Is the Dutch disease ample evidence of a resource curse?

The case of Libya

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Abstract: *The Dutch disease refers to an appreciation of the real exchange rate resulting from increased exports and capital inflows within a country with a booming natural resource industry. This elevated exchange rate feeds back into the rest of the economy and can crowd out domestic manufacturing and other exporting sectors, leading to what has been ascribed as the resource curse. This paper attempts to contribute to the literature by shedding some light on the existence of this mechanism in Libya over the period 1970-2010. It applies a time series approach to explore the relationship between oil price, gross domestic product, and trade balance as independent variables and real exchange rate as dependent variable. Theoretically, a resource boom leading to the general appreciation of the national currency negatively affects the economy, but this theoretical hypothesis is not evident in the case of Libya. Our results suggest that a country may experience a resource curse, but this may not be as a result of the Dutch disease of an appreciation of the real exchange rate.*

Keyword: Cointegration, Dutch disease, Libya, real exchange rate
JEL codes: O13, O43, Q33, Q35, Q38

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1. INTRODUCTION

A counter-intuitive relationship developed between natural resources abundance and economic development during the late 20th century (Auty, 1998, Auty & Gelb, 2001). Developing countries with abundant natural resources were underperforming compared to those poor in natural resources (Ranis, 1991, Lal and Myint, 1996, Sachs & Warner, 1995 & 2001, Auty & Gelb, 2001). Specifically, the per capita incomes of resource poor countries were increasing two to three times more than those of resource abundant countries. The growth rate between these two set of countries widened significantly in the 1970s. The apparent paradox between natural resource abundance, and economic growth and development led to increasing research into what has been termed the resource curse and Dutch disease phenomenon.

Dutch disease is named after the experience of the Netherlands in the 1960s when major gas finds brought a short-lived boom that created problems in other economic sectors (Stanford, 2012). The economic concept of Dutch disease refers to the potential negative effects natural-resource windfalls and accompanying appreciations of exchange rates can have on the rest of the economy (Brahmbhatt *et al*., 2010). Dutch disease occurs when resource booms cause real exchange rates to rise and, labour and capital to migrate to the booming sector. A situation where growth in income from natural resources damage other sectors of a country's economy which results in higher costs and reduction of competitiveness for domestically produced goods and services in previously effective productive sectors (Karl, 2004). This happens because increased revenues from natural resource exports tend to increase the value of the exporting nation's currency. That makes the country's other exports, such as agricultural products and manufactured goods, more expensive and therefore less competitive in world markets. The economy thus becomes over reliant on the natural resources that it is exporting and this can be particularly damaging if, for any reason, there is a drop in world price for those natural resources (Stevens & Dietsch, 2008).

Libya typically generates 80 to 95% of total revenues from the oil sector. The country's economy depends heavily on oil exports therefore the Dutch disease phenomenon is hypothesised to exist. The oil industry is not only an enclave but also, an extremely capital intensive industry. For these reasons, it has been argued that the link between the oil industry and the rest of economy is particular weak and does not contribute much to the reduction of unemployment. The oil sector creates few workplaces per capita investment and those jobs usually require high skilled labour. The common practice is to import them from abroad. The Libyan unemployment rate averaged 17.7% between 2005 and 2010, reaching an all-time high of 20.7% in 2009 and a record low of 13.0% in 2005. However, unofficial estimates indicate that unemployment affects at least 30% of the total population. The Libyan labour market is shaped by the co-existence of expanding unemployment for nationals and growing numbers of foreign migrant workers a paradoxical situation arising from a combination of mismatched skills and public sector dominance in the labour market, with implications for long term growth and development. Given the nature of the economy, could the country be experiencing the problem of a resource curse and could this be explained be explained by the Dutch disease of exchange rate appreciation? This is the focus of the analysis in this paper over the period 1970 - 2010. The next section discusses the approach to the study followed by the empirical results in section 3. Discussion of the results is presented in section 4, while section 5 concludes.

2. MODEL SPECIFICATION AND METHOD OF ANALYSIS

2.1 Model Specification

As explained above, the paper examines the real exchange rate, regarding whether high oil prices have led to the Dutch disease in Libya. It employed time series macroeconomic data on exchange rate, oil price, gross domestic product and trade balance. This longitudinal study covers a time span of forty years from 1970 to 2010. The analysis is limited to 2010 because of the political instability that has existed in the country since 2011. The variables in the model consist of the log of real exchange rate (LRER) as the dependent variable, log of oil price (LOP), log of gross domestic product (LGDP) and log of trade balance (LTB) as independent variables. Including the intercept and error term the equation is stipulated as follows

$$logRER_t = \alpha + \beta_1 logOP_t + \beta_2 logGDP_t + \beta_3 logTB_t + \varepsilon_t$$

Where:

logRER = *real exchange rate;*
logOP = *oil price;*
logGDP = *gross domestic product;*
logTB = *trade balance;*
ε = *error term.*

2.2 Method of Analysis

The stochastic properties of the data have been assessed on the basis of conventional unit root test; the Augmented Dicky Fuller (ADF) and Phillips-Perron (PP). Critical values for the rejection of null hypothesis of the unit root are those computed according to the Mackinnon (1991) criterion. Both tests have been carried out in three settings; with a constant, without a constant and with a constant plus linear trend. The lag length for the ADF test is based on the Schwarz Information Criterion (SIC), and the lag structure for the PP is determined by using the Bartlett Kernel with an automatic Newey-West bandwidth (Cheung & Lai, 1997).

Johansen (1988 & 1991) cointegration methodology has been adopted to identify the long run relationship among the variables and to test for the number of cointegrating vectors. The Johansen cointegration test based on the trace and maximum eigenvalue statistics were both applied. To determine the number of cointegration vectors, both tests used the critical values of Mackinnon *et al.* (1991). Result is based on inclusion of linear deterministic trend in the data. To select the optimal lag length, SIC has been implemented.

3. EMPIRICAL RESULTS

3.1 The Unit Root Test

The ADF and PP tests, as presented in Table 1, show that all variables are non-stationary at level in the three settings for both tests, except the trade balance variable (LTB), which according to both tests with constant and a constant linear trend is stationary at each critical value. These tests were repeated after taking the first difference for all the variables. The results indicate that the null hypothesis is rejected at the first difference, that is to say, all the variables are stationary in both tests. The combination of the unit root tests results suggests that the variables are integrated of order one I(1). This implies the possibility of co-integrating relationships. Consequently, the Johansen methodology in testing for co-integration was applied.

3.2 Cointegration test

The results of the Johansen cointegration test are reported in Table 2. The first row of the trace statistic tests the hypothesis of no co-integration, the second row tests the hypothesis of one cointegrating relation, the third row tests the hypothesis of two cointegrating relations, and so on, all against the alternative hypothesis of a full rank. Since 78.14 and 37.32 exceeds the 5% critical value of the trace statistic, it is possible to reject the null hypothesis of no co-integration vectors and accept the alternative of one or more co-integrating vectors. The max statistic test confirms the result of the trace statistic, so it can be concluded that there are two cointegration vectors in the system. This reveals the existence of a long run equilibrium relationship between the exchange rate and the explanatory variables used in the model. The selected normalised co-integration long run relationship results are presented in Table 3.

Table 1: Unit root tests

(A) Augmented Dickey Fuller test statistic

	Level	ADF		First difference
	t-statistic	Probability*	t-statistic	Probability
With constant				
LEXR	-0.794178(1)	0.8096	-4.157252(0)	0.0023
LOP	-2.025966(0)	0.2750	-5.835030(0)	0.0000
LGDP	-0.817991(0)	0.8031	-5.589111(0)	0.0000
LTB	-3.775075(0)	0.0064	-7.428444(1)	0.0000
Constant and Linear Trend				
LEXR	-1.415032(1)	0.8407	-4.335929(0)	0.0073
LOP	-1.978374(0)	0.5950	-5.762105(0)	0.0001
LGDP	-1.449569(0)	0.8301	-2.871447(3)	0.1832
LTB	-5.855149(0)	0.0001	-7.327875(0)	0.0000
No constant				
LRXR	-0.951838(1)	0.2986	-4.147386(0)	0.0001
LOP	-1.822359(0)	0.0655	-5.805180(0)	0.0000
LGDP	2.086614(0)	0.9899	-5.074428(0)	0.0000
LTB	1.201093(2)	0.9383	-7.266479(1)	0.0000

Note: *Mackinnon (1991) one-sided p-values. ( ) Lag length: Automatic based Schwarz Information Criterion

(B) Phillips-Perron (PP) test statistic

	Level	**PP**		**First difference**
	t-statistic	Probability*	t-statistic	Probability
With a constant				
LEXR	-0.637306[3]	0.8507	-4.157252[0]	0.0023
LOP	-2.160876[3]	0.2232	-5.838288[2]	0.0000
LGDP	-1.078191[4]	0.7151	-5.712383[4]	0.0000
LTB	- 3.719869[3]	0.0074	-13.69895[3]	0.0000
Constant and Linear Trend				
LEXR	-1.143661[2]	0.9084	-4.322634[1]	0.0075
LOP	-2.109822[3]	0.5248	-5.767126[2]	0.0001
LGDP	-1.858339[4]	0.6571	-5.644813[4]	0.0002
LTB	-5.866095[2]	0.0001	-13.51148[3]	0.0000
No constant				
LRXR	-0.971627[3]	0.2907	-4.147386[0]	0.0001
LOP	-1.792457[3]	0.0697	-5.809133[2]	0.0000
LGDP	1.731304[4]	0.9780	-5.290164[4]	0.0000
LTB	0.823617[2]	0.8856	-12.03906[1]	0.0000

Note : *Mackinnon (1991) one-sided p-values. [ ] Lag length: Bandwidth Newey-West using Bartlett Kernel.

Table 2: Johansen Cointegration Test

Hypothesised No. of CE(s)	*Eigen-value*	*Trace Statistic*	*0.05 Critical Value*	*Prob***
None *	0.678197	78.14413	47.85613	0.0000
At most 1 *	0.563777	37.32675	29.79707	0.0056
At most 2 *	0.184868	7.461123	15.49471	0.5247
At most 3	0.002845	0.102555	3.841466	0.7488
		Maximum-Eigen Statistic		
None *	0.678197	40.81739	27.5843	0.0006
At most 1 *	0.563777	29.86563	21.13162	0.0023
At most 2 *	0.184868	7.358568	14.26460	0.4476
At most 3	0.002845	0.102555	3.841466	0.7488

Note:
(1) Trace statistic and Max-eigenvalue statistic indicates 2 co-integrating equations at the 0.05 critical value.
(2) * denotes rejection of the hypothesis at the 0.05 level.
(3) **MacKinnon-Haug-Michelis (1999) p-values

Table 3: Cointegration Equation Normalised

	Dependent variable: LRER		
Explanatory variables	Coefficient	Standard error	t-statistic
LOP	1.414165	0.32278	4.38120
LGDP	-6.903115	1.87786	3.67605
LTB	8.266987	1.58094	5.22915

The long run results in Table 3 show that all the explanatory variables have the expected signs and are significant. There is a significant positive relationship between the exchange rate (LEXR) and oil price (LOP). A 1% increase in the oil price will cause the Libyan exchange rate to increase (depreciate) by 1.4%. The relationship between Libya's exchange rate and the gross domestic product (GDP) was negative, with a 1% increase leading to a decrease (appreciation) in the exchange rate by 6.9%. Moreover, the result indicates that trade balance (LTB) has a positive relationship with the exchange rate, as a 1% increase in trade balance leads to an increase (depreciate) in the exchange rate of 8.3%.

3.3 Vector Error Correction Model (VECM) – Short run

In the short run model, a dummy variable (DUM) representing the period 2002 – 2010 was included as an exogenous variable in the test VECM to take into account the dramatic increase of the exchange rate since 2002 (Figure 1).

The results in Table 4 show that the estimated error correction coefficient (EC_{t-1}) is -0.48 and significant, and consistent with the method of error correction. It also indicates that the deviation from the long-run equilibrium path is corrected by nearly 48% over the following year.

Figure 1: Libyan Exchange Rate (Libyan Dinar:US$) - 1970 - 2010

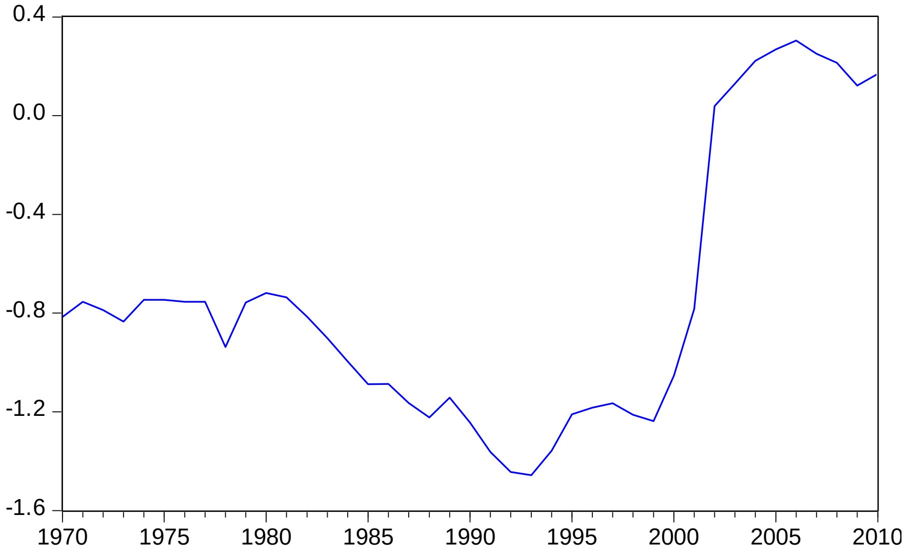

Table 4: Vector Error Correction Estimates

Variables	Coefficient	S.D error	T-test
EC_{t-1}	-0.479198	0.12004	-3.99208
D (LEXR (-1))	0.186483	0.16592	1.12396
D (LOP (-1))	0.147212	0.09014	1.63319
D (LTB (-1))	0.435238	0.19147	2.27316
D (LGDP (-1))	-0.447072	0.39924	-1.11980
Constant	-0.119405	0.04057	-2.94287
DUM	0.548064	0.13069	4.19347

4. DISCUSSION

The estimated results presented in Table 3 indicate that an increase in oil price leads to depreciation of the Libyan domestic currency. This result is different from the theoretical concept of Dutch disease and some empirical studies, as indicated by Brahmbhatt *et al.* (2010), Akpan (2009) and Corden & Neary (1982), which highlight the potential negative effects that natural resource windfalls (and the accompanying appreciations in exchange rates) can have on the rest of the economy. It can however be argued that the effect of the appreciations of the exchange rate depends on government policy and how the economy is managed.

Al-mulali (2010) found similar results in the case of Norway, wherein an increase of 1% in oil price caused the real exchange rate to depreciate by 0.22%, with a positive effect on the country's economic growth (see also Al-mulali & Che Sab, 2010). Benhabib *et al.* (2014) also investigated the relationship between the two variables, oil price and exchange rate and found that a 1% increase in oil price tended to depreciate the Algerian exchange rate by nearly 0.35%. Other studies support this result, such as Gelb (1988) and Spatafora and Warner (1995), who, using aggregated data, could not find evidence of Dutch disease in the manufacturing sector due to oil booms. Other evidence of Dutch disease being caused by oil price shocks in country case studies has also been weak. Sala-i-Martin and Subramanian (2013) could not find evidence of Dutch disease in Nigeria due to movement in oil prices.

Moreover, they found that the real exchange rate is insensitive to the price of oil. They highlighted an issue that is all too common in analysing the impact of oil prices on macroeconomic variables in oil exporting countries, which is the importance of the type of spending, and not only the quantity. As the spending of revenues on tradable bears no impact on the real exchange rate, if the bulk of the windfall is spent on imported goods, any signs of a Dutch disease may be weak.

The difference between our results, and the theoretical evidence and other studies could be due to the exchange rate policy and government control. In general, the Central Bank has followed a policy of pegging the Libyan Dinar (LD), either to the US dollar or to the IMF's special drawing rights (SDR). The dinar's peg to the SDR and ample foreign exchange reserves mean that the currency is not likely to come under pressure. The Central Bank remains committed to the peg, and Libya's foreign-reserve stock of billions of US dollars will support the currency over the forecasted period. Since the early 1970s until the period of this study, all businesses in the country were state controlled. They essentially operated without the need to make profits in any conventional sense, but were only expected to supply a range of goods and services to the Libyan people at government-controlled prices, with such controls having a strong impact on movements of the exchange rate.

5. CONCLUSION

High oil prices generally provoke a large appreciation of exchange rates in oil exporting countries. Many previous studies suggest that an appreciation of the exchange rate is one of the major factors that impede economic growth and development in resource rich countries. That is, the Dutch disease underpins the resource curse phenomenon in these countries. However, this evidence is not clearly established in the case of Libya. On the contrary, oil prices depreciated the Libyan Dinar against the US dollar by about 1.4% during the period of the study. This inverse impact between oil price and the Libyan Dinar reflects the puzzling role of the exchange rate policy in Libya. In sum, the evidence concerning the effect of Dutch disease on economic development and thus growth is mainly inconclusive. Dutch disease is an unintended consequence of foreign exchange and natural resource abundance, however, the negative effects would not necessarily offset the benefits of this inflow.

The Libyan case has shown how natural resource abundance can be a blessing and a curse, despite the fact that the country did not seem to suffer from the Dutch disease relating to currency appreciation. Although many countries are highly dependent on their natural resources, it is not likely that they all suffer or have suffered from Dutch disease of currency appreciation – Libya is a prime example of this. Due to the nature of the economy, Dutch disease does not manifest itself in terms of the effect of oil prices on the exchange rate. The implication is that, a country could potentially suffer from Dutch disease, but no evidence can be brought by one model alone, rather it could be through different channels.

Theoretically, the general appreciation of the national currency negatively affects the economy, but this theoretical hypothesis is not evident in the case of Libya. Our results suggest that a country may experience a resource curse, but this may not be as a result of an appreciation of the real exchange rate. The resource curse, therefore, may not be explained by the Dutch disease related real exchange rate appreciation but possibly by sectoral changes in the economy which may have implications for economic growth and therefore the resource curse in countries such as Libya.

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