

## The Impact of Oil Price Rise on Industrial Production

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### Abstract

Oil revenues and the effect exerted on the economic climate have long captured the researchers' attention. Drawing on the importance of oil in oil producing countries, this study taps into the impact of a rise in oil prices on different economic sectors, including manufacturing, agriculture and service. To this end, the study has tested the following hypotheses within the framework of Dutch disease theory: oil price rise diminishes agriculture's and industry's share of the total gross domestic product (GDP), yet it augments that of the service sector. To assess the proposed hypotheses, a couple of channels through which the natural resource abundance could exert influence on the countries' economy are addressed along with Dutch disease theory (as one of the channels) before estimating an econometric model with panel data for 10 oil producing countries and 10 non-oil producing countries over a 14-year period from 1993 to 2007 inclusive. The results revealed that oil price rise over the period has diminished the manufacturing's, agriculture's and, services' value added share of GDP in oil producing countries. However, no similar pattern was observed for non-oil producing countries.

**Keywords:** oil Price, Industry Sector, Dutch Disease, Resource Curse.

### 1- Introduction

Oil revenues and the effect exerted on the economic climate in oil exporting countries are of great importance. On the one hand, oil price rise appears to be a window of opportunity for our country, resulting in an increase in foreign exchange revenues. Managing such a revenue source, on the other hand, proved to be a serious challenge facing the government. As an oil-dependent economy, Iran's economy is highly susceptible to minor

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changes. Oil is currently the single most important and yet the most politically sensitive commodity. Accordingly, oil policy in oil-rich countries, in effect, constitutes a major part of national policy making in these countries. This very issue has doubled the importance attached to oil and oil products.

Fluctuations in oil revenues are deemed to be one of the factors leading to economic turbulence in the oil-dependent economies. The 1973 oil crisis and the sudden rise of oil price made Iran's economy to undergo a fundamental transformation, raising the oil sector's share of the national income substantially, compared to that of non-oil sectors. Such a phenomenon could lead to de-industrialization and de-agriculturalization directly or indirectly, depending on the conditions in different countries.

Yet the rise of the value of national currency, as a result of increase in oil export, reduces the competitive nature of manufacturing sector and reduces industrial production and workforce. The debate over competitiveness is currently in the midst of our manufacturing sector since competitiveness is now considered one of the important issues in developed countries. With the manufacturing sector's power on decline, a drop in the oil prices leads to economic instability on a large scale. Under such conditions, there is no industry to compensate for the decline of oil production. Variations in oil prices could, therefore, result in economic instability.

Generating high value added and huge foreign exchange earnings, manufacturing sector captures the attention of many developing countries. Accordingly, investment in manufacturing and optimal allocation of resources to this sector is believed to be the main impetus for industrial development. Compared to other economic sectors, manufacturing has wider anterior and posterior rings, is capable of attracting extensive human resources, and enjoys high variety in exporting industrial products. Oil-rich countries' economy calls for preventing the damaging impacts of fluctuations in oil prices on economy, especially in tradable sectors such as manufacturing and agriculture, through the use of appropriate strategies.

The paper explains a couple of channels through which the natural resource boom could exert influence on the countries' economic climate before addressing the Dutch disease theory as one of the channels through which oil price rise could exert influence on economic sectors (especially manufacturing). The third section is a review of domestic and foreign studies

in this field. In the fourth section, an econometric model is estimated in order to test the proposed hypotheses in this study.

## **2- Resource curse hypothesis**

According to conventional economic theory there are two ways the producing countries could benefit from the high prices of oil or other natural resources. First, huge income streams derived from export earnings create investment opportunities which contribute to the development of the country. For example, such a source of income can be used in road construction, updating telecommunication networks, health, and educational programs. The whole discussion is based on a couple of assumptions. Such as existence of full information about improvement of development process ; investment opportunities are also quite clear and the investment decisions are rationally made; and the country enjoys the human and institutional capacity needed for implementing these decisions. Second, the foreign exchanges obtained from natural resources exports could resolve “dual gap analysis”. The whole concept is that the increasing domestic savings rate to compensate for inadequate investment does not necessarily improve the development. Development calls for imported capital goods whose attainment needs foreign currency, whereas, increasing domestic savings leads to an increase in domestic currency (Joshi, 1970; El Shibley and Thirlwall, 1981).

Most mineral exporting countries had relatively high rates of growth during the 1960-1980 when mineral prices were rising. However, their growth rates declined sharply during the 1980-1993 so that a great number of these countries experienced a negative per capita growth rate over the period. For these countries, the huge incomes derived from natural resources exports did not lead to a permanent growth. Experience of rich-resource countries bears witness to the fact that abundant resources lead to lower growth in other sectors. Resource curse hypothesis is also based on the observation that countries with an abundance of natural resources tend to have less economic growth and worse development outcomes than countries with fewer natural resources. Most countries with rich resources such as Nigeria, Venezuela, Angola and Ecuador, for example, witnessed a low growth over the past few decades while countries poor in resources in Asia including Hong Kong, South Korea, and Singapore experienced a rapid

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economic growth (Gelb, 1988; Karl, 1988; Sachs & Warner, 1995, 1997, 2001; Karl, 1997; Leite & Weidmann, 1999; Gilfason, 1999; Auty, 2001; Salaimartin & Sabramanian, 2003).

A couple of channels through which the natural resource boom could exert influence on the economic climate are economic instability, rent-seeking, undermined human capital, institutional factors, and Dutch disease.

### **1- Fluctuations in Natural Resource Prices in International Markets and Economic Instability**

Volatility and instability are the hallmarks of raw commodity markets. Although such a market volatility appears to pose a threat to raw commodity exports, it has mostly harmed oil exporters, resulting in serious consequences. The most important of which is the lack of confidence in the definitive amount of earnings from oil export, and as the government earnings become unpredictable, government expenditure will accordingly become entirely unpredictable. Government expenditure going up and down proves costly in itself, changing the budget predicted by the government.

Expecting high earnings, the governments often set up highly demanding though unnecessary projects which are not only economically inefficient but also promote rent-seeking. Once the earnings from the resources are not realized, the projects' completion date will be delayed and the previous amount spent on the projects will, in effect, be futile. Under such conditions, the governments tend to borrow which increases budget deficit. Drafting domestic investment projects and the rise of foreign debts could raise inflation and harm the production. Further, in an instable and unpredictable economy, critical long-term investments do not occur since these investments are of high risk and without which sustainable economic development can hardly be expected. (alireza keikha, 1387)

### **2- Rent- Seeking**

Natural resource revenues and the royalties are by far easier to get and larger than the revenues derived from other resources. In countries with an abundance of natural resources, the expected returns of rent-seeking activities are quite high and the opportunity cost of such activities are relatively low. The public, as a result, compete for taking control of these resources and the resulting revenues, making the entrepreneurs to quit

production activities and be inclined toward unproductive activities pushing up the costs and time of rent-seeking at the expense of a decline in time and energy for productive activities (Mehlum et al., 2006).

### **3- Human Capitals Weakening**

Nations that are convinced that the natural resources are their most important asset might unintentionally fail to consider developing their human resources and allocating insufficient sums for education. The natural wealth of their countries could push the nation to neglect their children's need for education (Thorvaldur Gylfason, 2001)

### **4- Government Enlargement**

Despite the proposed slogans concerning privatization and government size reduction in oil producing governments, the governments are, in effect, constantly engaged in more investment thus enlarging its size. Under such conditions where the private sector investors are unable and reluctant to embark on huge, long-term investments, thanks to oil revenues it is merely the government which constantly enters huge investments. Overly-enlarged government could exert negative influence on economy through the following factors:

a) Government enlargement could result in the dominance of non-sovereign undertaking over sovereign duties. (the main task of an efficient government) and the government accordingly neglects its very obligation i.e. policy setting, macro planning, and control and monitoring thus disrupting social order.

b) With large governmental enterprises on the rise – considering the status and power of such enterprises – monopolies in economy increases and competition decreases at the expense of efficacy, discouraging the private sector from investing. Such downward efficacy in large government's activities leads to the non-optimal allocation of resources in the economy.

c) Compared to the private sector, the governmental enterprises and the public sector responds to the environmental changes at a slower rate. These enterprises also appear to be to acquire data and use innovations sluggishly.

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### **5- Institutional Factors**

These factors highlight the relation between the economic rent of natural resources and the quality of institutional structure in a country. The whole idea is that easily obtained money – money achieved from the exploitation of natural resources – could help to remove the political barriers to use public fund, pushing the government to spend the money on politically important projects, making such an income source to go to waste (Martine E. Sandbu, 2006). Karl and Ross (2001) have argued that how to access the benefits obtained from natural resources could raise government expenditure on political purposes. A couple of economic studies have demonstrated that natural resources do not necessarily cause problems once the institutions in a country are efficient enough and able to prevent corruption and embezzlement from happening. Mehlum, Moene & Torvik (2002), for example, have designed a model in which the impact of natural resource abundance on growth is rather vague and depends on the abundance of resources and the quality of governmental institutions.

### **6- Dutch Disease Theory**

Dutch disease is one of the most important channels through which natural resource affects the economy. It refers to a situation in which there is a sudden leap in an export sector which leads to the transfer of production agents toward the leaping sector and increases the prices of non-tradable goods, upsetting the calm atmosphere of tradable goods. W. M. Corden (1984) and J.P. Neary (1982) were among the forerunners of developing this phenomenon, whose thorough studies covered the fundamentals of this theory which informed most of the applied studies and contribute to a literature on this very issue.

In the basic economic model describing Dutch Disease, there is the non-tradable good sector (N), manufacturing sector (M) and resource sector. As defined, the prices of tradable goods (resources and manufacturing) are set by the supply and demand in the international market and it is assumed that the country is too small to determine on the prices. Prices in the non-tradable sector, on the other hand, are determined by the domestic supply and demand. A sudden leap in the resource sector affects the rest of economy through two channels: resource movement effect and spending effect.

We assume that oil supply, compared to its price, is not entirely inelastic. Oil price rise increases investment in this sector, increases marginal product of labor in this sector, and raises the demand for labor and capital in the sector which results in a wage rise. By the existence of resource movement, labor and capital shift away from manufacturing sector and non-tradable sector toward the oil sector, increasing production and employment in the oil sector while reducing them in the two other sectors. Corden and Near refer to this production decline in the manufacturing sector as direct de-industrialization.

It also gives rise to indirect de-industrialization since the relative price in the non-tradable sector increases. The price rise in this sector occurs for three reasons:

1- Due to labor shortage, the supply in the non-tradable sector decreases, giving rise to extra demand and the resulting price rise.

2- Considering the rise of nominal and real wages in the oil sector, in the economy if different sectors tend to have equal wages, it also increases the wages in the non-tradable sector which accordingly gives rise to price rise in this sector.

3- Provided that demand's income elasticity is positive in the non-tradable sector, higher profits and wages in the oil sector and the associated tax revenues are also spent in the non-tradable sector. That is to say, higher wages and profits in the oil sector increases demand in the entire economy. Part of such demand is related to non-tradable sector where the prices increases while the prices in the manufacturing and oil sector remains stable because they are determined somewhere outside of the domestic economy. This, in turn, reduces the real exchange rate, constituting the spending effect. If the workforce is entirely immobile, the supply in the non-tradable sector does not change and the only effect of increased demand in the whole economy will be the increased relative prices in the non-tradable sector. With the existence labor mobility between manufacturing and non-tradable sector, however, the supply in the non-tradable sector increases and so does the demand for labor in this sector. The wages, consequently, increases in this sector, encouraging the workers to move from manufacturing and oil sectors to the non-tradable sector. Such an increase in wages pushes the manufacturing and oil sectors to raise their wages but since they cannot

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compensate for the increases in wages by simply raising the prices, there will be a debilitating fall in their profits.

One reason why de-industrialization causes lower growth is that this phenomenon contributes toward instability. Hausmann and Rigobon (2003) argue that the smaller the manufacturing sector, the more difficult it will be for the economy to absorb the shocks through labor mobility. In extreme circumstances, if the oil sector recruits no new hire and the manufacturing sector cease to exist, the non-tradable sector is the only employer of new staff and should absorb all the shocks, giving rise to instability. This will lead to lower growth as long as defective financial markets exist.

### **6-1- Dutch Disease and Agriculture Sector**

Considering the expenditure alone, the core model of Dutch disease contends that oil sector growth debilitates the tradable sectors (manufacturing and agriculture) and expands the non-tradable sector (Van Wijnbergen, 1984). Increased oil revenues increase the relative prices (profitability) and production in the non-tradable sector. Nevertheless, the statistics show that since 1970's oil crisis manufacturing sector in most developing countries has developed whereas the agriculture sector has been entirely debilitated (World Bank 1984). A new line of argument concerning the Dutch disease has focused on de-agriculturalization rather than de-industrialization which opened a new chapter in the literature. Accordingly, a few modifications to the core model have been made as to explain the reason behind manufacturing sector expansion and weakening agriculture sector in minerals exporting developing countries. Fardmanesh (1991), for example, included the rising world prices of industrial goods, compared to agricultural goods, due to oil price rise in the core model. If the oil exporting developing countries are price takers in the world non-oil markets, domestic relative prices (profitability) of manufacturing goods in these countries increase with the rise of oil price, making the manufacturing sector to develop against the agriculture sector. This very effect i.e. world price rise in manufacturing goods is referred to as world price effect. The rise of world oil prices lead to an increase in the relative prices of manufacturing goods in two ways: 1) it increases the cost of oil imports thus increasing the cost of producing manufacturing goods in the developed countries which export manufacturing goods (Marquez, 1985); 2) it also increases the national



income in oil exporting countries, giving rise to world demand for manufacturing goods. World export price indices for manufacturing and agricultural foods can be used in capturing the overall effect on the relative price of manufacturing goods through either channel.

### **3- Previous Studies**

#### **3-1- Foreign Studies**

In the field of foreign studies the study of Jeffrey Sachs & Andrew M. Warn (1995) is of great importance. They showed that economies with high ratio of natural resource export to GDP (1995 as the base year) have had lower growth rate in the period 1971-89. This negative relation remains even after controlling variables including initial per capita income, trading and commercial policies. In their studies, Alen Gelb (1988) and Auty (1990) argued that the poor performance of countries rich in natural resources stems from a set of political and economic factors. Auty, for example, outlined a couple of factors leading to the poor performance of countries with an abundance of natural resources: 1) due to Dutch disease, the tradable sector shrinks and is ultimately weakened; 2) primary commodities exports give rise to income inequality; 3) orientation toward primary commodities exports causes ever more instability in the prices of these commodities relative to those of manufactures, hindering economic growth.

Apart from having adverse effects on the manufacturing sector, the growth of primary commodities exports (due to the anterior and posterior links between this sector and other sectors, Van Wijnbergen (1984) argues, affects economic growth. If the economic growth is based on learning by doing process, a temporary reduction in the manufacturing sector leads to a decline in productivity, thereby reducing national income.

Political economy accounts for other issues linking poor economic growth to natural resource abundance. Tornel and Lane (1996) show that resource-rich countries are highly sensitive to rent-seeking policies. In their model, windfall revenues from natural resources generate an intense competition between different groups for owning that resource, making it a public good.

In the latter half of the 1990s, the overall accuracy of the Dutch disease hypothesis was examined by a series of empirical studies showing the existence of Dutch disease under certain conditions.

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Davis (1995) classified 43 top developing countries in terms of their minerals production. Investigating the performance of these countries during the 1970s (before gold and oil price rise) and 1990s (after the rise had already ceased), he concluded that the detrimental effects of misusing natural resources on long-term growth appear to be insignificant in these countries. Splimberg (1999) demonstrated that Chile and countries in the South Africa were by no means subject to the Dutch disease.

Gylfason (2002) argued that low growth rate in resource-rich countries is not merely due to the Dutch disease in the long run. There are, he further argued, several other reasons including: no precise and clear definitions of property right, weak regulations and defective competitive markets in developing countries, strong tendency toward rent-seeking activities in the government and the trading sector and reluctance to accumulate human capital, locating people in low-skilled activities involving natural resources. This has been also confirmed by Stijns (2000). He believes that by using real data in energy, minerals reserves and production sectors, there would be no negative relation between economic growth and natural resources as perceived by Sachs.

Masten & Torvik (2003) advocates that the Dutch disease could be beneficial under certain circumstances as low growth in resource-rich countries can be a part of an optimal growth path.

### **3-2- Domestic Studies**

In this regard, there are also studies conducted in Iran. A prime example of these studies is a study by Tabary (1993). Allowing for the government's behavioral patterns and the mechanism for spending oil revenues, he concluded that non-tradable sectors such as housing and service have had the highest growth during the time of increase in oil revenues yet suffered most by the undue increase in agricultural products imports. Failing to form de-industrialization in the manufacturing and mining sector, he argues, owes to the reliance of the sector and the demand side to domestic markets.

Studying the impacts of the rise in oil revenues, Khodaveysi and Ghareh Baghian (1997) also analyzed this very phenomenon in Iran's economy, identifying three functions concerning agriculture, housing and service sector. They argue that boosting the real exchange rate represents the most important symptom of Dutch disease and confirm the production shift

toward the non-tradable sectors and further proposed a couple of ways to avoid the adverse effects of this phenomenon in Iran's economy. The study of Molabeygy (2005) reveals that the rise of oil revenues boosts the real exchange rate thereby leaving negative effects on the manufacturing sector including chemical industry, metal products, mineral products, machinery, and food yet having positive effects on service and housing sector.

A study by Khosh Akhlagh and Mousavi (2006) demonstrated that with an oil shock increasing oil revenues by 50%, the tradable sector, particularly agriculture and manufacturing, are debilitated and the housing sector as the non-tradable sector is made stronger. The effect of such an oil shock in Iran's economy is clearly evident in boosting the real exchange rate. Such a pattern also generates increased imports and a decline in non-oil exports in all sectors. It further increases the production costs, raises domestic prices and reduces the competitive ability of domestic commodities in the face of similar foreign commodities which, in turn, weakens the tradable sectors severely.

Khatai, Shah Hosaini and Mowlana (2007) suggest that with the oil revenues on the rise the nominal exchange rate in both short-term and long-term period initially decreases and then shows an upward trend before it stabilizes. Also, in the short-term period, they argue, as the nominal exchange rate falls (rises), the real exchange rate increases (decreases). Nevertheless, since an oil shock increases the general level of prices, the percentage of rise (fall) in the real exchange rate is higher (lower) than that of rise (fall) in the nominal exchange rate. In the long-term period, however, with oil revenues on the rise the real exchange rate falls, hitting a lower level than the initial stabilized level before the rise of oil revenues.

#### **4- Estimating the Econometric Model**

##### **4-1- The Model and Data**

The model used in this study is a regression model with panel data initially estimated for 10 oil producing countries over a 14-year period from 1993 to 2007 inclusive. The model is as follows:

$$\text{LnVAMANit} = \alpha_i + \beta_1 \text{LnPOILt} + \beta_2 \text{LnPMANt} + \beta_3 \text{LnIMPit} + \text{LnVAMANit}(-1) + \mu_{it}$$

$$\text{LnVAAGRit} = \alpha_i + \beta_1 \text{LnPOILt} + \beta_2 \text{LnPAGRt} + \beta_3 \text{LnIMPit} + \text{LnVAAGRit}(-1) + \mu_{it}$$

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$$\text{LnVASERit} = \alpha_i + \beta_1 \text{LnPOILt} + \beta_2 \text{LnIMPit} + \text{LnVASERit}(-1) + \mu_{it}$$

Where,

*Ln* is the natural logarithm

$\alpha_i$  is country-fixed effects

*VAMAN* is the share of manufacturing sector value added in GDP

*VAAGR* is the share of agriculture sector value added in GDP

*VASER* is the share of service sector value added in GDP

*POIL* is the real price of crude oil (the nominal price of crude oil divided by the U.S. Consumer Price Index, base year: 2000).

*PMAN* is the Global Relative Price Manufacturing Production Index (Base year: 2000). The index is a weighted average of export prices of manufactured goods for the G-5 (the United States, Japan, Germany, France, and the United Kingdom) with local-currency based prices converted into current U.S. dollars using market exchange rates. Weights are the relative share in G-5 exports of manufactured goods to developing countries in 1995. The index is then divided by the U.S CPI (base year: 2000).

*PAGR* is the Global Relative Price Manufacturing Production (base year: 2000). The index is a weighted average of global price index for three categories of commodities including food, beverage and agricultural raw materials<sup>2</sup>. The index is then divided by the U.S CPI (base year: 2000).

*IMP* is the total imports (as a percentage of GDP)

The oil producing countries under study (Algeria, Saudi Arabia, Cameroon, Congo, Egypt, Gabon, Indonesia, Iran, Mexico, and Trinidad and Tobago<sup>3</sup>) were selected as to the availability of the data.

Based on the availability of the data, geographical distribution, poor natural resources, and being economically and historically similar to Iran, non-oil countries (China, Turkey, South Korea, India, Brazil, Argentina, Paraguay, Uruguay, Ethiopia, and Kenya) were also selected among developing countries.

The entire data was extracted from World Bank and IMF official websites.

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1- U.S.: 32.2%, Japan: 35.6%, Germany: 17.4%, France: 8.2, and United Kingdom (6.6%).

2- Food: 63.7%, beverage: 6.8%, and agricultural raw materials: 29.3%

3- For agriculture and service sectors, Kazakhstan was also included.

#### **4-2- Theoretical Fundamentals of the Model**

As mentioned earlier, the economic literature has mainly discussed the impact of oil price rise on economic sectors within the framework of the Dutch disease theory. The mechanism is that a leap in the oil sector<sup>1</sup> (for example an increase in oil price or discovering a new resource) will debilitate the tradable sectors (agriculture and manufacturing) and most probably boost the non-tradable sector (service). The model, therefore, has used the real oil price variable as one of the variables explaining the share of agriculture, manufacturing, and service sectors value added in GDP.

According to the global price, as mentioned in 3.1, an increase in the global price of manufacturing goods relative to agricultural goods leads to profitability and develops the manufacturing sector. With this respect, the global relative price of manufacturing goods variable as one of the variables explaining the share of manufacturing sector value added and the global relative price of agricultural goods variable as one the variables representing the share of agriculture sector value added were incorporated in the model<sup>2</sup>.

Furthermore, imports act as a conduit transferring the rise of oil revenues to the rest of economic sectors, making the tradable sectors (agriculture and manufacturing) stronger or weaker depending on the share of consumer, capital and intermediate goods in imports. Imports variable was accordingly included in the model as a variable accounting for the share of economic sectors in GDP.

#### **4-3- Estimation Results of the Model**

Estimation results of the model for oil and non-oil countries are discussed separately.

Oil countries: Table 4.1 represents the estimation results of the model for manufacturing, agriculture and service sectors.

Manufacturing sector: the rise of real oil price decreases the share of manufacturing sector value added in GDP. The estimated coefficient for oil price variable (-0.16) is statistically significant, demonstrating the Dutch disease. Over the period the rise of oil price, in the selected oil countries, has

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1- or generally a leap in the export sector.

2- Note that these indices were relative by dividing either of global price manufacturing and agricultural production indices by the U.S. CPI.

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debilitated the manufacturing sector and decreased the share of this sector in GDP. According to the estimated coefficient, a 1% rise of real oil price<sup>1</sup> decreases 0.16% the share of manufacturing sector in GDP.

The coefficient for the global relative price of agricultural goods variable is positive (0.26), proving the world price effect. As stated in 3.1, Fardmanesh argues that if developing oil producing countries are price takers in the world non-oil markets, with the global relative price of manufacturing goods on the rise the domestic relative price of manufacturing goods in these countries increases, promoting profitability and developing the manufacturing sector. According to the estimated coefficient, a 1% increase in the global relative price of agricultural goods increases 0.26% the share of manufacturing sector in GDP.

The import rate has also a positive and significant effect on the manufacturing sector value added though the coefficient for this variable is quite small (0.08). Composition of imports appears to be a deciding factor in how this variable affects the economic sectors. In composition of imports the higher the share of capital or intermediate goods needed in sectors, the more an increase in this variable is likely to boost agriculture and manufacturing sectors. On the contrary, the higher the share of consumer goods in composition of imports, the more it negatively affects competitiveness of manufacturers in the tradable sectors thereby debilitating these sectors.

Agriculture sector: as shown in Table 4.1, the rise of real oil price leads to a fall in the share of agriculture sector value added in GDP. The coefficient for oil price variable is statistically significant, measured -0.20. According to the estimated coefficient, a 1% increase in real oil price has decreased 0.20% agriculture sector's share of the total production in the selected country over the period. The result is consistent with the new subdivision with the Dutch disease theory concerning the negative effect of resource boom on agriculture.

The coefficient for the global relative price of agricultural goods variable is positive. Similar to the manufacturing industry, it implies that with the

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1- Since natural logarithm was taken from all of the variables, one unit change in the natural logarithm of real oil price implies a 1% change in the real oil price variable.

global price of agricultural goods on the rise, domestic prices increase too thereby increasing the share of agriculture sector value added in GDP.

The import rate has also a positive and statistically significant effect on agriculture sector value added and, similar to the manufacturing sector, the value of coefficient is small (0.06).

Service sector: the rise of real oil price increases the share of service sector value added in GDP and the coefficient for oil price variable is statistically significant (with the value measured -0.09). As stated in the Dutch disease theory section, prices effect makes the service sector stronger, whereas resource movement may strengthen or debilitate the service sector. Also, in most oil exporting countries the shift of production between the oil sector and other economic sectors appears to have a weak effect, making the resource movement effect to be overlooked. Oil price rise is, therefore, expected to boost the service sector. The sign of the estimated coefficient, however, is not as it was expected which indicates that oil price rise has decreased the service sector's share of GDP in the selected countries over the period. Yet the smaller absolute value of the oil price effect on the service sector relative to the agriculture and manufacturing sectors hardly confirms the Dutch disease theory.

The import rate has also positive and significant effect on the service sector value added and, similar to the two sectors discussed earlier, the value of its coefficient is small (-0.09). An increase in imports could also have a positive effect on the service sector provided that the commodities needed in the service sector have proper share of the total imports.

Coefficient of determination in all three models is 99% which is quite satisfactory.

Non-oil countries: the estimation results of the model for the manufacturing, agriculture, and service sectors are represented in Table 4.2.

Manufacturing sector: as the results show, the impact of a rise in real oil price on the share of manufacturing sector value added in GDP is negative and statistically insignificant.

Also, the coefficient for the global relative price of manufacturing goods variable is 0.3 and statistically significant. The imports variable does not have a significant effect on the manufacturing sector either.

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Agriculture sector: the impact of real oil price increase on the share of agriculture sector value added in GDP is negative (-0.03) and statistically significant.

The global relative price of agriculture goods variable does not have a statistically significant impact on agriculture sector. Neither do the imports have a statistically significant on agriculture sector.

**Table 4-1: Investigating the Impact of Real Oil Price on Manufacturing, Agriculture, and Service Sectors in Oil Countries**

Sector/Explaining Variables	Real oil price	Global Relative Price	Imports *	Dependent Variable	Coefficient of Determination
Manufacturing**	-0.16 (-20.07)	0.26 (7.84)	0.08 (5.07)	0.55 (20.05)	%99
Agriculture***	-0.20 (-13.76)	0.19 (4.86)	0.06 (6.06)	0.71 (28.08)	%99
Service****	-0.09 (-9.84)	- -	0.09 (13.81)	0.38 (10.03)	%99

Service sector: the coefficient for oil price variable is statistically insignificant. Unlike the two other sectors, however, the imports variable has significant positive impact on the service sector (0.03).

The coefficient of determination is satisfactory in all three models.

**Table 4-2: Investigating the Impact of Real Oil Price on Manufacturing, Agriculture, and Service Sectors in Non-Oil Countries**

Sector/ Explaining Variables	Real Oil Price	Global Relative Price	Imports *	Dependent Variable	Coefficient of Determination
Manufacturing**	-0.001 (-0.19)	0.30 (2.83)	0.01 (0.71)	0.61 (18.48)	%99
Agriculture***	-0.03 (-4.66)	0.01 (1.02)	0.0009 (0.06)	0.74 (19.63)	%99
Service****	-0.005 (-0.98)	-	0.03 (4.17)	0.80 (22.08)	%97

\* as a percentage of GDP

\*\* Share of manufacturing sector value added in GDP

\*\*\* Share of agriculture sector value added in GDP

\*\*\*\* Share of service sector value added in GDP

Figures in parentheses are t statistics



## 5- Concluding Remarks

As the estimation results of the econometric model revealed, over the period the rise of oil price and revenues has decreased the share of three sectors of agriculture, manufacturing, and service in Gross Domestic Product (GDP) in the oil countries (this includes Iran). That is to say, the oil sector has been substituted for other sectors in economy. Over the period a unit increase in unit real oil price in oil countries has led to a 16%, 20%, and 9% fall in the share of manufacturing, agriculture, and service sectors respectively. The negative impact of real oil price on manufacturing and agriculture sectors confirms the Dutch disease theory and also the greater negative impact on agriculture sector relative to manufacturing substantiates the earlier theories on the Dutch disease. These theories explain that in developing countries the Dutch disease often appears as an anti-agricultural phenomenon rather than an anti-manufacturing one. The negative impact of real oil price on service sector proves contrary to the Dutch disease theory. According to this theory, a leap in the resource sector debilitates the tradable sectors yet promotes the non-tradable sector. Nevertheless, the small absolute value of the impact (0.09) of real oil price on service sector implies that the negative impact of oil price on tradable sectors (manufacturing and agriculture) is greater than non-tradable sectors, hardly confirming the Dutch disease theory. Statistically insignificant impact of manufacturing sector in non-oil countries and the small value of this impact on agriculture sector, compared to oil countries (-0.03 compared to -0.20 for oil countries) give stronger clues as to the existence of the Dutch disease theory in oil countries.

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