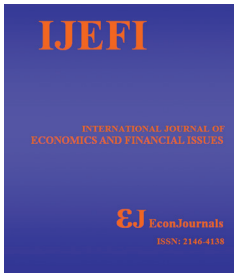

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Impact of Non-oil Export on Non-oil Economic Growth in Saudi Arabia

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ABSTRACT

This study empirically estimates the critical parameters of non-oil export impact on non-oil economic growth in Saudi Arabia for the period 1988-2014 by using ordinary least squares and error correction model approach. The empirical results obtained show that, in both short run and long run, there are positive and significant relationship between the non-oil economic growth and non-oil exports. There is also positive and significant relationship between non-oil economic growth and capital in both long run and short run. On the other hand, there is positive and significant relationship between non-oil economic growth and labor in the long run but positive and insignificant in the short run. The error correction is correctly negatively signed and highly significant and has a large magnitude (−0.537) suggesting a rapid adjustment process, which means that, if non-oil gross domestic product is 1% out of equilibrium, a 53.7% adjustment towards equilibrium will take place within the first year.

Keywords: Non-oil Export, Open Economy, Non-oil Gross Domestic Product, Saudi Arabia
JEL Classifications: F11, F14, F41, F43

1. INTRODUCTION

Saudi Arabia was the world's largest producer and exporter of total petroleum liquids in 2010, and the world's second largest crude oil producer behind Russia. Saudi Arabian economy remains heavily dependent on crude oil. Oil export revenues have accounted for 80-90% of total Saudi revenues and above 40% of the country's gross domestic product (GDP). Saudi Arabia is the largest consumer of petroleum in the Middle East, particularly in transportation fuels and direct burn for power generation. Domestic consumption growth has been spurred by the economic boom due to historically high oil prices and large fuel subsidies. In 2008, Saudi Arabia was the 15th largest consumer of total primary energy, of which almost 60% was petroleum-based and the rest natural gas.

Export is an important determinant of growth in either developed or developing economies. Exports of developing countries constitutes mainly of natural resources such as oil, while that of developed countries are mainly of capital goods. The policy thrust of the export-led growth hypothesis is non-natural resource based products. Increasing exports is the main engine of growth because export creates positive externalities by employing a more efficient institutional structure and production methods. In addition, exports bring about economies of scale, relaxes foreign exchange barriers and makes foreign markets more reachable. Moreover, in the long run exports have the potency of increasing economic growth through high technical innovation and dynamic learning from abroad. The export-led growth hypothesis is a framework that supports long run growth in developing countries spurred by non-natural resources output. The reasons for this notion are:

1. The first reason is that natural resources are exhaustible (short run phenomenon), but export-led growth hypothesis is a long run phenomenon.
2. Second, previous empirical findings have shown that revenues from the exports of nonrenewable natural resources affect economic growth negatively in the long run. In particular, according to the Dutch disease concept, "increasing revenues from the export of natural resources cause an appreciation of the real exchange rate, which undermines competitiveness of the non-resource tradable sector of economy while inducing demand for imports." There is the need to seek ways of developing the export of non-renewable resources in parallel with the renewable natural resources. The essence of this study is significant for an oil rich developing and exporting country

like Saudi Arabia, where crude oil has constituted the bulk of its exports for over four decades.

For these reasons, this study aims at determining the impact of non-oil export to non-oil real GDP in Saudi Arabia. Also, this study intends to investigate a cause and effect relationship between non-oil exports versus non-oil economic growth in Saudi Arabia for the period 1988-2014.

Currently, much research can be found that examines the impact that export has upon the economic growth in both developing and also developed countries. Nevertheless, an examination of this research revealed that no recent study has yet appeared regarding the estimates impact that non-oil exports has upon the economic growth of Saudi Arabia.

This study is motivated by the need to examine the impact of non-oil export to non-oil economic growth in Saudi Arabia for the period 1988-2014. The study will adopt the export-led growth hypothesis as the framework of study. A production function will specify non-oil economic growth as a function of capital stock, labor and non-oil export is formulated to express the relationship between the dependent and the independent variables. The econometric techniques of Johansen cointegration and the vector error correction model will be employed to ascertain the impact and the long run relationship between the dependent and the explanatory variables.

The plan of the paper is as follows: Section 1 is an introduction, Section 2, a brief review of Saudi Arabian export is presented. Section 3 gives information on the data and the model used. Section 4 will include the model applications for Saudi Arabia, whereas Section 5 explains the relationship between non-oil export and non-oil GDP. Finally, Section 6 summarizes main conclusions of the study.

2. STYLIZED FACTS ABOUT SAUDI ECONOMY AND THE BEHAVIOR OF SAUDI NON-OIL EXPORTS

The Saudi economy continued its growth during 2015 because of ongoing government expenditure on development projects and continuous structural and regulatory reforms aimed at achieving sustainable economic growth through diversifying the production base and increasing the contribution of non-oil sector. Real GDP at 2010 constant prices indicate that it grew by 3.5% to SAR 2,520.8 billion in 2015 compared to a growth of 3.6% in 2014. The oil sector GDP increased by 4.0% to SAR 1,085.1 billion, while the non-oil sector GDP rose by 3.1% to SAR 1,414.9 billion. The growth rate of the non-oil private sector GDP went up by 3.4% to SAR 989.9 billion, and that of the non-oil government sector by 2.5% to SAR 424.9 billion.

The growth and strength of the Saudi economy maintained the Kingdom's sovereign credit rating by international credit rating agencies. Fitch Ratings and Standard and Poor's Ratings Services recently announced fixing the Kingdom's sovereign credit rating at (AA) with a stable outlook. The same was confirmed by Moody's Corporation following its announcement of fixing the Kingdom's sovereign credit rating at high credit score of (AA3) while maintaining a stable outlook. The actual State public budget recorded a deficit of SAR 362.2 billion, or 14.95% of GDP. The current account of the balance of payments recorded a surplus of SAR (−200.54) billion or 8.28% of GDP in 2015. Broad money supply (M3) increased by 2.6% to SAR 1,774.1 billion in 2015 compared to an increase of 11.9% to SAR 1,729.4 billion in the preceding year. Currency circulated outside banks rose by 10.1%, and other quasi-monetary deposits by 3.4%. Time and savings end of 2015. Market capitalization of issued shares went down by 12.9% to SAR 1,579.1 billion at the end of 2015 from SAR 1,812.9 billion at the end of the preceding year. The number of shares traded increased by 6.0% to 65.9 billion with a value of SAR 1,660.6 billion (Saudi Arabian Monetary Agency (SAMA), 2015, 2016).

The Figures 1 and 2 indicate that there are similar directions of non-oil exports and non-oil GDP. That indicates that the potential relationship may be positive between them. Table 1 indicates that non-oil exports are smoothly increasing during 1988-2015, where they increase from 17% of total exports in 1988 to 25% in 2015. It considered the low share of total exports compared with many developing oil exporting countries. In particular, Saudi policy makers are always declaring the need to economic diversification. This highlights the need to search for new and competitive goods and services or new markets.

In analyzing the Saudi Arabian non-oil exports performance, the structure of non-oil exports should be analyzed. Table 2 presents the structure of non-oil exports in 1988 and 2015; indicating the

Figure 1: Saudi non-oil exports in constant prices (2010=100) 1988-2015 (billion riyal)

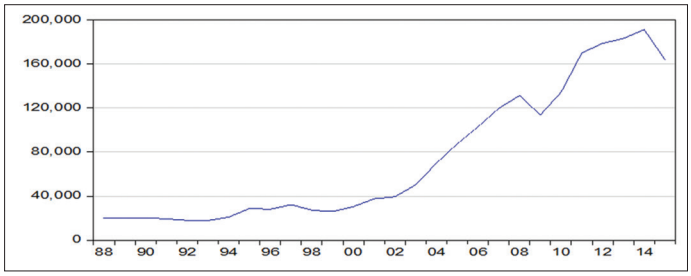
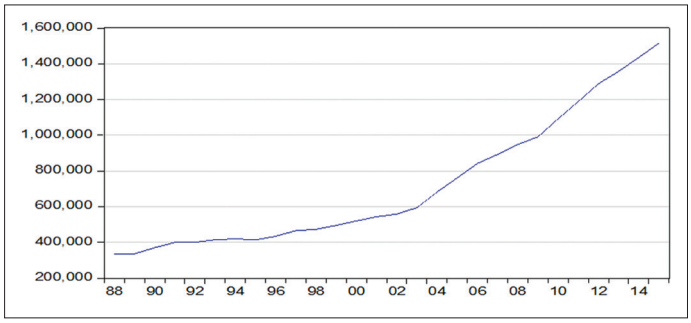


Figure 2: Saudi non-oil gross domestic product in constant prices (2010=100) 1988-2015 (billion riyal)



Source: Table 1 in the Appendix

Table 1: The structure of total exports in current prices and its yearly relative shares 1988-2015

Period	Non-oil exports (billion riyal)	Oil exports (billion riyal)	Total exports (billion riyal)	% of total exports*	
				Non-oil exports	Oil exports
1988	15.301	75.987	91.288	17	83
1998	22.927	122.461	145.388	16	84
2008	121.622	1053.860	1175.482	11	89
2011	175.504	1192.116	1367.620	13	87
2012	190.148	1266.354	1456.502	13	87
2013	201.369	1208.154	1409.523	14	86
2014	216.034	1068.088	1284.122	17	83
2015	188.636	574.677	763.313	25	75

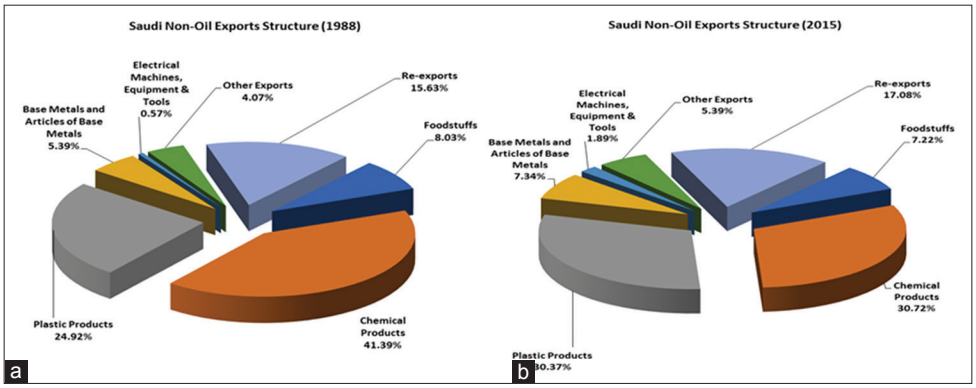
Source: Saudi Arabian Monetary Agency (SAMA) (2016), Annual report, http://www.sama.gov.sa/ReportsStatistics/Pages/AnnualReport.aspx, *calculated by the author

Table 2: The structure of non-oil exports in current prices and its yearly average growth rates 1988-2015

Non-oil exports	Value (billion riyal)		Yearly average growth rate* (%)	% of non-oil exports*	
	1988	2015	1988-2015	1988	2015
Foodstuffs	1.229	13.611	9.31	8.03	7.22
Chemical products	6.333	57.951	8.54	41.39	30.72
Plastic products	3.813	57.284	10.56	24.92	30.37
Base metals and articles of base metals	0.824	13.845	11.02	5.39	7.34
Electrical machines, equipment and tools	0.87	3.573	14.75	0.57	1.89
Other exports	0.623	10.159	10.89	4.07	5.39
Re-exports	2.392	32.213	10.11	15.63	17.08
Total	15.301	188.636	9.75	100	100

Saudi Arabian Monetary Agency (SAMA) (2016), Annual report, http://www.sama.gov.sa/ReportsStatistics/Pages/AnnualReport.aspx, *calculated by the author

Figure 3: (a and b) The structure of Saudi Arabian non-oil exports 1988-2015



Source: Table 3

rates of average growth attributed to non-oil components and its proportion to total exports during this period. It shows that Chemical products and plastic products shares together has over than half of total exports with 30.72 and 30.37% respectively. We can also in Figure 3 observe that electrical machines, equipment and tools and base metals and articles of base metals sectors achieved the highest yearly average growth rate during the period 1988-2015 respectively, which enabled it to raise their shares of total exports in 2015. Re-exports also achieved high average growth rates during the same period, which enables it to raise its share of total exports to 17.08% in 2015.

3. LITERATURE REVIEW

Many empirical studies exist in the literature about the impact of non-oil sector on economic growth. Onodugo et al. (2013) examines the specific impact of non-oil exports to the economic growth in Nigeria during the period 1981-2012 using data between 1981 and 2012. The study adopted the Augmented Production Function, employing the endogenous growth model in its analysis. Results show a very weak and infinitesimal impact of non-oil export in influencing rate of change in level of economic growth in Nigeria. Usman (2010) investigated the determinants of non-oil export and its impact on economic growth in Nigeria by using the technique of multi-linear regressions to investigate whether there is a linear relationship between the non-oil export and GDP during the period 1989-2008. The results of the analysis confirmed that Nigeria's non-oil export has some significant contribution in determining economic growth in Nigeria over the period under study. Abogan et al. (2014) examined non-oil export impact on economic growth in Nigeria using time series data for the period 1980-2010. The study indicates a moderate impact of non-oil

export on the economic growth. A one per cent increase in non-oil export causes, increases output by 26% in Nigeria. Adebile and Amusan (2011) examine the contribution of non-oil sector export to the Nigerian and the contribution of cocoa export. Using the method of content analysis, it emphasizes the huge opportunities and advantages that are available in non-oil exports sector. Nigeria's dependence on the oil export as a major contributor to the country's GDP poses a threat to the continued sustenance of the GDP. The study also examined the trend of cocoa beans export over some regime changes and found that inconsistent policies and inadequate attention given to the agricultural sector is not in the best interest of the country. It indicates that investment in cocoa production is likely to boost the GDP and will also offer employment opportunities to the citizenry. It concludes that, the involvement in the non-oil export sector is a key to a realistic growth and sustainable development.

Monir et al. (2012) investigates the effects of oil and non-oil export on economic growth in Iran for the period 1973-2007. The result illustrates that real non-oil export and real oil export have positive impact on economic growth. Tabari and Nasrollahi (2010) also examines the effects of Iranian non-oil exports on output during the period 1980-2007. They use an augmented neoclassical production function type and apply vector error correction model methodology to estimate the short and long-run effects. The results indicate negative effects of non-oil export on non-export output, while capital stock and labor force have positive effects on non-export GDP.

Mohsen (2015) investigates the role of oil and non-oil exports in the Syrian economy over the period 1975-2010. The study indicates bidirectional short-run causality relationships between GDP, oil exports and non-oil exports. There is bidirectional long-run causality relationship between non-oil exports and GDP and unidirectional long-run causality relationship running from oil exports to GDP. The study results also indicate that oil exports have the biggest effect on the GDP.

Nasreen (2011) examined the validity of export-growth nexus for some selected Asian developing countries. The study tested the causal and long relationship between exports and growth. Results reveal that in the long run, an increase in exports requires higher growth. Also, the panel homogenous causality test shows the significant effect of economic growth on export in the panel selected. Panel non-homogenous causality hypothesis result reveals the existence of bi-directional causality between economic growth and exports. Panel heterogeneous causality results indicates that the causality is found running from economic growth to exports in case of Sri Lanka, Indonesia, and Pakistan, and from exports to economic growth in Thailand and Malaysia. Bi-directional causality also exists in case of India, Sri Lanka and Indonesia while a neutral hypothesis is discovered in the case of Bangladesh.

The review above shows that the empirical finding on the impact of non-oil sector is not uniform. While some studies find significant impact of the non-oil sector on economic growth, other studies agreed on insignificant and weak impact of the non-oil export on economic growth. Also, there is a controversy on the nature of the relationship between non-oil sector on economic growth. While some of the studies agree on a positive relationship subsisting between non-oil sector and economic growth, other studies put forward a negative relationship. The reason for these discrepancies may be linked to the methodologies employed in these previous studies. What is needed to address this issue is the use of a more dynamic model that shows both the long short and long run relationship between economic growth and non-oil exports. Hence, this study employs a data point observation to investigate the relationship and impact of non-oil export on non-oil economic growth in Saudi Arabia during the period 1988-2014, using the error correction analysis.

4. THE MODEL AND THE METHODS

This study investigates the impact of non-oil export on non-oil economic growth in Saudi Arabia during the period 1988-2014. Following Solow (1957), it is assumed that output (Y) depends positively on both labor (L) and capital (K) represented by gross capital formation. Thus, the production function becomes:

$$Y = f(LK) \quad (1)$$

To augment the traditional neo-classical production function above, we include non-oil export value and non-oil GDP into the above equation. This is based on the claim of the export-led growth hypothesis that export drives growth. Therefore, a new variable non-oil export (NX) is added to equation 1 and non-oil GDP (NY) to become:

$$NY = f(L,K,NK) \quad (2)$$

This paper employs the ordinary least squares (OLS) technique for estimating non-oil export impact on non-oil economic growth in Saudi Arabian economy during the period 1988-2014.

The representation of OLS with respect to our variables is as given:

$$Log(NY_t) = C_0+C_1Log(L_t)+C_2Log(K_t)+C_3Log(NX_t)+\xi_t \quad (3)$$

We sourced data for the study from the Saudi Arabian Monetary Agency (SAMA) (2016). All variables were transformed into a natural logarithm to avoid the problem of heteroscedasticity and obtain elasticities.

If the four variables are cointegrated, they can be represented equivalently in terms of a short run OLS framework. The most common procedure to test for cointegration is the Engle-Granger two-step estimation technique (EG). The first step in this method implies fitting the long-run relationship in levels by OLS and using the resulted residuals to test the hypothesis of cointegration by applying the augmented Dickey-Fuller (ADF) test. If the hypothesis of cointegration is accepted, then there exists an error correction representation (Engle and Granger, 1987). Then, the next step is to construct the Error Correction Model, which represents the short-run dynamics.

$$\Delta Log(NY_t) = C_0 + C_1\Delta Log(L_t) + C_2\Delta Log(K_t) + C_3\Delta Log(NX_t) + C_4 ECT_{t-1} \quad (4)$$

Another procedure to test for cointegration is developed by Johansen and Julesius (1992), and it is known as the maximum likelihood approach. This method estimates and tests for multiple cointegrating vectors (multivariate cointegration). It applies the analysis of the vector auto-regressive model where all variables are treated as endogenous.

The sign and significance of the coefficient of error correction term$_{t-1}$ describes the existence of short run relationship. Its value and sign tells about the speed and convergence or divergence to or from the long run equilibrium. Its negative value indicates about the convergence whereas its positive value indicates about the divergence. A significant coefficient of error correction with a negative sign is considered as a further proof of the existence of stable long run relationship (Banerjee et al., 1998).

5. EMPIRICAL RESULTS

An ADF test is calculated for individual series to provide evidence as to whether the variables are stationary and integrated of the same order.

The results for each variable appear in Table 3. The lag parameter in ADF test is selected by Akaike information criterion) to eliminate the serial correlation in residual (Akaike, 1973). As shown in Table 3, the null hypothesis of a unit root can't be rejected for levels of all variables but the null hypothesis is rejected for the first differences of all variables. Therefore, we conclude that the series are integrated of order one.

Table 3: Unit root test

Variable	ADF
Log (NY)	
Level	0.837637
First different	−3.408110[b]
Log (L)	
Level	4.011456
First different	−4.014545[a]
Log (K)	
Level	−0.579960
First different	−3.414371[b]
Log (NX)	
Level	0.499652
First different	−3.689466[b]

Dickey and Fuller (1979) unit root test with the H_0: Variables are I (1); [a,b]indicate significance at the 1% and 5% levels respectively, ADF: Augmented Dickey-Fuller

Table 4: ADF unit root test for residual

Variable	Level
ECT	−3.602600[b]

[b]Indicates significance at 5% level, ADF: Augmented Dickey-Fuller

Cointegration analysis refers to the process of getting equilibrium or long-run relationships among non-stationary variables. The idea is that although the variables are non-stationary, a linear combination of them may be stationary, given that all variables are integrated of the same order (Engel and Granger, 1987). The vector that links the variables in the long-run relationship is called the cointegrating vector.

The estimated OLS model is:

$$Log(NY_t) = -0.53 + 71.8*Log(L_t)\_0.2*Log(K_t) + 15.8*Log(NX_t) + \xi_t \quad (5)$$

Table 4 illustrates the ADF test result for residual which indicates that the residual is integrated at 5% level, so the hypothesis of cointegration is accepted; therefore there exists an error correction representation.

Tables 5 and 6 give the results of the likelihood ratio tests based on the maximum eigenvalue and the trace of the stochastic matrix respectively. Both these tests confirm the existence of two cointegrating vectors between the variables, i.e., the existence of long-run relationship between them.

Since the three variables are cointegrated, they can be represented equivalently in terms of a short run OLS framework. Then, the next step is to construct the error correction model, which represents the short-run dynamics.

$$\Delta Log(NY_t) = 0.022 + 00.295*\Delta Log(L_t) + 0.162*\Delta Log(K_t) + 0.111*\Delta Log(NX_t) - 0.537*ECT_{t-1} \quad (6)$$

The robustness of the model has been established by several diagnostic tests as shown in Tables 4-7 in the appendix, such as Breusch-Godfrey serial correlation LM test, ARCH test, white heteroskedasticity test and Jacque-Bera normality test (Breusch & Pagan, 1979 and Jarque & Bera, 1981). All the tests disclosed that the model has the aspiration econometric properties; it has a correct functional form and the model's residuals are serially uncorrelated, normally distributed and homoskedastic. Therefore, the outcomes reported are serially uncorrelated, normally distributed and homoskedastic. Hence, the results reported are valid for reliable interpretation.

The stability of the long-run coefficient is tested by the short-run dynamics. Once the ECM model given by equation 4 has

Table 5: Cointegration test based on trace of the stochastic matrix

Hypothesized number of CE (s)	Eigenvalue	Trace statistic	0.05 critical value	P**
None*	0.701944	66.63008	54.07904	0.0026
At most 1*	0.577642	36.36821	35.19275	0.0372
At most 2	0.345063	14.82068	20.26184	0.2368
At most 3	0.156007	4.240276	9.164546	0.3775

Trace test indicates 2 cointegrating equation (s) at the 0.05 level, *denotes rejection of the hypothesis at the 0.05 level, *denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values

Figure 4: (a and b) Parameters stability tests of short-run model

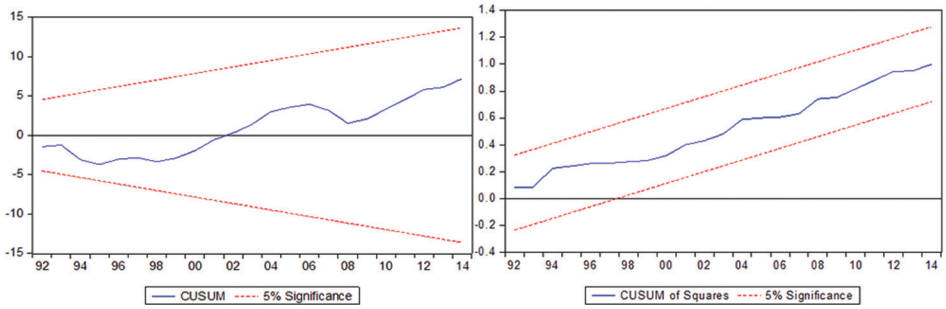


Table 6: Cointegration test based on maximal eigenvalue of the stochastic matrix

Hypothesized number of CE (s)	Eigenvalue	Max-Eigen statistic	0.05 critical value	P**
None*	0.701944	30.26187	28.58808	0.0303
At most 1	0.577642	21.54754	22.29962	0.0634
At most 2	0.345063	10.58040	15.89210	0.2844
At most 3	0.156007	4.240276	9.164546	0.3775

Max-Eigen value test indicates 1 cointegrating equation (s) at the 0.05 level, *denotes rejection of the hypothesis at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values

Table 7: OLS estimates for the long run and short run (1988-2014)

Variable	Coefficient	
	Long run	Short run
C	0.536	0.022[c]
Log (L)	0.718[a]	0.295
Log (K)	0.2[a]	0.162[a]
Log (NX)	0.158[a]	0.111[b]
ECT (-1)	-	−0.537[b]

Source: Tables 2-3 in Appendix, [a,b,c]denotes significance level at 1%, 5% and 10% respectively, OLS: Ordinary least squares

been estimated, the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMSQ) tests are applied to assess the parameter stability (Pesaran and Pesaran (1997). Figure 4 plot the results for CUSUM and CUSUMSQ tests. The results indicate the absence of any instability of the coefficients because the plot of the CUSUM and CUSUMSQ statistic fall inside the critical bands of the 5% confidence interval of parameter stability.

The error correction is correctly negatively signed and highly significant and has a large magnitude (−0.537) suggesting a quick adjustment process, which means that, if non-oil GDP is 1% out of equilibrium, a 53.7% adjustment towards equilibrium will take place within the first year.

Table 7 summarizes the empirical results of the long run and short run OLS estimates; these results obtained show that, in both short run and long run, there are positive and significant relationship between the non-oil economic growth and non-oil exports. There is also positive and significant relationship between non-oil economic growth and capital in both long run and short run. On the other hand, there is positive and significant relationship between non-oil economic growth and labor in the long run but positive and insignificant in the short run.

6. CONCLUDING REMARKS

This study empirically estimates the critical parameters of non-oil export impact on non-oil economic growth in Saudi Arabia for the period 1988-2014 by using OLS and error correction model approach. The empirical results obtained show that, in both short run and long run, there are positive and significant relationships between the non-oil economic growth and non-oil exports. There is also a positive and significant relationship between non-oil economic growth and capital in both long run and short run. On the other hand, there is a positive and significant relationship between non-oil economic growth and labor in the long run but positive and insignificant in the short run. The error correction is correctly negatively signed and highly significant and has a large magnitude (−0.537) suggesting a rapid adjustment process, which means that, if non-oil GDP is 1% out of equilibrium, a 53.7% adjustment towards equilibrium will take place within the first year.

These results will lead to some serious policy implications for decision-makers. Export growth can be driven by an intensification of existing relationships such as exporting traditional products to traditional, old markets, or by the discovery of new export products and markets. We can expect non-oil export growth to provide motives for overall economic progress only if there are well-developed relations between export and non-export sectors. In addition, the positive effect of non-oil exports on non-oil economic growth or overall economic growth is not initiated unless minimum progress levels and strong intersectional relations in economy are established. However, it should be considered that the development of manufactured goods probably has more positive and reliable effects on economic growth. Of course, new capital and infrastructure must also be accommodated to support the production for domestic use and exports.

Based on this study results, the Saudi Arabian government should diversify exports, simplify the export procedures, improve Saudi

Arabian industry, and increase the percentage share of non-oil exports in total Saudi Arabian exports to reduce the effect of oil prices fluctuations on the Saudi Arabian economy, as well as boosting the quality, productivity, and competitiveness of the Saudi Arabian products in global markets.

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APPENDIX

Appendix Table 1: Economic data in 2010 constant prices (billion riyal) (1988-2015)

Period	Non-oil exports	Oil exports	Total exports	Non-oil GDP	Oil GDP	GDP
1988	100.2958	120.4918	220.7876	334.97	626.72	961.69
1989	118.5364	138.7022	257.2386	337.2	619.65	956.85
1990	198.903	219.2998	418.2028	371.25	730.98	1102.23
1991	207.4355	226.9053	434.3408	400.57	867.08	1267.65
1992	223.3036	241.3506	464.6542	401.54	916.66	1318.2
1993	183.1098	201.0035	384.1133	414.9	885.32	1300.22
1994	178.4585	199.4006	377.8591	420.51	886.98	1307.49
1995	193.64	222.5168	416.1568	414.22	896.04	1310.26
1996	241.4186	269.4834	510.902	435.41	909.41	1344.82
1997	238.0162	270.339	508.3552	467.14	892.52	1359.66
1998	146.0112	173.3472	319.3584	473.71	925.29	1399
1999	205.4457	231.4505	436.8962	495.86	850.49	1346.35
2000	327.0513	357.5797	684.631	520.78	901.31	1422.09
2001	280.1622	317.7913	597.9535	544.46	860.41	1404.87
2002	298.8589	338.4223	637.2812	559.56	805.7	1365.26
2003	382.7375	433.1151	815.8526	595.48	923.27	1518.75
2004	513.2436	583.3662	1096.61	683.45	956.17	1639.62
2005	744.053	831.5676	1575.621	761.86	969.15	1731.01
2006	850.3836	953.4305	1803.814	842.51	936.76	1779.27
2007	883.1154	1002.94	1886.055	893.69	918.45	1812.14
2008	1139.281	1270.761	2410.042	948.79	976.6	1925.39
2009	634.7322	748.5177	1383.25	992.7	893.05	1885.75
2010	807.176	941.785	1748.961	1093.72	881.82	1975.54
2011	1148.014	1318.202	2466.216	1189.64	982.65	2172.29
2012	1185.936	1364.876	2550.812	1289.21	1000.04	2289.25
2013	1092.755	1276.024	2368.779	1358.36	992.01	2350.37
2014	940.7798	1132.12	2072.9	1436.58	999.32	2435.9
2015	494.8861	658.781	1153.667	1516.71	1004.09	2520.8

Source: Saudi Arabian Monetary Agency (SAMA) (2016), Annual Report, http://www.sama.gov.sa/ReportsStatistics/Pages/AnnualReport.aspx, GDP: Gross domestic product, SD: Standard deviation

Appendix Table 2: OLS regression results (long run relationship)

Dependent variable: LOG (NY)				
Method: Least squares				
Date: 01/18/17 time: 20:21				
Sample (adjusted): 1988 2014				
Included observations: 27				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
LOG (L)	0.718080	0.094564	7.593557	0.0000
LOG (K)	0.200183	0.040539	4.938094	0.0001
LOG (NX)	0.157961	0.031594	4.999741	0.0000
C	−0.535959	0.931185	−0.575567	0.5705
R-squared	0.995696	Mean dependent variable		13.34005
Adjusted R-squared	0.995135	SD dependent variable		0.461613
Standard error of regression	0.032199	Akaike info criterion		−3.897829
Sum squared residual	0.023845	Schwarz criterion		−3.705853
Log likelihood	56.62069	Hannan-Quinn criterion		−3.840745
F-statistic	1773.611	Durbin-Watson stat		1.420343
P (F-statistic)	0.000000			

OLS: Ordinary least squares, SD: Standard deviation

Appendix Table 3: OLS regression results (short run relationship)

Dependent variable: D (LOG (NY))				
Method: Least squares				
Date: 01/18/17 time: 22:25				
Sample (adjusted): 1989 2014				
Included observations: 26 after adjustments				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (LOG (L))	0.295448	0.236146	1.251123	0.2246
D (LOG (K))	0.161820	0.054878	2.948732	0.0077
D (LOG (NX))	0.110864	0.045297	2.447477	0.0233
ECT(-1)	0.022136	0.012404	1.784564	0.0888
C	−0.537326	0.219449	−2.448520	0.0232
R-squared	0.436364	Mean dependent variable		0.055999
Adjusted R-squared	0.329005	SD dependent variable		0.036080
Standard error of regression	0.029554	Akaike info criterion		−4.034123
Sum squared residual	0.018343	Schwarz criterion		−3.792181
Log likelihood	57.44360	Hannan-Quinn criterion		−3.964453
F-statistic	4.064524	Durbin-Watson stat		1.588011
P (F-statistic)	0.013560			

OLS: Ordinary least squares, SD: Standard deviation

Appendix Table 4: Breusch-Godfrey serial correlation LM test for short-run model

F-statistic	1.653912	P F (2.19)	0.2177
Observe*R-squared	3.855304	P Chi-square (2)	0.1455

Appendix Table 5: Residuals ARCH heteroskedasticity test of short-run model

F-statistic	0.005389	P F (1.23)	0.9421
Observe*R-squared	0.005857	P Chi-square (1)	0.9390

Appendix Table 6: Residuals normality test of short-run model

Jarque-Bera	P
0.034216	0. 983037

Appendix Table 7: Residuals white heteroskedasticity test of short-run model

F-statistic	0.372797	P F (14.11)	0.9573
Observe*R-squared	8.366530	P Chi-square (14)	0.8694
Scaled explained SS	5.377982	P Chi-square (14)	0.9798