

# **Dutch Disease and Changes of the Productive Structure in Moroccan Economy. An Analysis Using VECM**

**Bilal Lotfi<sup>1</sup> and Mohamed Karim<sup>2</sup>**

## **Abstract**

The term Dutch Disease is not new but it always remains an updated notion due to the expansion of capital flows coming from the export of natural resources that can produce reverse effects on the economy of rich countries in these resources. Indeed, this situation can lead, in the case of a developing country, to a contraction of sectors producing tradable goods apart from the booming sector, and the development of sectors producing non-tradable goods. However, several authors highlight the existence of a similarity between the increase in incomes coming from the exploitation of natural resources, the transfers of the foreign residents, the foreign assistance and tourist receipts.

In this paper, we will study the theory of the "Dutch Disease" to analyze the phenomenon of the deindustrialization which characterizes the Moroccan economy within the last decades, considering the importance of the shares that have these resources in the Moroccan GDP, in order to give recommendations to neutralize its effects.

After a brief talk on the contents and the theoretical statue of the Dutch Disease models, we will proceed, on the basis of empirical checking, to a critical analysis of the theory using a Vector Error Correction Model VECM, aiming to identify the transmission channels of the Dutch Disease in the Moroccan economy and explain the challenges with which industrialization is confronted.

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<sup>1</sup>EREMEF, University of Mohammed V, Rabat, Morocco.

<sup>2</sup>EREMEF, University of Mohammed V, Rabat, Morocco.

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## 1 Introduction

The question related to the weak economic growth of the developing countries, rich in natural resources, remains active<sup>3</sup>. This paradoxical phenomenon was described as the Dutch Disease. Briefly, it is related to the deindustrialization of the economy following the discovery of the natural resources, which increases consequently the value of the national currency and makes the manufacturing sector less competitive on the external market. From a theoretical point of view, the Dutch Disease model developed by W.Max Corden and J.Peter Neary (1982) and W.Max Corden (1984) clearly explains the effect of this phenomenon on the structure of the productive base of an economy.

In order to study the appearance of the Dutch Disease in any country, it is necessary to establish the relationship between the currency resources, considered in the review of literature as a rent and the decline of the sector of tradable goods, in particular the industrial sector, in terms of added value and employment.

As far as the checking of the theory at the empirical level is concerned, the choice of Morocco as the country of study is particularly adapted to these problems, owing to the fact that the foreign incomes monopolize more than 22% of the GDP on an average between 2010-2013 whereas it presented only 8% of the GDP along the period 1991-1994. The income was typically the export of natural resources, the transfers of the foreign residents, the entry of foreign assistance and the tourist receipts. On the other hand, the industrial added value lost more than 6 points in one decade, while decreased from 31.6% in 2003 to 25.5%<sup>4</sup> in 2012 and the share of employment in industry compared to total employment decrease from 36.4% in 1990 to 21.39% in 2012<sup>5</sup> which means a loss of 15% in the twenty last years.

In this context, in relation to the difficulties encountered by the manufacturing sector (as international competition), the current situation of the industrial companies led us to wonder whether the Moroccan economy does not suffer from the Dutch Disease.

This paper will be structured around three points: the first one will analyze the theoretical background of the Dutch Disease models. In the second point, we will expose the selected alternatives as well as the various methods of estimation used. Finally, we will present the results obtained and their interpretations in the third point.

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<sup>3</sup>The Economist, 24 May 2003, p.78

<sup>4</sup>World Bank [2014].

<sup>5</sup>World Bank [2014].

## **2 Literature Review**

### **2.1 The concept of Dutch disease**

The term of the Dutch Disease is not a new concept but it always remains updated because of the sudden and massive entry of foreign currencies, due to the export of the natural resources, on the local market which cause macroeconomic adjustment problems. The economic agents indeed will be found face to face to an additional money stock that is not anticipated and if this addition of income is badly managed, this will probably have harmful consequences on the global economy.

The Economist (1977) introduced the expression "Dutch Disease" in the occasion of the debates relating to the difficulties that took place in the United Kingdom following the discovery of oil reserves. In that article, the English review has referred to the difficulties encountered by the Dutch economy after the introduction, in the Sixties, of the natural gas reserves of the Slochteren. These reserves generated an abrupt increase in the incomes, which curiously induced with an appreciation of the rate of real exchange. Consequently, this blocks the development of the manufacturing industry. The Dutch economy was indeed confronted with a strange phenomenon after the first oil crisis at the beginning of the Seventies: a fall of the activity level of the manufacturing sector and a fall of the private investment, consequently that led to the fall of the profits but with a recording of good performances on the external level. In this situation, the Netherlands learned that any medal has a backside and that an abundance of natural resources can have negative effects on the economy.

Parallel to the concept of Dutch Disease, highlighted in the Netherlands, were born in Australia models known as the booming sector, which were supposed to illustrate the effects of the boom sectors on the other sectors of the economy. Gregory (1976) consecutively highlighted the structural changes occurred in the Australian economy by the development on a great scale of the mining sector and it concluded that the development of the booming sector in Australia caused a weakening of the goods manufacturing sector. Indeed, the discovery of a mining resource necessarily leads to an increase in the offer of export which is translated, on the level of external accounts, by a balance of payments surplus. The correction of this surplus, according to Gregory (1976), internationally increases the prices of the tradable goods (which are fixed on the international market) relative to the prices of the non-tradable goods (where the prices are fixed on the local market) which affects the preexisting industries negatively. These structural changes of the economy are likely, underlines Gregory (1976), to cause two kinds of short-term imbalances. The first in the form of reiterated calls to the devaluation. The decrease of the rate of real exchange will involve a strong inflation with the raising of prices of the non-tradable goods. While the second relates to the granting of subsidies specific to the sector of the tradable goods. However, these subsidies can hardly have durable effect and cannot protect the sector from the

tradable goods because they would not make the surpluses of the trade balance to increase and thus to still push with the "re-appreciation" of the exchange rate.

The phenomenon that existed in the Netherlands and in Australia was analyzed as Dutch Disease or booming sector model, we are at the same conclusion. The new rises in the price of oil occurred into 1979-1980 were going to allow a renewed interest for the phenomenon of the Dutch Disease. Several models were elaborated as from the Eighties with an aim of explaining the perverse effects which have occurred in the economy of certain developing countries having profited from the rise in the price of oil. However, the multiplication of work relating to the analysis of the impact of the "positive exogenic shocks" brought to a generalization of the concept of Dutch Disease. Until now, it does not result anymore just from the export of the natural resources, but can also result from the export of other basic commodities: copper, phosphate, iron... etc. Other causes explain the Dutch Disease such as flows of capital or because of a major technological advance, which reduces considerably the production cost of a given product meant to be exported. In this situation, the phenomenon of Dutch Disease becomes more general and complex.

## 2.2 The causes of Dutch disease

Overall, according to this review of literature, the origin of the boom can result from a major discovery of natural resources, from an exogenic technological change out of B or from an exogenic increase in the price of the product of B on the world market. However, trying to generalize the phenomenon of the Dutch Disease, several authors' highlights other sources which can give rise to structural changes of the productive base similar to that generated by this phenomenon:

- *Transfers of the foreign residents*: The discussions concerning the role of the foreign residents workers in the economic development of the countries of origin is in full effervescence. Among the most significant questions are those which put a link between these flows and the competitiveness of the industrial sector (Fajnzylber and López, 2007) via the appreciation of the rate of real exchange, which creates doubts about the possibility of the appearance of the Dutch Disease. Indeed, the increase in the transfers of funds improves the results of income of households that is what automatically impacts the level of their expenditure and leads to a decline of work offers. By taking into account the neo-classic assumption of the full employment of the production factors, it results in a situation of excessive demand of the non-tradable goods thus causing a rise of the prices (since the offer of these goods is limited) and an improvement of the rate of real exchange. This situation makes the sector of the non-tradable goods a profitable sector, and stimulates an indirect mobility of the work factor thanks to the improvement of the marginal productivity of the non-tradable goods sector. Consequently, not only the sector of the tradable goods will face a less effective technology, but also with a labor force relatively more expensive. Thus, in comparison with the scenario of reference without the transfers of funds, the optimal capital stock is smaller, the fall of investment is more severe, and the total

fall of productivity in the sector of tradable goods is more severe. It is also advisable to note that the foreign residents workers contribute to the national demand only when they visit their countries. In this case, these transfers can be similar to the expenditure of the tourists.

- *Tourist receipts*: The sector of tourism appears, for many economic actors, like a source of enrichment and growth, but it can play a significant role in the development of the Dutch Disease through the evolution of the terms of trade. Many contributions refer to the concept of Dutch Disease in the explanation of the impact of the tourist growth on the productive structure in the case of country in development (Hazari and Ng, 1993, Chen and Devereux, 1999, Hazari and Nowak, 2003, Nowak and Al, 2003). Indeed, the tourists consume products considered as non-tradable, and with the increase in the request for these products, which are also consumed by the resident consumers, it results from it a rise from their relative prices and consequently an appreciation of the rate of real exchange. Under these conditions, a tourist rise can cause effects of foreclosure against domestic consumption, thus causing a loss of wellbeing. Moreover, Nowak and Al, (2003) show that *"if the sector of the exportable goods is the only one which records constant returns on the scale, a tourist growth can be impoverishing because the reduction of the production of the exportable goods can lead to later losses of effectiveness"*. The tourist growth will involve an increase in demand, which will lead to significant profits of abnormal nature, thus stimulating the consumer expenditure, which affects at the same time the price of the non-tradable goods and the rate of real exchange, which leads thereafter to an indirect deindustrialization of the country.

- *Donations and foreign assistances*: Certain developed countries grant humanitarian donations to the profit of the countries in the development with which they have a strategic and diplomatic relation, in order to reinforce their performance in terms of economic growth and human development (for example assistance of the international community to achieve the goals of the millennium for development OMD). Nevertheless, work of Edwards and Van Wijnbergen (1989) underlines similarities between the additional receipts generated by the exploitation of the natural resources (oil, minerals...) and flows of international assistance. Each one of these sources contribute to a temporarily accumulation of reserves in foreign-exchange while using a limited quantity of the local factors of production which will result in an appreciation of the rate of real exchange. This reallocation of resources leads to an alienation of the factors of production of the tradable goods sector and especially of the industrial and agricultural sectors, which thus generates a significant rise of wages in this sector and a decline of external competitiveness of the national economy.

### 2.3 The consequences of Dutch disease

The diagnostic of the Dutch Disease<sup>6</sup> initiated by Gregory (1976) will be deepened by W.Max Corden and J.Peter Neary (1982) in order to apprehend the impact of this problem on the whole economy. This model adopts the assumption of a small open economy, which produces two tradable goods, whose prices are exogenic, and a non-tradable good, whose price is flexible and is established on the domestic market. The goods of the tradable sector are the goods of the mining and manufacturing sectors, and those of the sector of the non-tradable goods are the services. The model does not take into account only relative prices of the tradable goods and ignored monetary factors. The authors suppose at the beginning that each sector has a specific factor (the capital) and a mobile factor (work). On the basis this model, Corden and Neary (1982) propose to study the impact of a boom in the mining sector on the sector of tradable goods except mining and which can be brought back, according to these authors, for two distinct effects:

- *Resource Movement Effect*: which relates to the move of the mobile factors towards the sector in boom and the sector of the non-tradable goods. Indeed, the increase in the marginal product of the mobile factor (labor), due to the growth of the sector in boom, exerts effects on the resources and more precisely on the mobility of labor. We observe an increase in job applications in the mining sector and the sector of the non-tradable goods. In the other hand, there will be a shortage of manpower in the sector producing the tradable goods except mine which sees consequently its production dropping.

- *Spending Effect*: the balance of payments surplus, which results from the boom in the mining sector, can be compared to an increase in the total income. This additional income led to an increase in the demand of the non-tradable goods sector and causes a rise of the domestic prices of these goods. it causes consequently a fall of the relative price (relationship between the price of the tradable goods and the price of the non-tradable goods) what means real appreciation of the domestic currency. This appreciation involves a growth of the production of the non-tradable goods and a contraction of the production of the tradable goods except mine.

However, Corden (1984) develop Corden and Neary (1982) model quoted before, by working out a model which lays in its analysis on the division of economy sectors to the three following sectors<sup>7</sup>: (i) *The Booming Sector*: which can be the oil or any other primary industry of export in a phase of increasing prices and exploitation of a major discovery of resources or a neutral technical progress within the context of Hicks<sup>8</sup> of which the effect is a substantial reduction of the

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<sup>6</sup> Corden, Neary [1982].

<sup>7</sup> Corden [1984].

<sup>8</sup> Hicks means by a neutral technical progress that the efficiency of labor and capital increase simultaneously in the same proportions and with a similar remuneration.

costs; (ii) *The Lagging Sector*: or sector of the other tradable goods which covers other exports and the substitutes of importation as well in the manufacturing sector as in the agricultural sector and (iii) *The sector of the non-tradable goods*: including the services, the utilities, transport, the building, etc.

Corden (1984) analysis starts from a core model which horizon is in medium term. The labor factor is the only assumed factor mobile as for the other factors of production, they are considered specific to each of the three sectors. The capital is also internationally specific and factors stocks are fixed, but their prices are flexible. In the following, we symbolizes the booming sector by (B), the lagging sector by (L) and the sector of the non-tradable goods by (N). The first two sectors produce tradable goods which prices is universally fixed and the third product of the non-tradable goods which prices are determined by confrontation of supply and demand. Corden (1984) studies the impact of a boom in (B) on the other sectors of the economy.

As in the preceding model, the growth in the booming sector has two distinct effects: an "spending effect" and an effect of "resource movement effect". According to Corden (1984), following a boom in the sector (B), the price of non-tradable goods  $P_N$  increases and the resources are transferred from (L) to the profit of (N). In addition, in the sector (B), the application for a job becomes more significant because the marginal product of work increases (with constant wages in terms of tradable goods), which involves a transfer of labor of (L) and (N) towards (B): it is the movement effect of the resources. This effect related of the resources involves are two:

- *A direct deindustrialization*<sup>9</sup>: The transfer of labor of the lagging sector L towards the sector in boom (B) decreases the product of (L). The market of (N) is not implied and this does not require a real appreciation of the rate of exchange.

- *An indirect deindustrialization*: there is a transfer of resources of (N) towards (B), at a constant rate of real exchange. The reallocation of resources generates an excessive demand for (N) (in addition to that already created by spending effect) and a new appreciation of the rate of real exchange. An additional transfer of labor of (L) towards (N) thus takes place.

The product of the sector of the non-tradable goods (N) can be higher (due to spending effect) or weaker (due to the resources effect) compared to the initial situation. The two effects reduce the real incomes of the lagging sector (L). The consequences on the sectorial distribution represent the essential problem of the Dutch Disease impact the both effects involve, in all the cases, a fall of the real

Thus, only the level of the product increases without changing the relative amounts of factors.

<sup>9</sup>Corden (1984) states that in some countries the lagging sector can be agriculture (not just manufactured). In this case, the term "deindustrialization" could be replaced by the term "désagriculturation".

production of the L sector whereas the one of N sector can grow or decrease. In conclusion, the interest of all the models presented, and in particular the generalization of Corden (1984), are to provide the instruments of analysis to understand the effects of a boom on the allocation of the resources, on the factorial distribution of incomes and on the rate of real exchange, which results thereafter in a fall of relative part, in added value and employment, of the traditional sectors (manufactured or agricultural) while making them less competitive.

### **3 Methodology**

#### **3.1 Data**

This study cover the period 1980-2012. It makes appeal to several sources of information in order to fill up our database on some aggregates of the Moroccan economy. Real Gross Domestic Product is produced by the HCP (Ministry of Plan) and the industrial added value is available on the database of the ministry for the economy and finances, as for the REER (the Real Effective Exchange Rate) is available on the database of Central Bank. The share of employment in the industrial sector in employment total is obtained from the database published by the World Bank.

Lastly, the variable Rent, defined as the sum of the foreign entries of capital coming from the export of the natural resources (Phosphate, Copper, Lead...), of the transfers of the Moroccan's foreign resident, of the donations which Morocco receives of various countries or international organizations and of the tourists' receipts, is available on the database of the exchange office and at the ministry for the foreign trade. This variable constitutes the angular stone in the analysis of the impact of the Dutch Disease on the whole of the Moroccan economy. The real variables "GDP", "industrial V.A." and "Revenue" in this model are expressed in curved logarithmic form so that their coefficients in the estimated model can be interpreted like elasticity's.

The analysis of the variables stationary is essential. However, a preliminary analysis of the evolution of the series is crucial because it will enable us to have an idea of the various components of these series. During the period of study, the chart graphics of the series of the model (appendix1) gives the intuition that these series are rather not stationary. Their processes do not seem to satisfy the condition of invariance of the expectancy, and the same applies to the variance. This assumption of non-stationary will be cancelled or confirmed through the strategies of unit root test, which will be presented later.

#### **3.2 The model**

In this paper, we will try to have the results of the statistical analysis, based primarily on modeling in time series, of the impact of the Dutch Disease on the national industrial sector and the economic growth in Morocco. To do that, we use an Error Correction Model to analyze the effects of shocks between the variables



selected and which arises as follows:

$$\Delta \text{Log (Real GDP)}_t = \delta \begin{pmatrix} 1 \\ -\beta_0 \\ -\beta_1 \\ -\beta_2 \\ -\beta_3 \\ -\beta_4 \end{pmatrix}' \begin{pmatrix} \text{Log (Real GDP)}_{t-1} \\ 1 \\ \text{Log (Rent)}_{t-1} \\ \text{Log (Indus A.V.)}_{t-1} \\ \text{Employ} - \text{indus}_{t-1} \\ \text{REER}_{t-1} \end{pmatrix} + \begin{pmatrix} \gamma_{1i} \\ \gamma_{2i} \\ \gamma_{3i} \\ \gamma_{4i} \\ \gamma_{5i} \end{pmatrix}' \begin{pmatrix} \Delta \text{Log (Real GDP)}_{t-i} \\ \Delta \text{Log (Rent)}_{t-i} \\ \Delta \text{Log (Indus A.V.)}_{t-i} \\ \Delta \text{Employ} - \text{indus}_{t-i} \\ \Delta \text{REER}_{t-i} \end{pmatrix} + \varepsilon_0$$

With  $i = a$  number of delays of the corresponding standard VAR model.

In a case which resembles our study, this later is the model most suitable because:

- It provides a structure of shift more general and less restrictive, by allowing an adjustment (partial or total) that is more appropriate to the studied case;
- It captures the balance of long term and the dynamic relations of the short term associated with the model.

Two types of specifications will be used: a stationary VAR model (Vector Autoregression) which will make possible to analyze causality between the variables and a Vector Error Correction Model (VECM) for the analysis of the relations of long term. This analysis will start by carrying out the stationarity tests of the various variables. Then we will test the existence of cointegration relations before examining causality between variables. At the end, we will carry out an impulse analysis by calculating the functions of answers to shocks.

## 4 Results

### 4.1 Unit root test

A good specification of VECM requires that the all variables used in the model are integrated in the same order. According to the order of integrity, we studied the presence or not of a unit root in order to carry out an adequate procedure of stationarity test. In this paper, we chose Augmented Dickey-Fuller tests (1979) enhanced because not only they are widely used but also because their implementation is relatively simple.

By using the ADF strategy enhanced, we affirm that the variables chosen in our study are integrated variables of rank 1. Thus, they will have to be differentiated at least once to make them stationary. The differentiated series will undergo the same tests to ensure their stationarity. If in one of the models we accept the root unit assumption, then we must again differentiate the series and take again the

tests until the moment when we will find a stationary series. The tests of stationarity, presented by the table that follows, lead to the conclusion that the series "log(Real GDP)", "log(Indus – A.V.)", "REER", "log(Rent)", and "Employ – indus", are stationary with the threshold of 5% of first difference. I.e. they are integrated of first order I(1). The results of this analysis are presented in the table that follows:

Table 1: Augmented Dickey-Fuller Test (1979) in first difference

Variables	Model 3 <sup>10</sup>		Model 2 <sup>11</sup>		Model 1 <sup>12</sup>	
	P-value	Sig. Trend	P-value	Sig. constant	T-stat	C.V 5%
$\Delta$ Log (Real GDP)	0.000	0.851	0.923	0.000	4.816	-1.95
$\Delta$ Log (Indus A.V.)	0.023	0.793	0.912	0.002	3.961	-1.95
$\Delta$ Log (Rent)	0.002	0.689	0.635	0.032	-5.302	-1.95
$\Delta$ REER	0.006	0.641	0.136	0.028	2.967	-1.95
$\Delta$ Employ – indus	0.012	0.596	0.743	0.001	3.843	-1.95

Source: Authors' calculations.

## 4.2 Test of cointegration

### 4.2.1 Selecting the number of lags

A preliminary condition to the estimate of VECM consists in determining the number of lags, which it is advisable to retain while being based on the number of lags of the standard corresponding VAR model. We use AIC, HQIC, FPE and the SBIC information criteria to ensure that the model residues are white noises.

Table 2: Selecting the number of lags

Lags	FPE	AIC	HQIC	SBIC
0	0.00289	-0.17241	-0.14252	-0.07899
1	0.00002	-4.98242	-4.89277	-4.70219
2	0.00001	-5.48466	-5.33524	-5.01759*
3	0.00001*	-5.55019*	-5.34100*	-4.8963
4	0.00001	-5.52485	-5.2559	-4.68413

Source: Authors' calculations.

<sup>10</sup> The most general model, including a trend and a constant.

<sup>11</sup> The model including just a constant.

<sup>12</sup> The most constraint model, with no constant nor trend.

The result of the test applied to the stationary variables gives three as the optimal order on the VAR model. Indeed, the modeling of all the equations of this model, confirms the persistence of the influence of history for variables retained during three years considering the significance of the variables coefficients delayed in order 1, 2 and 3.

#### 4.2.2 The choice of best model

Based on the number of cointegration equation of the corresponding standard VAR model, several specifications can be considered: presence of a tendency on the level of the variable, the level of the first difference, the whole in presence or not of a constant. In total, we can have five different specifications. Given that the determination of the cointegration number depends on the specification selected, we will estimate the five models and will deduce the best starting from the comparison of their criteria of AIC. Finally, we will use Johansen's test (1988, 1991, 1995) on the best-selected model. All the steps being carried out with the software Stata 11.0, we will have here only the results from the best-selected model.

Table 3: Johansen's test (1988, 1991 and 1995)

Hypothesis on the number of co-integrating equation	Log Likelihood	Eigen value	Trace statistic <sup>13</sup>	Critical Value at 5%
None	83.70573	.	79.8953	77.74
At Most 1	98.14765	0.63064	51.0115*	54.64
At Most 2	110.06559	0.56042	27.1756	34.55
At Most 3	117.22365	0.38961	12.8595	18.17
At Most 4	121.86205	0.27377	3.5827	3.74
At Most 5	123.65340	0.11621		

Source: Authors' calculations.

<sup>13</sup>Trace statistic is defined by:

$$Q_r = -T \sum_{i=r+1}^k \log(1 - \lambda_i)$$

with T = number of observations ;  $\lambda$  = Eigen value

### 4.3 Model estimation

As announced before, the Dutch Disease is a typical problem of the countries rich in natural resources, but it also applies to the countries that receive significant amounts of capital other than the one coming from the export of these resources. In the presence of this Disease, the relationship between the price of the tradable goods and that of the non-tradable goods decrease, which stimulates the production of the non-tradable goods and makes the economy less competitive in the medium term. It results from them a structural process of deindustrialization of the economy. The central idea of this work is to check if these types of monetary flows could give birth, in Morocco, with a phenomenon similar to the Dutch Disease and if they slow down competitiveness price of the sector exposed to international competition.

The model is overall significant in comparison with the statistics of Wald. Thus, we model the interdependences between the six variables using a model with error correction including three lags. All the parameters of short term and long term of the model with error correction estimated is presented in the equation below:

Table 4: Estimate of the Model

Variables	$\Delta$ Log (Real GDP)	$\Delta$ Log (Rent)	$\Delta$ Log (Indus A.V.)	$\Delta$ Employ - indus	$\Delta$ REER
Ce L1.	-0.395 <sup>14</sup> (0.001) <sup>15</sup>	-0.951 (0.036)	-0.152 (0.02)	-3.818 (0.009)	-2.700 (0.017)
Log (Real GDP)					
L1D	-1.398 (0.000)	2.163 (0.022)	0.187 (0.069)	-3.032 (0.879)	-25.445 (0.294)
L2D	-0.702 (0.003)	1.719 (0.063)	0.062 (0.807)	9.378 (0.631)	-2.550 (0.915)
Log (Rent)					
L1D	-0.076 (0.031)	0.902 (0.003)	-0.009 (0.017)	-3.625 (0.636)	10.409 (0.028)
L2D	-0.231 (0.009)	-1.157 (0.655)	-0.047 (0.028)	-4.779 (0.079)	12.087 (0.048)
Log(Indus A.V.)					
L1D	1.181 (0.001)	-2.486 (0.068)	-0.002 (0.996)	2.517 (0.930)	31.769 (0.035)

<sup>14</sup>Coefficient.

<sup>15</sup>Significance.

	L2D	0.638 (0.048)	-1.629 (0.201)	0.1 (0.774)	5.833 (0.048)	-27.16 (0.047)
Employ – indus						
	L1D	-0.004 (0.209)	-0.010 (0.430)	0.000 (0.859)	0.120 (0.641)	0.153 (0.626)
	L2D	0.001 (0.715)	-0.004 (0.698)	0.000 (0.780)	0.066 (0.767)	-0.147 (0.587)
REER						
	L1D	-0.003 (0.339)	-0.019 (0.078)	-0.001 (0.035)	0.297 (0.088)	0.206 (0.445)
	L2D	-0.003 (0.187)	-0.009 (0.277)	-0.001 (0.012)	0.195 (0.065)	0.451 (0.030)
Constant		0.127 (0.000)	-0.106 (0.250)	0.065 (0.010)	0.461 (0.813)	0.355 (0.881)

Source: Authors' calculations.

This model is the result of our study and it is based primarily on two axes. The first is that of the existence of a bond between a positive external shock and the weight of the manufacturing sector in Morocco. The second axis is that of the relation of the shocks with the economic growth in the long run through its impact on the manufacturing sector. The estimation of the specification with error correction indicates in general a significant coefficients of the explained variables. According to these results, the flow of foreign capital coming from the exploitation of natural resources and other types of monetary flows like the transfers of residents abroad, the entry of foreign assistance from other countries or international organizations and the tourists receipts impact significantly and negatively the industrial sector in terms of added value and employment and on the economic growth for the case of Morocco.

The impact of the explanatory variables chosen by our model is consistent. An increase in one or all these aggregates, which we incorporated under the variable "Rent", will have negative and significant effects over the whole of the Moroccan economy and particularly on the industrial sector. According to our estimate, an increase of 1% of the entries in currencies of the variable "Rent" will lead to consequences similar to those described by the theory of the Dutch Disease and which, according to the analysis of the model selected, generates, for the Moroccan case, the following induced effects:

- A loss of approximately 0.8% of the economic growth in the first year and of 0.23% in the second year of the economic growth;
- An appreciation of the rate of real effective exchange of more than 10 and 12 points in the two years which follow;

- A fall of the industrial added value of 1% the first year and more than 5% during the second year;
- A loss of around 4 points of employment in the industrial sector compared to total employment during two following years.

Nevertheless, the most interesting result, and to which we should give much attention in the case of a modeling with error correction, is that the coefficients of the term of error correction, noted are significant and negative. This coefficient of adjustment represents the difference between the level of the variable and its target in long term and must be significantly negative due to the fact that it represents a restoring force towards into equilibrium in long term. Thus one of the results that we can confirm is, whatever the shocks of the industrial added value, the revenue, the rate of real effective exchange, as well as those share of employment in the industrial sector, the level of economic growth in Morocco will end up finding the long-run equilibrium.

So the Moroccan economy presents the symptoms of the Dutch Disease and which can give rise to a phenomenon of deindustrialization of country if the public authorities do not take safety measures to neutralize its effects.

#### **4.4 Impulse Response Function**

The analysis of the impulse-response functions (IRF) will enable us to visualize the impacts of the variation of a variable on the others. In other words, up to what point the fluctuations of a given variable are attributable with the variations of each variable of the model. On this level, we used the technique of orthogonal impulse-response function (OIRF) of the variables retained in our model following a positive shock of the variable "Rent". The analysis of these functions shows quantitatively that the Moroccan economy behaves in a way similar to that described in the theory of the Dutch Disease following the increase in the flow of foreign capital coming from the resources incorporated on the level of the aforementioned variable. According to this technique of forecast, that we chose to project over 4 years, the economic growth rate loses more than 18% during the three years which follow the shock, and the industrial added value and the share of employment in industry compared to total employment move back of 5.9% and 6.2% respectively, while recording an increase in the REER of almost 6.1 points.

Table 5: Impulse Response Function

	Log (Real GDP)	Log (Indus A.V.)	Employ - indus	REER
Year of shock	0.24%	0,00%	0,00%	0,00%
First Year	0.07%	-2.5%	-2.1%	3.2%
Second Year	-0.18%	-2.6%	-2.4%	1.2%
Third Year	-0.31%	-0.8%	-1.7%	1.7%

Source: Authors' calculations.

## 5 Conclusion

Following the results presented, the extent of the Dutch Disease knew a remarkable growth during years. It threatens the Moroccan productive structure while returning the sector of the tradable goods less competitive on the international market following a positive external shock coming from a massive re-entry of foreign capital, thus leading to a deindustrialization of the country. Therefore, the Dutch Disease remains a phenomenon that threatens all the Moroccan economy considering the importance of financial flows which have profited from it.

The increase in the incomes coming from the exploitation of natural resources and the other quoted types of monetary flows let the State profit from the loans at preferential rates on the national and international market and making it more solvent. On the other hand, if the flow of these incomes in currencies drops, the country can suffer from over-indebtedness.

It should be also noted that the Moroccan manufacturing sector has a bad classification compared to the other countries in terms of technological contents of its products on a side and in terms of share in the GDP on another side. It is a handicap for productive diversification that leads to the fact that the Dutch Disease tends to paralyze the efforts made to promote the growth focused on exports. So and with an aim of facing these positive external shocks and of neutralizing their effects, the process of transformation of the productive structure requires that Morocco accelerates its change towards a production with high added value and that it develops its competitiveness. This applies in particular to the growth in the exports of products and services which already exist on the world market but which is nevertheless new in the structure of production of Morocco. The good news is that Morocco is well placed in the new sectors of "proximity" what highly pushes the public authorities to recommend the identification of the sectors that are closest to the structure of current production, by opening new prospects to escape the harmful effects of the Dutch Disease.

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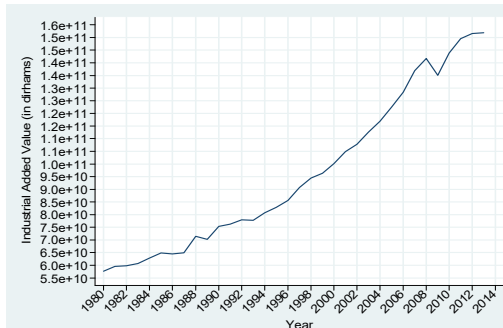
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## Appendices

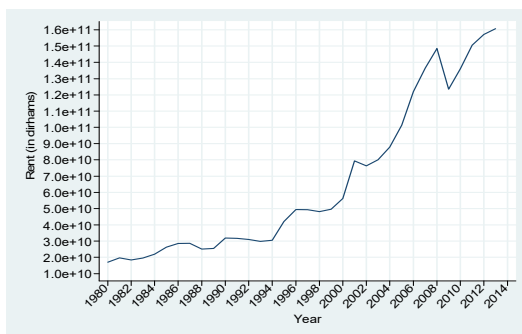
Appendix 1: Chart of the variables.



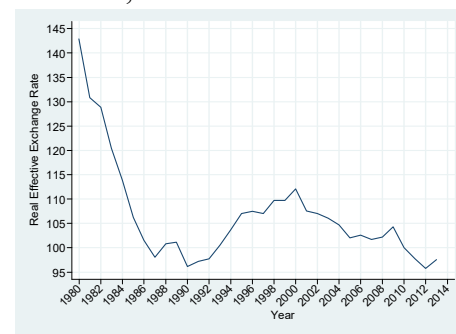
Source: Ministry of Plan, Morocco.



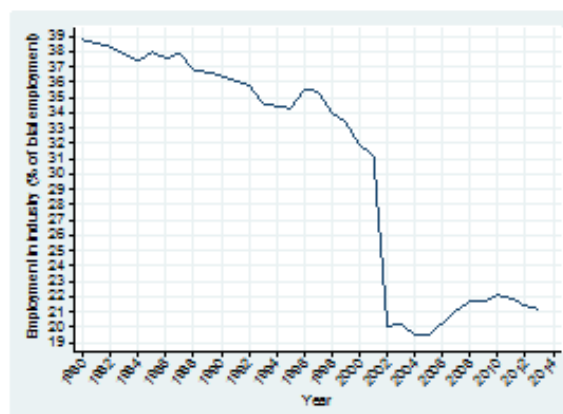
Source: Ministry for the Economy and Finances, Morocco.



Source: Exchange Office and Ministry for the foreign trade databases, Morocco.

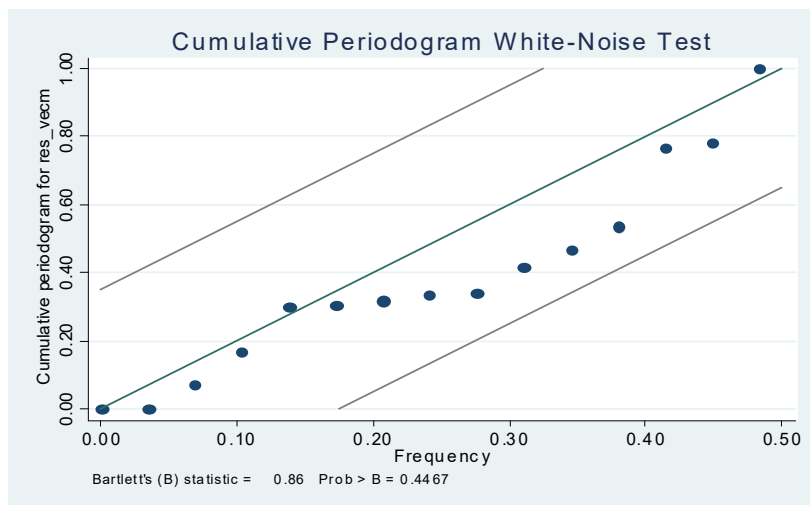


Source: Central Bank, Morocco.



Source: World Bank databases.

## Appendix 2: White Noise Test



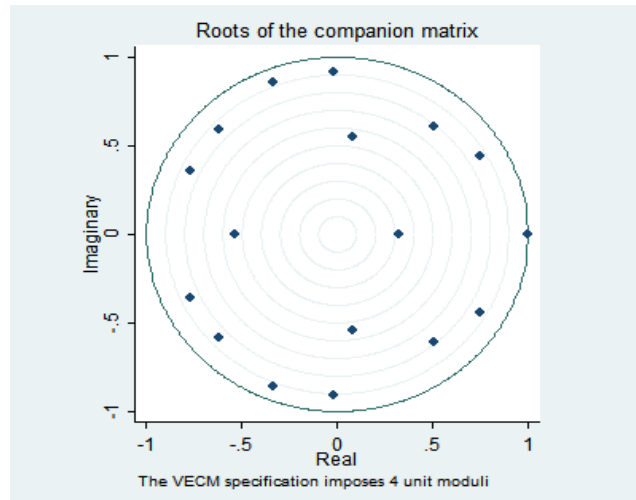
Source: Authors' calculations using STATA 11 software.

## Appendix 3: Test of normality

Variables	Jarque-Bera test	Skewness test	Kurtosis test
$\Delta$ Log (Real GDP)	0.754	0.547	0.652
$\Delta$ Log (Indus V.A.)	0.826	0.549	0.881
$\Delta$ Log (Rent)	0.576	0.601	0.362
$\Delta REER$	0.582	0.304	0.875
$\Delta$ Employ-indus	0.871	0.602	0.762
All Variables	0.970	0.803	0.955

Source: Authors' calculations.

## Appendix4: Test of Stability



Source: Authors' calculations using STATA 11 software.