ARTICLES

Non-Oil Export Growth and Economic Development in Saudi Arabia: A Simultaneous Equations Approach

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Abstract:

Since the evolution of neoclassical growth models in the 1950s and 1960s, many empirical studies have attempted to examine the effects of trade on growth in developing as well as developed countries. Most of these studies have followed a similar approach that is based on a single equation estimation which relates the exogenous variable exports with the endogenous variable economic growth. This study, however, uses a simultaneous equation approach to examine the relationship between economic development and non-oil export performance in Saudi Arabia. Results of three-stage least squares tests lend support to the evidence of positive effect of non-oil exports on economic development in Saudi Arabia. The study finds also that growth of non-oil exports has a positive impact on investment and production in the Kingdom.

Introduction:

In the fields of international trade and economic development, the relationship between export growth and economic growth has been the subject of a considerable amount of empirical studies. The early literature on trade and development focused on three kinds of feasible gains from trade in developing countries: a) static comparative advantage; b) increased capacity utilization; and c) improved productivity growth. Amongst these three, the gain associated with capacity utilization is the most important one.Higher exports will make foreign exchange available for financing imports of capital goods, which are

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critically important to achieve higher capacity utilization. Likewise, increased capital inflows can produce similar effects on capacity utilization.

Historically, neoclassical growth models, pioneered by the work of Solow (1956) and Swan (1956), were the major theoretical framework used to elucidate economic growth. In the neoclassical analysis, a reduction in trade barriers increases trade and the level of productivity. GDP rises through the reallocation of resources and capital accumulation. On the other hand, however, some economists refer to the vicious circle argument of the 50's that firms do not industrialize because there is no market for their goods, and there is no market for their goods because income is low, and income is low because firms did not industrialize.

At the empirical level, most of the studies were interested, however, in estimating the relationship between the dependent variable, which is often economic growth, and the explanatory variables in which exports are among them. In this regard, economists usually identify four different views: 1) Exports are an engine of growth, meaning that high exports result in higher economic growth, 2) that export and growth are both endogenous and are affected by other factors, 3) that economic growth stimulates expansion in export sectors, and 4) that exports and economic growth motivate each other, i.e. they have a bidirectional causality relationship, so that exports expansion contribute to the rate of economic growth, and the latter enhances investment in exports sector.

In fact, it has been a customary practice for many previous studies that have dealt with the issue of causality between economic growth and export growth to regress the former on export growth and other relevant variables. Such assessment is based on the assumption, which is not necessarily always true, that export growth causes economic growth. Kavoussi (1984) examined the relationship between export expansion and economic growth in a sample of 73 developing countries for the period of 1960-1978. He found that export expansion is associated with better economic performance because of the positive impact of exports on total factor productivity.

Ram (1987) provided a relatively extensive investigation on the relationship between export expansion and economic growth. His model was based on simple production function, where exports are treated as similar to a production input in the sense that the level of exports affects aggregate output for given levels of labour and capital. Ram concluded that export growth could improve economic performance.

On the other hand, most recent studies have followed a different line of hypothesis testing technique, which is based on Granger causality procedure, to detect the direction of causation between economic growth and exports. Chow (1987), for example, focused on the causal relationship between export growth and industrial development. The study found that the development of manufacturing industries and export growth have reciprocal causal relationship. Using similar procedure, Karunaratne (1996) studied the relationship between growth and trade dynamics for Australia. He demonstrated that trade operated as an engine of growth during the study period investigated.

These kinds of standard Granger tests have been criticized as yielding inconsistent results. Some studies indicated that exports unidirectionally caused growth, while others revealed the existence of reverse causality (i.e. that growth caused exports) [see, for example, Jung and Marshall (1985)], or that economic growth and exports have bidirectional causality relationship [see, for example, Darrat (1986)].

In contrast, and contrary to the widely believed view that a causal relationship between exports and economic growth does exist in many countries, Hsiao's (1987) causality tests could not find evidence of causal relationship between exports and output in either direction for Korea, Singapore, and Taiwan. Moreover, Jung and Marshall (1985) found that only 4 out of the 37 countries included in their sample data showed a significant relationship between exports and economic growth.

Recently, the issue of dynamic benefits of trade has become even more controversial with the rise of globalizationism. As Fischer (2003) noted, world has become economically more interdependent in the

sense that greater amount of trade in goods and services is crossing boarders, higher volume of international capital is flowing between countries, and increasing numbers of labour is moving across countries. Various studies have found a positive relationship between openness and economic growth. Sachs and Warner (1995), for example, demonstrate that many open economies experienced faster growth in real GDP per capita over the period 1970-89. Borland and Yang (1992) argue that output-market expansion steers economic growth, allowing domestic producers to utilize economies of scale and economies of specialization. Rodrik (1995) underlines the link between investment, growth and exports. For example, one hypothesis holds that an increase in exports will be correlated with growth because higher investment demand causes a rise in exports.

Review of many of the previous time series research in this area reveals that most of the studies are based on the application of in-sample Granger causality tests to annual data on exports and GDP. Nevertheless, exports can affect economic growth in several ways, directly and indirectly. A high export growth rate can directly promote general economic growth in several ways: **First**, an increase in exports will enable the country to have the necessary resources to obtain capital goods which are particularly important in contributing to economic growth. **Second**, the expansion of exports will make it possible for the country to achieve economies of scale. The international market together with domestic markets clearly allow larger scale operations to evolve. **Third**, export growth is expected to encourage more investment in those sectors of the economy in which the country has a comparative advantage.

There are also other indirect channels where exports expansion can affect economic growth. A substantial growth in exports will attract foreign investments, especially to the industries associated with the operation of the key export industry. Moreover, expanding export sector encourages technology transfer into the country because exporting domestic firms find themselves in a need to import foreign techniques and methods of production if they want to keep up with international competition (Emery, 1967).

Therefore, a single equation approach, which is adopted in many previous studies, might not be appropriate technique to capture all the factors affecting the relationship between economic development and export growth.

The primary focus of this study is to use a simultaneous equation system and apply three-stage least squares method (3SLS) to investigate the relationship between economic development and non-oil exports growth in Saudi Arabia. This technique allows for the endogeneity of exports and economic development to be explicitly recognized. In addition, it yields consistent and, in general, asymptotically more efficient estimators.

The rest of this paper is organized as follows: Section II gives a brief background analysis of the foreign sector in Saudi Arabia. Section III outlines the model and the methodology used. Estimation results and the conclusion are presented in sections IV and V, respectively.

II. The External Sector in Saudi Arabia: An Overview

Saudi Arabia as a major oil exporter has been adopting a plan that aims to provide the country with a sustainable base for after-oil economy. This was expected to take place through exchanging its natural resources with human and physical capital in the form of complete infrastructure, better education, better housing, and an increase in average life expectancy. However, many of the projects that were carried-out during the boom period of high oil revenues were selected without applying appropriate cost-benefit analysis. What was worse is that the government based its ambitious spending plans on the assumption that income generated from oil exports will continue to flow. This was not the case, however, the government became a net debitor with significant public debt.

Furthermore, the government of Saudi Arabia relied mainly on fiscal policies as a means to distribute resources among its citizens, including health, social, and education services; while monetary and exchange rate policies were left to be used as dependent policies. This situation resulted somehow in what is called "The Dutch Disease",

where oil discover in huge quantities led to the development of new petrochemical industry at the expense of traditional industries which over-time became less competitive in the international markets. Moreover, encouraging import-substitute industries also contributed to the low performance of non-oil exports.

Foreign trade sector, which is the focus of this study, plays a crucial role in the economy of Saudi Arabia. The Kingdom has a high degree of openness, as measured by the ratio of total import and export to GDP[1]. It depends largely on imports for its capital formation as well as for consumer goods. Saudi Arabia's external position has generally been improving in the last decade, showing a surplus in the current account of balance of payments. Nevertheless, total exports, which constitute over 40% of GDP in recent years, have been fluctuating during the past two decades. Exports increased from only 11 billion Saudi Riyal in 1970 to 405.5 billion in 1981, then dropped down to only 74 billion in 1986 before it increased again in 2003 to 450 billion Riyal. The volume of total exports, however, is dominated by oil exports and that is the reason for large fluctuations in total export data. Variations in export proceeds affect the entire domestic economy in several ways, including unemployment, importation of capital goods, government revenue, balance of payments position, the level of uncertainty and the overall stability of the economy, and the ability to commit funds to the development programs.

On the other hand, focusing on non-oil exports alone, Figure 1 shows a smooth increase over time which can be interpreted as an evidence of a partial progress of diversification of the Saudi economy. Nevertheless, their share in gross domestic product (GDP) has been insignificant during almost the entire period from 1970 to 2003, as shown in Figure 2. The gap between oil and non-oil exports in the figure is sizeable, with the latter, however, showing a smoother trend compared to the former, which is influenced by the fluctuations in oil prices.

(1) In 2003, the degree of openness was more than 60 percent.

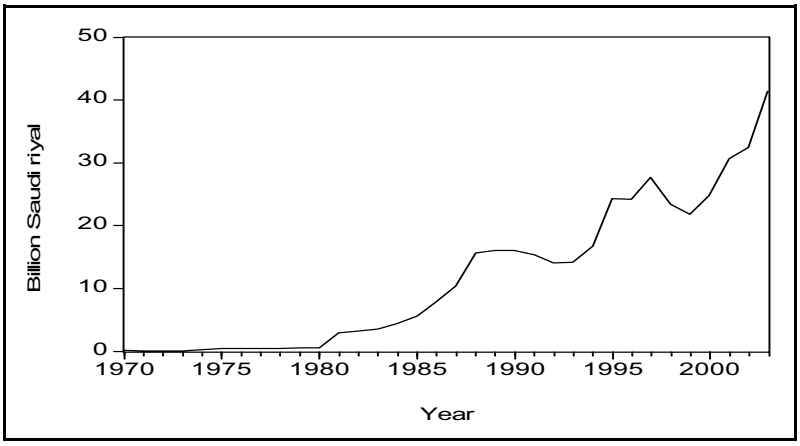

Figure 1: Saudi Non-oil Exports, 1970-2003

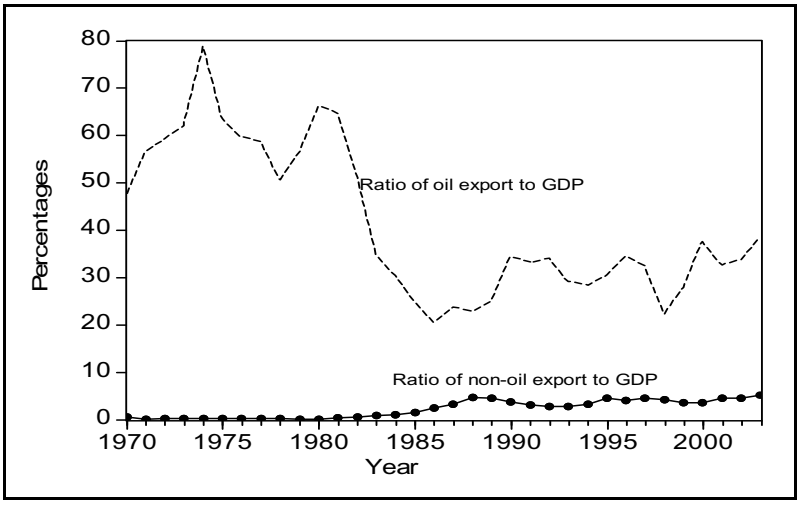

Figure 2: Share of Oil and Non-oil Exports in Saudi GDP, 1970-2003

It is not surprising, however, to say that the Kingdom faces several challenges at the domestic and the international level. Economic globalization and the resulting tendency toward freer trade flows, the vast development in information technology and data processing, the instability of world financial and exchange markets,

and the fluctuations of oil prices, are some of the international challenges. At the domestic level, the most important challenges can be summarized in the following points: a) reducing the dependency on oil and diversifying the sources of national income, b) broadening domestic production base in services, industry and agriculture, and c) facing the problem of high rate of population growth and the resulting increase in the number of individuals, male and female, entering the labour market, coupled with the growing pressure on basic public services, such as education, health, and infrastructure.

For unemployment, though no reliable data exist on its magnitude, it is believed by many observers that the rate of unemployment is relatively quite high and might result in domestic social, political and economic problems. The government is encouraged to take steps without delay to set short and long-run plans to absorb the growing number of young people entering the labour market. Authorities are urged to adopt suitable reform programs that endeavor to reduce the economy's dependence on the government, and to encourage the private sector to play a substantial role in the economy.

Saudi economy, in its present stage of development, has the potential to gain from export growth. Saudi Arabia has achieved major economic development objectives; an elaborate infrastructure has been built, per capita income has improved, and the country can now produce a large variety of goods and services. The government provides numerous incentives for investors, citizens or foreigners, especially in the industrial sector, in order not only to develop this sector and hence diversify economic base, but also to promote exports expansion in the country.

Many economists in the Kingdom believe, however, that the country's accession to the World Trade Organization (WTO) will improve the performance of the economy. The improvement is expected to stem from opening up domestic activities for foreign competition, which will then force local firms to improve their production and services. One of the Saudi government's primary objectives since the early 1990s has been containing the impact of swift

shifts in government spending on non-oil activities. The government is currently launching several economic reform programs, including opening up further sectors of the economy, dominated presently by the government, to the private sector in order to broaden economic participation and to accelerate the growth in non-oil sectors. These programs are intended also to create more job opportunities, and to reduce the country's reliance on oil export earnings. The question, however, is how far did the government succeed in accomplishing these objectives? As Figure 2 shows, during the seventies, the ratio of non-oil exports to GDP has been very low and did not even cross the level of 1% of the GDP.

In the eighties, however, non-oil exports made remarkable progress rising steadily from less than 0.5% of GDP in 1980 to its peak level of 4.7% in 1988 before it fell again in 1993 to 2.9% of GDP. The ratio was, in general, fluctuating during the nineties. At the beginning of this decade, the ratio of non-oil exports showed promising progress reaching a new high level of 5.2 of GDP in 2003. These non-oil exports are composed mainly, as Table 1 shows, of mineral products, which alone account for almost 90 percent, on average, of the total non-oil exports, followed by plastic products, but with far lower percentage.

Table 1
Composition of Non-oil Exports, Selected Years
(Million Riyals)

Product Category	1985	1990	1995	2000	2003
Mineral products	93,953	150,868	163,083	265,747	308,993
% of total	94.4	90.7	87.0	91.5	88.4
Foodstuffs	257	1,182	1,589	1,700	3,038
% of total	0.3	0.7	0.9	0.6	0.9
Plastic products	493	3,758	5,455	3,805	7,011
% of total	0.5	2.3	2.9	1.3	2.0
Base metals products	392	1,231	2,631	1,982	3,667
% of total	0.4	0.7	1.4	0.7	1.1

Table 1
Composition of Non-oil Exports, Selected Years
(Million Riyals)

Product Category	1985	1990	1995	2000	2003
Electrical machines	6	301	851	951	1,416
% of total	0.01	0.2	0.5	0.3	0.4
Other exports	119	924	1,866	2,357	4,411
% of total	0.1	0.6	0.9	0.8	1.3
Re-exports	2,072	2,414	1,762	1,886	4,928
% of total	2.1	1.5	0.9	0.7	1.4
Total	**99,536**	**166,339**	**187,403**	**290,553**	**349,664**

Source: Saudi Arabian Monetary Agency, Annual Reports, 2004. Percentages are calculated by the author.

III. Model and Methodology:

The theoretical foundation of our model is based to a large extent on the model developed earlier by Salvatore (1983). Our model, however, differs in several specifications, including the introduction of two variables; namely, population and exchange rate. The model, here, consists of four relationships and assumes that economic development performance, measured by real per capita income, is affected by non-oil exports through the effect of the latter on investment and production in the economy. Therefore, the first function assumes that real per capita income growth in Saudi Arabia depends on the level of capital formation in the country, the level of industrial output, the exports of non-oil sector and the population. The function, therefore, can be expressed as:

$$PCG = f(FCR,\ NOXG,\ IDR, POPG) \qquad (1)$$

Where:

- PCG = growth of real per capita income,
- FCR = fixed capital formation as percentage to GDP,
- NOXG = growth of the percentage of non-oil exports to GDP,
- IDR = industrial production as percentage to GDP,
- POPG = population growth.

Capital formation is very important to the development process through creating more job opportunities and raising the level of output in the economy. For industrial production, it is believed that higher output indicates that the country has some established infrastructures and technology and its competitiveness is improving [Chow (1987)].

The second function measures the level of investment rate in the Kingdom. Because of the low per capita income, LDCs, in general, are characterized by low rates of domestic savings. Uncertainty, induced mainly by downturns fluctuations in export earnings in many LCDs causes reduction in investment, and creates general instability in the economy. The reduction in investment expenditure results from limited time horizons, high level of risk, and disruption of imports of capital goods. Thus, the function is specified in that capital formation depends on real per capita income, and foreign sector performance measured by non-oil export and capital inflow. All these variables are expected to have positive relation with the level of capital formation. Thus, the function, is:

$$FCR = f(PCR,\ NOXR,\ CIR) \qquad (2)$$

Where:

- PCR = real per capita income,
- CIR = capital inflow (net imports of goods and services) as percentage to GDP.

In the third equation of the model, industrialization, which is a key objective for many developing countries, including Saudi Arabia, is assumed to depend on the performance of economic development measured by real per capita income, on the level of non-oil exports, and on the previous period of industrial output. The inclusion of lagged dependent variable in this equation implies a partial adjustment process to take into account the existence of adjustment costs, delivery delays and contracts extending to more than one year.

$$IDR = f(PCR,\ NOXR,\ IDR_{t-1}) \qquad (3)$$

Where:

- IDR = industrial output as percentage to GDP,
- IDR_{t-1} = industrial output in previous period as percentage to GDP.

An increase in the level of per capita income is an indication that productivity has improved, which led us to expect an improvement in

the level of industrial output as well. On the other hand, it is argued that as the country becomes more competitive, its export share in the world market increases, which is reflected in a more industrial output.

Finally, our fourth function specifies the variables affecting Saudi non-oil exports. It is assumed, here, that non-oil export level is affected by domestic prices compared to world prices (to reflect competition between domestic and foreign producers), industrial production, world income, and exchange rate. The function, therefore, is:

$$NOXR = f(INR,\ IDR,\ WI,\ ER) \qquad (4)$$

Where:

- NOXR = non-oil exports as percentage to GDP,
- INR = ratio of domestic prices to world prices,
- WI = index of world real income, and
- ER = effective exchange rate.

Exchange rate variable is expected to capture the effects of relative prices of traded to non-traded goods. One might wonder that if Saudi currency, riyal, is pegged to US dollar, then exchange rate variable should not enter export equation. However, since other major currencies fluctuate against each other and against riyal, this causes the effective exchange rate of riyal to fluctuate as well, affecting therefore trade flows. Effective exchange rate variable is defined so as an increase in this variable represents an appreciation in riyal. It is expected, therefore, that its coefficient will take a negative sign indicating that depreciation of riyal stimulates exports.

The simultaneous equation model to be estimated can be presented as:

$$LPCG = \alpha_0 + \alpha_1 LFCR + \alpha_2 LNOXG + \alpha_3 LIDR + \alpha_4 LPOPG \quad (1a)$$

$$LFCR = \beta_0 + \beta_1\ LPCR + \beta_2 LNOXR + \beta_3 LCIR \qquad (2b)$$

$$LIDR = \delta_0 + \delta_1 LPCR + \delta_2\ LNOXR + \delta_3 LIDR_{t-1} \qquad (3c)$$

$$LNOXR = \gamma_0 + \gamma_1 LINR + \gamma_2\ LIDR + \gamma_3 LWI + \gamma_4 LER \qquad (4d)$$

Where L stands for natural logarithms.

The model is a simultaneous one in the sense that growth of real per capita income (LPCG) is determined by fixed capital formation (LFCR) and industrial production (LIDR) in equation (1a) while itself determines LFCR and LIDR in equations (2b) and (3c), respectively. Non-oil exports (LNOXR) in equation (4d) are influenced by LIDR while it also determines LIDR in equation (3c). The model is estimated for the period of 1970-2004, and the data are collected mainly from Saudi Arabian Monetary Agency (SAMA) Annual Reports, and from the IMF Statistics (IFS).

To test for the impacts of the two Gulf Wars, Iraq-Iran (1980 - 1986) and Iraq-US (1990 – 1991), on the relationship between non-oil exports and economic development, two dummy variables were introduced[2]; D1 = 1 for the years 1980 to 1986 and zero in other years. D2 = 1 for the years 1990 to 1991 and zero in other years.

IV. Estimation Results:

Since the model is simultaneous, that is, the endogenous variables are jointly determined the number of equations must be equal to or greater than the number of endogenous variables for the model to be identified. With four endogenous variables PCG, FCR, IDR, and NOXR and four equations, the model is identified.

The simultaneous nature of the model will cause the estimates to be biased if ordinary least squares (OLS) method is used. Therefore, to get consistent and unbiased estimates, the three-stage least squares (3SLS) method is applied[3]. This technique is appropriate for simultaneous equation systems since it is asymptotically highly efficient (Kennedy, 1998). It utilizes the covariance matrix of disturbances among equations to obtain the estimates of the parameters. The 3SLS uses the 2SLS estimate of the variance-covariance matrix as explanatory variables to

(2) The author would like to thank the referee for raising this issue.

(3) VAR models can also be applied for types of equation. However, VAR models, though popular, have the limitation of treating all variables as jointly dependent, ignoring, therefore, priori information prescribed by economic theory. Critics of VAR models have argued that it has the unfortunate consequence of obscuring some important identification issues (Cooley and Leory, 1985).

obtain the coefficient estimates. The main idea behind the 3SLS is to clean the explanatory variables in equations (1a)-(4d) of the influence of their respective disturbances. Nevertheless, one of the major issues when applying simultaneous equation technique is the identification of the appropriate set of instrumental variables. Misspecification could lead to inferior estimates than OLS estimates because each of the endogenous variables is defined as a linear function of a set of instrumental variables.

In addition, the use of partial adjustment may introduce serial correlation into our terms. The 3SLS technique eliminates this problem because it can be interpreted as an extension of generalized least squares (GLS) to a simultaneous equation system (Intriligator, 1978).

Table 3 presents results of estimation. It appears that most of the variables are statistically significant at the 1% level, and many of the coefficients have the priori expected sign. Non-oil exports have positive sign in all of the three equations, with two of them are highly significant, and, at the same time, it is determined mainly by relative prices and industrial production. Population growth has negative and significant impact on real per capita income. This is consistent with the fact that Saudi real GDP was growing at a slower rate than the rate of population growth. It can be seen from the Table that both fixed capital formation and industrial production depend primarily on real per capita income. Exchange rate has the right sign, but it appears insignificant. The results, in general, support the argument that exports contribute to economic development in Saudi Arabia. The moderate size of $R^{2'}$s indicates the simplified nature of our model as well as the presence of many other factors influencing the variations in the dependent variables.

As expected, the introduction of dummy variables into the model improved the explanatory power measured by R^2. The results are similar to some extent to those obtained in the absence of dummies. The noticeable difference that non-oil exports in equation (1), though has the correct sign is statistically insignificant. The coefficients of the dummy variable, D1, are negative and significant in equations 2 and 3, indicating that the Iraq-Iran War had adverse effect on investment and production. The impact of this War on non-oil exports is positive,

indicating that Saudi exports perhaps played as a partial substitute for exports of Iraq and Iran.

Table 3
Model Estimates

Parameter	3SLS		2SLS		W2SLS	
	No dummies	With dummies	No dummies	With dummies	No dummies	With dummies
α_0	0.02 (0.51)	0.02 (0.43)	0.01 (0.17)	0.06 (1.41)	0.04 (0.81)	0.06 (1.61)
α_1	-0.05 (-0.35)	0.04 (0.25)	-0.24 (-1.34)	-0.11 (-0.60)	-0.31*** (-1.72)	-0.11 (-0.69)
α_2	0.16* (3.68)	0.08 (1.60)	0.15* (3.05)	0.03 (0.58)	0.13* (2.71)	0.03 (0.66)
α_3	-0.59** (-2.30)	-0.40 (-1.56)	-0.01 (-0.04)	-0.23 (-0.68)	0.18 (0.51)	-0.23 (-0.77)
α_4	-2.57* (-2.86)	-2.63* (-2.83)	-2.58** (-2.18)	-4.03* (-3.37)	-3.46* (-2.67)	-4.03* (-3.84)
α_5		0.05 (1.34)		0.07** (1.84)		0.07** (2.10)
α_6		0.03 (0.54)		0.06 (0.98)		0.06 (1.12)
R^2	0.22	0.42	0.34	0.48	0.31	0.48
β_0	-0.09* (-2.70)	0.06** (2.05)	-0.06 (-1.54)	0.06** (1.86)	-0.06 (-1.59)	0.06** (2.08)
β_1	-1.05* (-3.82)	-0.004* (-5.53)	-0.70** (-2.13)	-0.004* (-3.41)	-0.67** (-2.17)	-0.004* (-3.81)
β_2	0.18** (2.36)	0.17** (2.23)	0.16** (2.17)	0.10 (1.15)	0.17* (2.39)	0.10 (1.29)
β_3	-0.12* (-2.53)	-0.01 (-0.23)	-0.28* (-3.61)	-0.11 (-1.30)	-0.27* (-3.74)	-0.11 (-1.46)
β_4		-0.18* (-3.17)		-0.17* (-2.67)		-0.17* (-2.99)
β_5		0.05 (0.53)		0.06 (0.57)		0.06 (0.63)

Table 3
Model Estimates

Parameter	3SLS		2SLS		W2SLS	
	No dummies	With dummies	No dummies	With dummies	No dummies	With dummies
R^2	0.34	0.58	0.33	0.61	0.33	0.61
δ_0	-0.07* (-3.10)	0.04** (2.15)	-0.04*** (-1.67)	0.04** (2.01)	-0.04*** (-1.69)	0.04** (2.25)
δ_1	-0.69* (-4.18)	-0.001* (-4.15)	-0.40*** (-1.90)	-0.002* (-3.79)	-0.38*** (-1.84)	-0.002* (-4.24)
δ_2	0.25* (5.17)	0.21* (4.34)	0.20* (2.91)	0.144** (2.25)	0.21* (3.22)	0.14* (2.52)
δ_3	0.20*** (1.72)	0.14 (1.45)	0.29 (1.36)	0.11 (0.64)	0.24 (1.16)	0.11 (0.71)
δ_4		-0.10* (-3.10)		-0.08** (-2.13)		-0.08* (-2.38)
δ_5		-0.04 (-0.82)		-0.05 (-0.85)		-0.05 (-0.95)
R^2	0.14	0.49	0.24	0.55	0.22	0.56
γ_0	0.04 (0.33)	0.06 (0.47)	-0.04 (-0.17)	0.07 (0.47)	-0.07 (-0.32)	0.07 (0.55)
γ_1	-2.07* (-3.48)	-1.13*** (-1.78)	-1.15 (1.04)	-0.84 (-1.04)	-1.20 (-1.33)	-0.84 (-1.19)
γ_2	2.50* (4.79)	2.01* (3.94)	2.52* (3.12)	1.40** (2.33)	2.86* (3.84)	1.40* (2.66)
γ_3	-4.64 (-1.29)	-5.16 (-1.52)	-0.37 (-0.05)	-4.69 (-1.08)	0.39 (0.06)	-4.69 (-1.23)
γ_4	-0.002 (-0.26)	-0.13 (-0.16)	-0.01 (-0.72)	-0.03 (-0.03)	-0.01 (-0.47)	-0.03 (-0.03)
γ_5		0.27** (2.16)		0.29** (2.03)		0.29** (2.32)
γ_6		-0.07 (-0.31)		-0.08 (-0.31)		-0.08 (-0.35)
R^2	0.13	0.41	0.23	0.44	0.25	0.44
Total number of observation	120	120	120	120	120	120

Note: *, **, and *** denote 1%, 5%, and 10% significance level, respectively. α_5, β_4, δ_4, , and γ_5 , are the coefficients of D1, while α_6 ,β_5 ,δ_5 ,andγ_6,are the coefficients of D2.

Although the 3SLS provides consistent estimates of the parameters, and produces estimates that are asymptotically more efficient than 2SLS. Intriligator (1987) noted, however, that 3SLS can be sensitive to specification or measurement error. The use of 2SLS under these conditions is appropriate since it generates consistent and unbiased estimates. Moreover, Kennedy (1998) argues that the properties of the 2SLS estimation are insensitive to the presence of other estimation problems such as multicollinearity and specification errors(4). Therefore, results of 2SLS estimates are also reported in Table 3. In addition, the Table also presents results of weighted two-stage least squares (W2SLS), which intend to correct for heterocedasticity. This technique involves transforming the equations in a way so that the error-term assumptions (including constant error variance) are satisfying(5).

We notice from Table 3 that both 2SLS and W2SLS techniques lead to very much similar conclusions as the ones obtained under 3SLS. Non-oil exports proved to be significant in all equations, and they have a significant effect on economic development.

V. Concluding Remarks:

Researchers often recognize four linkages through which changes in exports may affect the domestic economy: Balance of payment position, government revenues, stability of the domestic economy and the level of domestic saving. For many LCDs, export earnings are the main source of foreign exchange earnings which are necessary for the importation of consumer and capital goods, as well as for financing government expenditures. Fluctuations in exports, generally create overall instability in the economy and tend to influence domestic saving.

In an oil-rich country like Saudi Arabia, which depends largely on exporting oil, it is very obvious how important role this sector plays in the

(4) 2SLS is a single equation estimation method that is appropriate when some of the right-hand side variables are endogenous. This method does not take into account the covariance between residuals; it is not, in general, fully efficient.

(5) For more discussion on this method, see Pindyck and Rubinfeld, 1981.

development process of the domestic economy. It is important, therefore, to focus on the other part of Saudi exports, i.e. non-oil, to assess their impacts on economic development. The results support the important role that non-oil exports can enhance investment, production, as well as economic development, measured by real per capita income.

The current study uses a simultaneous equation approach to examine the relationship between non-oil exports and economic development in Saudi Arabia. The 3SLS technique is applied to a system of equations representing four relationships in the economy.

Our empirical evidence supports the use of simultaneous equation system for estimating the relationship between exports and economic development. Despite the fact that oil constitutes a large proportion of Saudi exports, the 3SLS results show that non-oil exports in Saudi Arabia have contributed to economic development during the study period of 1970-2003. Industrial production showed significant role in non-oil export expansion. These findings are also supported by the results of two alternative techniques; namely, 2SLS and W2SLS. The results, in general, invite Saudi government to take further steps to encourage activities in various non-oil sectors as a means to accelerate economic development.

Overall, our results support the use of a simultaneous equation approach, however, caution should be exercised in interpreting the statistical results due to the nature of our model and the simplifying assumptions involved.

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