0.05). All the tests done indicated that the model and variables were well-specified.

Estimation Results and Hypotheses Testing

Table (5) below summarizes the parameters estimated by equation (1) which measures the effect of the oil price volatility on economic diversification; this shows the effect of other control variables as determinants of diversification.

Table (5): Summary of the Estimation Results
Dependent variable: D(HHI)

Variables	D(LRGDP)	Oilvolatility	D(FDI)	D(GCF)	D(ICRG)	D(OPENNESS)	D(REER)	Constant
	-0.564 (-1.954)*	-0.3248 (-3.855)***	0.185 -0.126	0.3938 (1.966)*	-0.0018 (-1.06)	0.5562 (3.062)***	0.000711 (2.042)**	0.0512 (3.93)***

R-Squared 51%	F-statistic 3.22**
Adjusted R-Squared 35%	Durbin- Watson 1.7096

*, **, *** mean significance at 10, 5 and 1% respectively. The values between parentheses are the calculated t-statistics.

Source*: Constructed by the Author using EVIEWS' output.*

- Hypotheses Testing:

As shown in the previous section, we have seven hypotheses to test.

From the results above, the *t* calculated is greater than the critical value of t tabulated at 5%,thus, we accept the hypothesis 1 indicating the existence of the **effect of openness on the export concentration (HHI)**.This effect is positive which means that the trade openness has a negative and significant relationship with export diversification in Algeria, and this is referred to the specialization of the Algerian export in the hydrocarbon sector.

The *t* calculated of the parameter $\alpha_2$is greater than the critical value of t tabulated at 5%, thus, we accept the hypothesis 2 indicating the existence of the **effect of oil price volatility on the export concentration (HHI)**.This effect is negative which means that the volatility in oil prices measured by the standard deviation has a negative and significant effect on export concentration in Algeria.

The *t* calculated of the parameter α_3 is less than the critical value of t tabulated at 5%; thus, we reject the hypothesis 3 indicating the existence of the **effect of foreign direct investment on the export concentration (HHI)**. This means that the level of foreign investment had no effect on export concentration and no role in economic diversification in Algeria.

The *t* calculated of the parameter α_4 is greater than the critical value of t tabulated at 10% only, thus, we accept the hypothesis 4 indicating the existence of the **effect of GCF on the export concentration (HHI)**. This effect is positive which means that the domestic investment measured by the gross capital formation has a negative and weakly significant relationship with export diversification in Algeria, showing the weakness of investment policy. This hypothesis is rejected at the level of 5%.

The *t* calculated of the parameter α_5 is less than the critical value of t tabulated at 5%; thus, we reject the hypothesis 5 indicating the existence of the **effect of ICRG on the export concentration (HHI)**, which means that the institutional quality and governance have not played any role on export diversification in Algeria.

The *t* calculated of the parameter α_6 is greater than the critical value of t tabulated at 5%; thus, we accept hypothesis 6 indicating the existence of the **effect of RGDP on the export concentration (HHI)**. This effect is negative which means that the level of income measured by the real GDP has a negative and weakly significant relationship with export concentration in Algeria forming the U-shaped curve as argued in theory. This hypothesis is rejected at the level of 5%.

The *t* calculated of the parameter α_7 is greater than the critical value of t tabulated at 5%; thus, we accept the hypothesis 7 indicating the existence of the **effect of REER on the export concentration (HHI)**. This effect is positive which means that the real exchange rate has led to more export concentration in Algeria—showing the Dutch Disease effect. However, this effect is very small estimated by 0.0007 only.

The calculated F-statistic of the model is significant at 5% (F calculated is greater than F tabulated) which confirms the validity of the model and the accuracy of the variables.

Conclusion and Recommendations

The trade openness has a negative and significant relationship with export diversification in Algeria, referring to the specialization of the Algerian export in the hydrocarbon sector (where 95% of exports are hydrocarbons).The Algerian imports are still focusing on the strategic commodities; thus, the openness of the Algerian external trade has been made up of exports of hydrocarbons and imports of the basic commodities in addition to the imports of the Chinese products with low prices and quality. Chines products have been one of the main products competing with domestic ones and impeding the development of national production. The level of foreign investment had no effect on export concentration and no role in economic diversification in Algeria. This is explained by the very low FDI inflows rates (about 0.02% in average) and the Algerian external policy regarding investment that is not attractive at all for foreigners (the partnership base of 49-51%).

Based on the above conclusions, we recommend that Algeria should link the external trade policy with the domestic investment one in order to increase the non-hydrocarbon exports, boost economic growth, and diversify its exports. Moreover, we argue that the problems in Algeria are caused not only by the external trade and openness, but also by other economic and institutional factors such as the fiscal policy, the exchange rate policy, the banking system, the governance and corruption. All these issued need to be addressed in order to manage the oil revenue and deal with its volatility, so that a good environment can be created to well-diversify the exports and the economy as a whole.

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