Natural resource abundance and Structural Change: The Dutch disease in Algeria

S.M. Chekouri, A. Chibi, M. Benbouziane

Abstract— **This study investigates the evidence of the Dutch Disease in Algeria by observing the structural change in the Algerian economy since independence. The paper argues that the Dutch disease in Algeria may be hypothesised. The main justifications behind it are the relative deterioration of manufacturing and agricultural sectors, and the relative improvement of service sector and oil sector performance. Furthermore, the Algerian hydrocarbon exports still dominate the total exports and account for more than 98 percent of export receipts in the last fifteen years. Thus, the work in hand has given more consideration to the Dutch Disease explanations to the oil curse. However, recent studies have mentioned that institutions have a powerful explanation of the curse in oil rich countries.**

Index Terms— **Dutch Disease; Institutions, resource curse thesis; Oil; Algeria.**
JEL Code: D73, C58, N57

1. INTRODUCTION

Algeria is rich in mineral resources such as , iron , ore , zinc , phosphates , as well as crude oil and natural gas. The exploitation of the Algerian hydrocarbon sector was started in 1958 after the discovery of two giant oil and gas fields at Hassi-Messaoud and Hassi R'Mel in the Northern Sahara region. Algeria's proven crude oil reserves are estimated at 11.3 billion barrels, which is about one percent of global proven crude oil reserves , while Algeria's proven natural gas reserves are estimated of about 4.5 trillion cubic meters (tcm), which is equivalent to approximately 3percent of world proven natural gas reserves .

Algeria's Average crude oil production in 2003 was about 1.2 million barrels per day , and if we add the 0.45 million barrels per day of natural gas production (0.25 barrels per day of liquid gas), total oil production will reached more than 1.8 million barrels per day , about 2.4 % of world oil production , and more than 80 percent of Algeria's total oil production is exported.

Hydrocarbons sector is the locomotive of the Algerian economy, the contribution of oil sector in Gross domestic product has not ceased to rise, jumping from 29% in 1995 to 48.86% in 2005, Non-hydrocarbon exportation remained stable at low levels , while the share of oil exportation in total exports reaching 98.05percent in 2005. This restructuring of the Algerian economy has not changed From independence in 1962 to the 2009:

During the phase of central economic planning, which coincided with the first oil shock , the oil revenue began to rise dramatically During the 1973s and 1979s , and it was the major source of finance for development and capital build-up, the government shifted its economic sights to the oil industry. Extensive industrialization took place and the economy flourished. However, the absolute priority attached to the oil and industrial sector in this stage of development has an adverse effect on the agricultural sector, since the industrial sector has benefited from large investments compared to the agricultural sector.

Unfortunately oil prices collapsed during the second half of the 1980s (to below ten dollars per barrel), negatively impacting on Algeria's economy which had become almost completely dependent on oil , as a result the Algerian economy knew a persistent shortfall in the balance of payments, and a decline in the level of economic growth , which did not exceed an average of 1% annually between 1986 and 1996 ,compared to 4.5% between 1978 and 1985, also this period was characterised by a decrease in the level of real consumption by -5.8% and -7.4% in 1986 and 1987 respectively, a decline in real output by -1.1%, -2.1% and -2.9%,in 86, 87 and 88 respectively, a high rate of inflation , a record rate of unemployment .

In the mid of 1980's, the Algerian government start a series of economic reforms, the first structural reforms initiated in the 1986's focused on the restructuring of the legal and institutional framework as well as on the decentralisation of economic decision-making, but limited financial resources of Algeria in this period due to a degradation in oil prices, was hampered progress in these reforms, this is why the Algerian authorities in 1991 undertaken the second stage of policy reform , following the International Monetary Fund economic stabilisation program , which consisted of an application of liberalism policies reform , and a structural adjustment program in 1994 , which was intended to maintaining macroeconomic stability of the Algerian economy , by forcing the authorities to conduct a tight fiscal policy via lower government spending in order to lower fiscal deficit , and a prudent monetary policy to hold down inflation .

The reforms enacted between 1994 and 1998 has stabilised macroeconomic indicators , however, it has a heavy social cost : close to 500000 workers were laid off , 815 public enterprise were dissolved , the number of people living below the poverty line reaching a high 12 millions , out of a population of 30 millions people (National Economic and Social council) .

However , Over the last few years , after the high of oil prices and the improvement of government revenue from hydrocarbon exports , the authorities have relied on an expansionary fiscal stance to stimulate growth and

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employment , The fiscal space generated by a prolonged oil windfall has enabled the country to embark on a two massive public investment program (Le Programme Complémentaire de Support a la Croissance Economique, PCSC) ,the first program was in 2001 for the amount of 550 billion dinars, followed by the second growth consolidation program over five years (2005-2009) with initial allocation of a roughly 55 billion of US dollars , with the objective of improving infrastructure and generating employment .

Despite efforts to diversify the Algerian economy, the multiplicity of economic reforms , and a strong financial position , the Algerian economy maintains the same characteristics of an economy depending primarily on the production and export of oil which is the economy's principal source of financing.

The non-hydrocarbon sector remains small, even the industrial sector contribution to gross domestic product has significantly decreased, and the industrial output of public enterprises has dropped by 25% in the last ten years, as well as, agriculture which has also suffered a great neglect in the four decades since independence. As a result, the agricultural sector does not contribute more than 10% to the Algerian GDP.

On the one hand, Algeria remains the country that is best endowed with natural resources and human capital, and, on the other hand, this country suffered from an external dependence on hydrocarbon exports and food imports, and a weakness in economic and social development.

However, the most important reasons responsible of the structural problems that Algeria is facing (deeper crisis in the non-hydrocarbon sector...,) is the development strategy which relied mostly on the rent of oil revenue.

Throughout the 1980s and 1990s, many resource rich countries faced the same problem, and have suffered from low growth in industrial and agricultural sector, and export become most dependent on resources. Since, Dutch Disease Economics it is one of the most modern economic theories that explain the decline in the economic development of countries rich in natural resources. The main thesis of the paper is that Algeria indeed experiences the Dutch Disease.

The study is divided into five sections. After the introductory notes in section one, section two outlines the main descriptive analysis of the evidence of Dutch disease economics in Algeria. Section Three summarizes the theoretical framework of the resource curse and its implication, by focussing mainly on the Dutch Disease Theory and, reviews very briefly, the existing economic literature on the empirical studies testing the Dutch disease theories in some oil exporting countries. Section four outlines the Modelling and empirical results, and finally, the fifth section concludes and summarises the main results and policy recommendations.

2. THEORETICAL ISSUES AND LITERATURE REVIEW

2.1. The Explanation of the natural resource curse:

The "natural resource curse" hypothesis is based on the observation that resource-rich economies grow slower, on average, than resource-poor economies (sachs and warner 1997-2001) . In more recent times, economists and political scientists have advanced new theories to explain the disappointing growth performance of resource-rich countries. In this section, we briefly review the main economic explanations for the resource curse: Dutch disease theory, rent seeking theory, and institutional explanations (Bulte H.E., Damania R. , Deacon R.2004) .

The Dutch Disease Theory: One class of hypotheses, of which the Dutch disease is most famous, postulates that a resource boom will divert a country's resources away from activities that are more conducive to long run growth. A resource boom causes a country's exchange rate to appreciate, which in turn induces a contraction in its manufacturing exports, or draws capital and labour away from manufacturing, raising manufacturing costs as a result (Neary and van Wijnbergen,1986). Because the manufacturing sector is the main engine of growth and because it generates positive externalities, a decline in that sector may generate lower growth . (Matsuyama, 1992; Sachs and Warner, 1999; Torvik, 2001).

Rent-seeking Theory: is built on the assumption that resource rents are easily appropriable, which in turn leads to bribes, distortions in public policies, and a diversion of labor away from productive activities and toward seeking public favours. (See Tornell and Lane,2001; Torvick,2002) .

Institutional Explanations : The third category of explanations also sees a connection between resources and institutions, Countries well endowed with point resources, then, are expected to have ''bad policies,'' and suffer from the so-called rentier effects, repression effects, or policies that postpone the transition to competitive industrialization and diversification of the economy. Auty (2001a, 2001b) argues that resource-rich countries, especially those with the so-called ''point resources'' like oil fields, tend to be dominated by factional and predatory oligarchic polities, governments that promote narrow sectional interests (see also work by the political scientists Karl, 1997; and Ross, 2001b; Leite and Weidman, 2002).

In this paper we explore the evidence of the Dutch Disease in the case of the Algerian economy, which is the most important explanation of the natural resource curse .

2.2. The Dutch Disease Theory (The Core Model):

It is a widely held view that countries with abundant natural resources and, especially, heavy reliance on oil production and sales, can suffer from so-called Dutch Disease .the DD primarily refers to a situation in which a booming export sector increases the relative price of non-tradable goods and services, thus hurting the rest of the tradable goods sector. The Dutch Disease is named after the 1970s crisis of the Dutch manufacturing sector, caused by the export boom in the natural gas industry. The discovery of large reserves of natural gas in the north of Netherlands resulted in an export boom and balance of payments surplus for the Dutch economy. However, this was short-lived as the economy suffered rising inflation, rising unemployment, declining manufacturing exports, and lower income growth rates during the 1970s.

Corden and Neary (1982) present the "core model" of Dutch Disease economics, the main hypothesis of which is that drastic increases in resource exports lead to reductions in manufacturing exports. They assume a small open economy that produces three goods: two are traded at exogenously given international prices; the third is a non-traded good whose price is determined by domestic supply and demand. The traded goods sector includes a booming good, and a non-booming one. The non-traded good is typically thought

to be produced by the service sector (but it can be extended to the construction sector, etc), a resource boom affects the rest of the economy in two main ways: the "resource movement effect" and the "spending effect".

The spending effect occurs when the extra income derived from booming resource rents is spent on domestic goods and services .More formally: the higher real income resulting from the boom leads to extra spending on services which raises their price.

The resource movement effect occurs when the booming extractives sector draws capital and labour away from other sectors. This typically produces other adjustments in the Economy including rising real exchange rates and increased wages and prices in the non-tradable sector which then draws additional labour from the lagging tradable sectors.

Both effects contribute in the decline of output in the Tradable sector while the effect on the output in Non-tradable sector is ambiguous: the spending effect tends to increase it while the resource reallocation effect moves it in an opposite direction. The resulting contraction of output in Tradable sector because of increase in the price of Oil sector output is usually referred as "Dutch Disease" effect .

2. 3. Literature Review:

The existing literature assumes that natural resource booms can harm the countries. For example, Sachs and Warner (1995) show that economies with a high ratio of natural resource exports to GDP in 1971 tended to have low growth rates during the subsequent period 1971-89. The authors conclude: "One of the surprising features of modern economic growth is that economies abundant in natural resources have tended to grow slower than economies without substantial natural resources".

The Dutch disease effect has been tested for many countries over various periods of time; the results have yielded conflicting evidence.

In an empirical estimation of cross- country data Sala-i-Martin (2001), Doppelhofer et al. (2000) classify natural resources as one of the ten most robust variables negatively affecting countries economic growth. Sachs and warner (1999) examine evidence of the Dutch disease for 11 major latin American economies over the period 1960-1994 to test the hypothesis that any natural resources booms occurring in these countries may have had a positive impact on their growth performance , on the balance , they found that resource booms appear to frustrate economic growth in these economies , most likely through the Dutch Disease effect .Mohsen Pardmanesh (1991) studied the sample of five developing oil-exporting countries (Algeria, Ecuador, Indonesia, Nigeria and Venezuela) over the period from 1966-1986 , he find that oil revenue expand the manufacturing sectors of these countries and contract their agricultural sectors. Jean-Philipe Stijns (2003) , estimated the effect of energy price on manufacturing trade exploiting. he use Data that covers most countries , from 1970-1997 , he find that a one percent increase in an energy exporting country's net energy exports is estimated decrease the country's real manufacturing exports by 8 percent. Nienke oomes and katerina kalcheva (2007) conclude that the diagnosis of Dutch disease remains to be confirmed in Russian economy , and Russia has all of the symptoms of DD – real exchange rate appreciation , slower manufacturing growth , faster service sector growth , and higher overall wage .

On the contrary, a number of recent papers have cast doubt on this view, arguing that countries rich in natural resources do not necessarily suffer from Dutch disease. Gelb (1989), Auty (1990) documented many of the development problems of natural resource dependent economies without showing the inverse association between natural resource intensity and economic growth. . Spilimbergo (1999) found that countries like chilli and south Africa seem to contradict the dutch disease hypothesis and he concludes that copper has actually helped the Chilean economy on various macroeconomic accounts

In the work in hand, we are more concerned with the case of the Algerian economy. There are very few papers on the Dutch Disease with strong empirical foundations that address the Algerian economy and country-specific features , R.M.auty(2003) in a comparative study between Algeria and Indonesia , shows that whereas the Dutch disease effects were negligible in the well-managed Indonesian economy , they were already substantial in Algeria before the boom , he also found that most of the Algerian industry would have shut down , and the Algeria's oil rents underline the weakness of the manufacturing, and consolidate an authoritarian bureaucratic political state.

3. Descriptive analysis of the evidence of Dutch Disease Economics in Algeria

3.1. A Diagnostic of the Dutch disease during the central economic planning period 1972-1989:

Before independence the Algerian economy was oriented toward private sector, however, from the start of independence, all sectors of the economy were dominated by the state, the public sector accounted for more than of 75% of total production. Algerian government considered industrialisation the best means to achieve socio-economic development, and After 1965 , accelerated industrialization became the core of the development strategy of Algeria .

Table 1, which shows the composition of public investment by sector during the periods between 1974-1984, states that the most of public investment focused in favour of industrial sectors, capital-intensive, specially the hydrocarbon sector, while , the agricultural sector has been allocated only a small portion of total government investment .

Table 1. Sectoral Distribution, of government investment

	1974-1977	1978-1979	1980-1984
Agriculture	7.7	3.1	4.0
Water development	2.9	1.5	4.0
Hydrocarbons	26.4	34.9	14.8
Other industries	36.2	28.4	16.4
Housing	5.3	8.2	13.1
Construction	10.3	14.3	32.7
Education and training	5.4	6.0	9.4
Services	5.8	3.5	5.6

Source : Gelb, A. and Associates, "Oil Windfalls: Blessing or Curse? ", World Bank: Oxford University Press , 1989 ,p.156.

The most important reasons that prompted the government in that period to give great importance to investment in the hydrocarbon sector, are, first, consider this as a base for manufacturing sector in Algeria, secondly, is the assumption that oil is an exhaustible resource , also the government's desire to increase natural gas exports, as it represent the fourth country in the world proved recoverable gas reserves compared with proven reserves of oil, which was expected to be exhausted by the end of the century.

In the three year plan priority was given to public investment in industrial sector ,as a result , the share of industry in total expenditure was 55% , and agriculture 13% of total expenditures , After the increase in oil prices in the international market in 1973 , the industry was given 43.5% of total allocation , while the agricultural sector was given only 15.2 % of total allocation , again in the investment programs for 1980-1984 the first priority was given to industrial sector , its share of total allocation was 38.6% , however , public investments allocated to the agricultural sector known gradually decrease during the period from 1974 to 1984, in 1974 share of total allocation to this sector was 7.7%, it falls to 3.1% in 1978 and to 4.0% in 1982.

Despite land reform of 1971(the agrarian revolution), the agricultural sector in Algeria knew very weak performance, The production of the agricultural sector has witnessed stable since 1962, and the contribution of agriculture in GDP has been reduced from year to year. The contribution of that sector in GDP was 24.7% in 1963 , it decline to 11.6% in 1970-1973 , and to 9.56% in 1980-1984 , but then rose to 13.3% in 1985-1989 , as a result , the country's food situation become so precarious , because : the insufficiency of investment for agricultural development , and government pricing policy which greatly discouraged production of cereals and lead the farmers to earning outside their farm.

While the contribution of oil sector rose from 17.12% in 1970-1973 , to 35.46% in 1974-1977 , and to 21.66% in 1985-1989, The share of non-oil sector in GDP declined from 19.18% in 1970-1973 , to 12.35% in 1974-1977 , but then rose to 17.34% in 1985-1989 , this caused mainly by increasing the role of oil in the economy after independence .

Table 2. Share of economic sectors in GDP

			1970-1973	
1974-1977	1978-1979	1980-1984	1985-1989	
Agriculture			11.6	10.5
Hydrocarbons			17.12	
35.46			31.0	35.34
Non-hydrocarbon industries			19.18	12.35
Construction and public works			13.1	16.0
Services			39.0	25.69
			27.3	25.2
Total			100	100

Source : National office of statistics

To sum up, we can see that the non-tradable sectors of the economy witnessed relative improvement (in the worst case, it did not fall) in terms of contributing to the production, the construction and civil engineering sector has known a large expansion ,the contribution of the services sector to the production remained high, while , the tradable sectors have seen a relative decline compared to the size of investment and reform programs that have benefited (industrialization-first, land reform) . Thus, the Algerian economy experienced structural change in favour of industrial sector and against the agricultural sector, and in favour of the oil sector against the non-oil sector. Thus, we can qualify this structural change in the Algerian economy in the period of socialist way of development as suffering from the Dutch disease symptoms.

3.2. A Diagnostic of the Dutch disease for the Market economy period(1990-2008):

The hydrocarbon sector dominates the Algerian economy, its share contribution in to GDP did not stop rising since 1999 after the strong development of oil prices , accounting for 21.5 percent of GDP in 1993 , to 40.8 percent in 2000 , and them to 45.9 percent in 2006 , with a corresponding decline in the contribution of the non hydrocarbon industry as a share of GDP, of more than half, from 12.1 percent in 1993 to 5 percent in 2007 , also , the contribution of the agricultural sector in production has remained very weak and unstable , when compared to the country's agricultural potential. Table (3) show that the hydrocarbon sector and the Non-tradable sectors (services, construction and civil engineering) , are the first sectors that contributes to GDP. Indeed, the contribution of these sectors in growth is estimated at more than 87% in 2007, whereas the contribution of agriculture and industry sectors did not exceed 13% for the same year.

Table 3. sectoral distribution of GDP (in percent) 1993-2007

	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07
Hydrocarbons	21.5	22.7	25.6	29.2	30.1	23.0	27.8	40.8	34.0	32.8	36.2	37.8	44.4	45.9	43.9
Agriculture	10.9	9.5	9.7	10.9	9.4	11.1	10.6	8.1	9.7	9.3	9.6	9.4	7.7	7.6	7.6
Industries	12.1	11.5	10.6	9.2	9.0	9.7	8.9	7.3	7.4	7.4	6.6	6.2	5.3	5.0	5.0
Government services	13.6	12.7	11.7	10.5	10.6	13.5	12.7	10.6	11.1	11.7	11.1	9.8	8.4	8.0	8.4
Nongovernment services	23.0	24.0	23.0	22.1	22.6	23.4	22.7	18.7	22.6	23.2	21.4	21.2	20.1	20.1	20.5
Construction and public works	11.5	11.3	10.2	9.6	9.9	10.7	10.0	8.6	8.5	9.1	8.8	8.3	7.5	8.0	8.9
Other sectors	7.4	8.3	9.2	8.5	8.4	8.1	7.3	5.9	6.7	6.5	6.2	7.3	6.5	5.4	5.7

Source *: International Monetary Fund , Algeria: Statistical Appendix , IMF Country Report , 1998 No. 98/87 , 2001 No. 01/163 , 2005 No. 05/51 , 2008 No. 08/102 , 2009 No. 09/111 , International Monetary Fund Washington, D.C*

The Algerian economy remains heavily dependent on the hydrocarbon sector , and, as a result , fluctuations in oil prices have a major impact on the structure of the Algerian economy. During the second half of 1980 and at the beginning of 1990, the economy of Algeria was adversely affected by the decline of international oil prices , the share of manufacturing sector has considerably shrunk as percentage of GDP , from above 65 percent in 1980 , to about 7 percent during the period from 1999 to 2005.

Furthermore , the public sector enterprises suffered heavily from this situation , the industrial sector production experienced negative growth rates from the end of the eighties. In 2004, the industrial production index loses 38 points compared to 1989, while in 2007 this indicator was losing 45.3 points compared to the same yaer 1989, which means that the non-oil industrial production fell by nearly half between 1989 and 2007, while the index of hydrocarbon production, rose from 100 points in 1989 to 150.7 points in 2007, and thus reaching a growth rate of more than 50% between 1989 and 2007.

Table 4. indices of industrial , hydrocarbons , and agricultural production (1989-2007).

1989	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Indices of industrial production	100	88.2	80.2	78.9	68.7	63.4	69.0	68.0
Indices of hydrocarbons sector	100	109.1	106.1	107.6	112.4	118.3	119.2	121.5
Indices of agricultural production	77.1	85.8	71.5	89.3	118.7	80.8	99.7	104.7

2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Indices of industrial production	66.6	65.9	64.9	62.8	61.5	60.0	58.7	54.7
Indices of hydrocarbons sector	128.6	128.0	133.2	138.8	145.2	149.6	148.5	150.7
Indices of agricultural production	89.0	106.3	107.5	132.9	128.4			

Source : International Monetary Fund , Algeria: Statistical Appendix , IMF Country Report , 1998 No. 98/87 , 2001 No. 01/163 , 2005 No. 05/51 , 2008 No. 08/102 , 2009 No. 09/111 , International Monetary Fund Washington, D.C.

The dominance of the hydrocarbon sector in the Algerian economy , and the large difference in growth between the booming petroleum industry , and the activities of other manufacturing sectors in decline, may contribute to some extent in support that the Algerian economy remains locked in Dutch Disease effect , but this effect was not through the influence of the real exchange rate primarily, but other factors contributed to the decline in the manufacturing sector , first : this sector was sheltered from external competition because of the restrictions and high tariffs imposed on imports during the central economic planning period (1972-1989) , second : this sector was heavily dependent on imported raw materials , equipment , and spare parts.

But in the beginning of the 1990's decade , the Algerian manufacturing sector faced two major problems: first: the compression of imports due of the reduced oil revenues created input shortages of domestic manufacturing sector. Second: the subsequent liberalization of external trade , that exposed it to foreign competition , in addition to the technical factors ,and its effect on the list of products that ended as outdated and non-competitive , which was considered as an obstacle not only for the development of the manufacturing sector, but moreover, to the existence of enterprises. The result , was an overall decline in the Algerian manufacturing sector , and a sharp decline as a share of GDP , from 12% in 1993 to 8.6% in 1999 and to 5% in 2007. Furthermore, the availability of large oil resources has pushed the Algerian government to focus more on the hydrocarbon sector at the expense of other sectors of the economy (IMF 2000) .

This structure of the Algerian economy, which is characterized by the dominance of the hydrocarbon sector, and a decline in the tradable sectors, will not know a significant change in the medium term due to several reasons, such as:

The State continues to give great importance to investment in the hydrocarbon sector. For instance, between 2000 and 2005, this sector has benefited for about 21 billion dollars of investments , and with the beginning of 2009 , the predominant state-owned enterprise in the hydrocarbon sector (Sonatrach) allocated more than 32 billion $ in order to raise Algeria's share of oil production in OPEC , to reach 2 million barrels per day in 2010.

The great interest given by the government of Algeria to the hydrocarbons sector has led to an expansion of the gap between the activities of oil industry and other manufacturing activities , while production of non oil industry can boost exportation which can lead to the creation of a wide range of

productive activities and enterprises that would contribute to reduce unemployment and increase growth. The hydrocarbons industry is almost closed and has little effect on the development of other economic sectors.

Non-tradable sectors (services, construction and public works) are expected to maintain stable growth rates for the coming years , as a result of the massive investments made on the two massive public investment program (2001, 2005) .

The initial economic reforms oriented in favour of the agricultural and manufacturing sector, were very weak and failed to boost non-mining tradables exportation, even, and the private sector was unable to cover the significant decline in the industrial public sector .

Accordingly the Algerian hydrocarbon exports still dominate the total exports , accounted more than 98 percent of export receipts in 2006 , this structure of exports in Algeria has not changed since 1970's, in the sense that the economy of Algeria remained with the same characteristics, of an economy based primarily on the production and export of oil.

4. MODELLING AND EMPIRICAL RESULTS

Methodology

In order to test for the symptoms of Dutch Disease (namely a slowdown in Manufacturing and agricultural growth, and an increase in non-traded sector growth) we estimate The three relations:

$$L(AGR/GDP) = \alpha + \chi L(oil.\exp or./GDP) + \varepsilon_1$$

$$L(MAN/GDP) = \alpha' + \chi' L(oil.\exp or/GDP) + \varepsilon_2$$

$$L(ntraded/GDP) = \alpha'' + \chi'' L(oil.\exp or/GDP) + \varepsilon_3$$

Where α , α' , α'' denote the constant terms , $\varepsilon_i (i = 1,2,3)$ is the respective error term , and :

MAN/GDP : share of manufacturing output in GDP , L :the logarithm of the series .

AGR/GDP : share of agricultural output in GDP, L :the logarithm of the series .

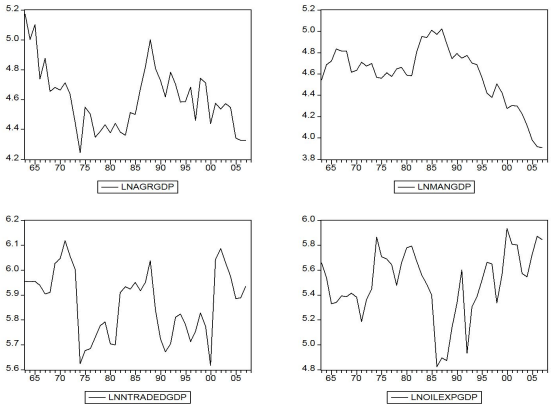
$ntraded/GDP$: share of non-traded output in GDP , L :the logarithm of the series .

$oil\exp o/GDP$: share of oil exportation in GDP, L :the logarithm of the series .

Given the theoretical frameworks , if the diagnosis of Dutch Disease remains confirmed for the Algerian economy , the following signs are expected regarding the estimated coefficients : $\chi < 0$; $\chi' < 0$; $\chi'' > 0$.

Database :

The Data covers the period from 1975 to 2008, all the variables are taken on annual basis, the data are obtained from various sources: World Development Indicators of the World Bank (2008) and the international financial statistics of the IMF (2008), statistics of the Algeria's ONS (office National des Statistiques) .



Estimation procedures :

The first step of our methodology is to test the order of integration , that is the stationarity of our variables , the Augmented Dickey–Fuller(ADF) test (Dickey and Fuller, 1981) .

The second step is to test for cointegration. The Johansen procedure was also used to test the existence of long-run equilibrium relationship between our series of interest ,There are many possible tests for this purpose, but the most general of them is the multivariate test based on the vector autoregressive representation of Johansen's maximum likelihood estimation approach(Johansen, 1988).

Empirical results

As mentioned earlier, before proceeding to test for cointegration, it is necessary to determine the order of integration of the series , the Augmented Dickey Fuller (ADF) is used , In fact, the series were found to be I(1). The results of the test are presented in table (5) .

Table 5. Statistics for ADF Unit Root Tests

Variable	*level*		*first difference*	
	Lag	*t-ADF*	*lag*	*t-ADF*
$L(AGR/GDP)$	1	-1.107757	1	-5.464734
$L(MAN/GDP)$	1	-1.142923	1	-4.325357
$L(ntraded/GDP)$	1	-0.086714	1	-5.449752
$L(oil\exp or/GDP)$	2	0.131095	2	-5.225711

Appropriate critical values for ADF Statistic at the 5% level is -1.9488 .

After determining that the variables are of order I(1), we now turn to examine whether they are cointegrated or not.The first step is to run a regression, In the present paper three regressions are set:

In the first one, we regress the share of manufacturing output in oil GDP (MAN/GDP) on the share of oil exportation in oil GDP $(oil\exp o/GDP)$ and an error term :

$$L(MAN/GDP) = \alpha' + \chi' L(oil.\exp or/GDP) + \varepsilon_2$$

In the second regression we use the share of agricultural output in oil GDP (AGR/GDP) :

$$L(AGR/GDP) = \alpha + \chi L(oil.\exp or./GDP) + \varepsilon_1$$

In the third regression we use share of nontraded output in oil GDP $(ntraded/GDP)$:

$$L(ntraded/GDP) = \alpha'' + \chi'' L(oil.\exp or/GDP) + \varepsilon_3$$

The three regressions are presented in table 6 .

Table 6. Regressions

Sectors	α	χ, χ', χ''
R^2	F-statistic	
Manufacturing	8.193968*	-0.654217*
0.423038		31.52825*
	(12.78065)	(-5.615002)
Agricultural	7.112216*	-0.455958*
	(13.33503)	(-4.704171)
nontraded	6.708494**	0.152880**
	(16.83926)	(-2.111632)

t-statistics in parentheses.
* Significant at 1%, level.
**Significant at 10%, level.

The second step is to test for cointegration , The results of cointegration tests are presented in tables (7) .

Table 7. Johansen cointegration test

Eigenvalue	Likelihood Ratio	*5% critical value*	*1% critical value*	*H0(n° of CE(s))*
Series: LNMANGDP and LNOILEXPGDP				
0.369197	16.58863	15.41	20.04	None
3.41E-05	0.001226	3.76	6.65	At most 1*
Series: LNNTRADEDGDP and LNOILEXPGDP				
0.315032	16.70	15.41	20.04	None
0.081970	3.07	3.76	6.65	At most 1*
Series: LNAGRGDP and LNOILEXPGDP				
0.242235	14.49651	15.41	20.04	None
0.138419	5.065517	3.76	6.65	At most 1*

The results show that: **First,** the signs of the coefficients ($\chi\langle 0, \chi'\langle 0, \chi''\rangle 0$) are in line with economic theory of Dutch Disease, i.e., there exists significant negative relationship between oil revenue and manufacturing and agricultural growth , however , the recovery of oil exports has a positive impact on the nontraded sectors growth. the negative impact of oil revenue on tradaeble goods sector in Algeria it corroborates empirical works on this issue (Mohsen Fardmanesh , 1991 ; R.M.auty , 2003) , this result also confirms the Dutch Disease effect for Algeria .

Second, The Johansen cointegration test shows that there exists a significant long-run relation- ship between oil exportation revenue , and nontraded and manufacturing growth , however ,it gives conflicting results in the third case , suggesting rejection of cointegration between oil revenue exportation and agricultural growth ,in summary , this results further validate the Dutch disease theory for Algeria , given the negative long-run impact of oil revenue exportation on manufacturing growth , in addition to this , the government policies were not sufficiently favourable to promoting agriculture and manufacturing.

CONCLUSION

The main objective of this paper is to investigate for the "Dutch Disease" effect on the Algerian economy during the period from 1963 -2008. Our results reveal that the economy of Algeria is clearly affected by the Dutch Disease : the manufacturing growth slowed down , The agricultural sector showed very slight performance , while the service sector performed well, and the employment shifted to service sector .

The dominance of the hydrocarbon sector has been an important element that weakened the incentives to develop the production of tradable goods outside the hydrocarbon sector in the Algerian economy , as a result the high volatility of hydrocarbon revenues due to frequent and unpredictable price fluctuations has distorted the tax structure through neglecting alternative revenue sources , which led to an slow down in non hydrocarbon activity , in particular the significant decline in the manufacturing and agricultural sectors , and the overall decline in the performance of the Algerian economy in general .

the Algerian economy is still poorly diversified, and the contribution of the non oil sector in to total GDP remains weak , Compared to the hydrocarbon sector , Algeria remains a major hydrocarbon-exporting country , The share of GDP of hydrocarbons was 45.9 per cent, The industrial sector, representing only 5 per cent of total GDP, showed very slight growth of 1.1 per cent in 2007, as against growth of 2.8 per cent in 2006.This weak growth is due mainly to the mediocre performance of the private sector and the decline in public manufacturing industries.

Of course, the Algerian government often fail to take measures in order to avoid problems related to resource abundance or resource price boom. Thus we have shown that this resource curse is best explained by the Dutch Disease hypothesis. However we could also argue that we could also apply the rentier state theory for the economic deficiencies, since both explanations are mainly due to the lack of democracy, corruption, poor institutions and a renk seeking attitude.

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