Application of Trade Gravity Model between Iran and Main Trade Partners (Panel Data Approach)

Majid Feshari

ABSTRACT: The main objective of this paper is to test the Dutch Disease hypothesis in the Iranian economy by application of trade gravity model. This study tests the Dutch Disease hypothesis on the country's non-oil exports which are a combination of exports from the manufacturing, mining and agricultural sectors. The econometric model has been estimated by using of panel data approach during the 1990-2015 Empirical results indicate that the oil exports instead of shrinking the country's non-oil exports have had an expansionary effect on it. In addition, for test of robustness, we use oil price variable instead of oil exports, and the findings still show that oil price has a positive and significant effect on the non-oil exports. Hence, the existence of Dutch Disease in Iran is rejected. In other words, there is no evidence of the adverse economic effects of oil booms on the non-oil exports in Iranian economy.

KEYWORDS: Dutch Disease, Panel Data Approach, Gravity Model, Trade Partners.

JEL CLASSIFICATION: Q33, Q13, F12, F41

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1. INTRODUCTION

It is widely assumed in the literature that natural resource booms tend to harm the countries in which they occur. Most famously, Sachs and Warner (1995) show that economies with a high ratio of natural resource exports to GDP in 1971 tended to have low growth rates during the subsequent period 1971-1989. This negative relationship holds true after controlling for other usual determinants of economic growth, such as initial per capita income, trade policy, government efficiency, and investment rates.

Sachs and Warner (1995) conclude that “one of the surprising features of modern economic growth is that economies abundant in natural resources have tended to grow slower than economies without substantial natural resources.” Such a statement deserves careful scrutiny if only because of its implications for both development policy in the third world, and for macroeconomic policy in industrialized countries. At the same time, there is a growing debate among academics, development and environment related lobbyists and policy makers regarding whether or not resource abundant countries should be encouraged to exploit their resource bases. A growing literature is dealing with an increasing number of aspects of the “resource curse”. There are two main areas of active research. The first can be termed the “political economy of mineral rent generation and distribution.” The second covers the “general equilibrium effects of a minerals boom”, including the spending effects of the mineral rents. This paper focuses on this second literature and what is probably the best-known and the most classical formulation of the resource curse hypothesis, namely the Dutch Disease —hereafter DD— hypothesis.

The recent literature on the economic growth has shown that the countries with natural resource endowment have experienced a lower economic growth in comparison to the countries with poor natural resources. Most of these empirical research concluded that economic growth has an inverse relationship with the natural resource abundance, so called resource curse. The typical example is related to the oil exporting countries. The empirical evidence regarding the growth rate in the newly industrialized East Asia in comparison with the oil exporting countries confirms this view. For instance, on average, per capita income growth rate 1% percent in Iran and Venezuela, 3 percent in Iraq and Kuwait, and 6 percent in Qatar over long run (1965-2007). In industrialized East Asia (Hong Kong, Singapore, South Korea, and Taiwan) with little natural endowment, the growth rate has been on average more than 4 percent over the same period (Gylfason, 2001).

The recent studies on the impact of the natural resource abundance on the poor economic performance have emphasized that the resource abundance does not itself directly have an adverse effect on the economic growth, but affects the growth rate indirectly through different channels and mechanisms such as long-run deterioration of the terms of trade, exogenous fluctuations in the revenues of the exportable natural resources, the Dutch Disease, mismanagement, and institutional quality, including corruption, bureaucratic quality, democracy, instability, leads to lower economic growth.

Generally, different aspects of the resource curse have been analyzed mainly based on two different grounds, namely the distribution aspects as well as allocation aspects of a natural resource boom which latter one is relevant to our discussion concerning Dutch Disease. The Dutch Disease hypothesis states that the natural resource booms leads to stagnation in the manufacturing exports. Thus the contribution of this paper in comparison with other empirical studies is to test the validity of Dutch Disease phenomenon by applying trade gravity model and panel data technique between Iran and main trade partners during the period of 1990-2015. For achieving this purpose, the rest of the paper has been organized as follows:

In section two. The literatures of subject are reviewed. Then, the methodology of research will be explored in the following segment. The section four is devoted to the estimation and the analysis of empirical findings. The last section is concerned with the concluding remarks.
2. LITERATURE REVIEW

In this section, the nature of Dutch Disease will be explored by a simple model, and then the empirical results relevant to the Dutch Disease are briefly reviewed.

The Dutch Disease refers to a situation in which a boom in an export sector leads to a shift of production factors towards the booming sector and an increase in the prices of non-tradable goods and services, thus hurting the rest of the tradable goods sector. Its name arose from the effects presumably caused by the discoveries of North Sea gas on the Dutch manufacturing sector. Corden (1984) notes that the term appears to have been coined in The Economist of November 26, 1977. Dorrance and Leeson (1997) trace the idea itself back to Meade. Meade spent six months in Australia in 1956. While there, he observed the effect of growth in Australia's resource exports, and identified what came to be called the DD (Corden, 1996). The first paper approaching this question is actually by Meade and Russell (1957). Corden (1984) and Corden and Neary (1982) are the cornerstones of a vast DD literature that developed around how a natural resource boom can trigger a process of “deindustrialization”.

Corden and Neary (1982) present what they call and what has come to be known as the “core Model” of Dutch Disease economics. They assume a small open economy that produces three goods: two are traded at exogenously given international prices; the third is a non-traded good whose price is determined by domestic supply and demand. The traded goods sector includes a booming good, and a non-booming one. The non-traded good is typically thought to be produced by the service sector (but it can be extended to the construction sector, etc). The main model assumes capital to be sector specific whereas labor is assumed to be mobile. A resource boom affects the rest of the economy in two main ways: the “resource movement effect” and the “spending effect”.

On the supply-side, an exogenous increase in the value of the booming sector’s output raises the marginal product of labor in that sector. A shift of labor to the booming sector from all other sectors will ensue and a contraction of the tradable sector will result from its reduced use of production factors. This is the resource movement effect. This factor movement also leads to an increase in the price of non-traded goods since, ex ante, it results in excess demand for non-tradable. Since the price of tradable is exogenously determined in world markets, the rise in the prices of non-tradable is equivalent to an appreciation of the real exchange rate. On the demand side, the boom, leads to increased income at home and therefore, to increased demand for all goods. Since the price of tradable is set on world markets, this extra spending raises the relative price of non-tradable, resulting in a further appreciation of the real exchange rate. In response, labor shifts from the tradable sector to the non-tradable sector resulting in a contraction of the non-booming tradable sector. This is the spending effect.

A boom in a natural resource sector either by increasing its world price or its export revenue will lead to absorb the resources labor primarily from the traded manufacturing sector and consequently wage rate goes up and spread to other sectors including non-tradable sector. subsequently, it will lead to price increase in that sector, but in the tradable sector such as manufacturing goods, since price is given internationally, the output level declines(resource shifting effect). In addition, an increase in the export value of natural resource tend to raise the domestic income and induce demand for the non-tradable goods to go up as well as production; which intensifies labor movements from the contractionary manufacturing sector and further deepening its stagnation (the spending effect). Both effects reinforce each other and the final result is reduction in the tradable manufacturing output.

Furthermore, in this process, as result of increasing price of non-tradable relative to tradable sector, the real exchange rate tends to appreciate which implies loss of competitiveness of the manufacturing sector. Overall, the output and exports of this sector drop (deindustrialization). The pattern of production will change from the tradable sector in favor of increasing non-tradable goods.
Therefore, the booming natural resource exports leads to four consequences and subsequently four propositions for the existence of the Dutch Disease have been suggested as follows:
1. The overvalue of national currency in the case of fixed exchange rate and a real exchange rate appreciation under flexible exchange rate regime.
2. An increase in the production of non-tradable sector.
3. Declining output of the manufacturing sector.
4. The manufacturing exports of the economy decline.

According to Stijns (2003) suggestion, since access to statistical data in less developed countries are often difficult, the forth proposition which states a negative linkage between a booming resource sector and the manufacturing exports seems the most appealing proposition for testing the Dutch Disease. We adhere this proposition as a testable hypothesis in the case of Iran.

Dutch Disease was studied for the first time by Georgy (1976), and Snape (1977) and then it was continued by Corden and Neary (1982), and Wijnbergen (1984 and 1985) and other researchers.

McMahon (1997) studied Dutch Disease in 8 developing countries. The results of this study indicate that Dutch Disease doesn’t exist in these countries, but the main cause of their slow economic growth is due to poor economic policies in dealing with the natural resource booms.

Gelb (1988) and Spatafora and Warner (1999, 2001) analyzed the performance of the oil producing countries in dealing with oil resources. They investigated the long-run effects of macroeconomic shocks for 18 oil countries in the period of 1965-1989. The findings showed that the positive shocks in the terms of trade have increased investment and consumption, but their balance of payment has been deteriorated and the production of non-tradable sector has been increases by overvalued of domestic currency (appreciation of foreign exchange rate).

Based on the early globalization in the 19th century and by developing a model of two sectors economy (natural resource and manufacturing), Findlay and Lundahl (1994) has shown that the intersectoral linkages has resulted a resource booms can accelerate economic growth.

Kuralbayeva, Kutan and Wyzan (2001) in Kazakhstan, Looney (1991) in Kuwait, Roemer (1985) in Nigeria, Mexico, Venezuela and Looney (1989) in Saudi Arabia showed that the oil booms has been accompanied by increasing in foreign exchange rates. The researchers argue that the rising exchange rate has stagnated industrial production. However, the growth rate of the manufacturing sector has been greater than or equal to that of non-tradable sector in the economies of Kuwait, Nigeria, Indonesia and Mexico.

Gylfason (2001) has shown that the economic growth is inversely related to the share of physical capital in national wealth. The transmission mechanism from the natural resource abundance to economic growth has occurred through four channels as: a) the Dutch Disease b) rent seeking c) more confidence, and d) ignoring education.

Stijns (2003) studied Dutch Disease hypothesis and the effect of resource booms on the country’s manufacturing exports using a gravity model of trade over the period of 1970-1997. The results show that a one percent increase in the world energy price has led to a decrease in the net energy exporter’s real manufacturing exports by almost half a percent. Similarly, after instrumentation, a one percent increase in an energy exporting country’s net energy exports is estimated decrease the country’s real manufacturing exports by 8 percent.

Olusi and Olagunju (2005) investigated the phenomenon of Dutch Disease in Nigeria during the period of 1980-2003. The results indicate that the presence of Dutch Disease in this country has been attributed to the stagnation of production and export of agricultural sector by oil price booms.

Makochekekanwa (2007) studied the Dutch Disease hypothesis in Botswana’s main exports during the 1999-2006. The overall results of study indicate that diamond boom have not negatively
affected the exports of copper, meat, meat products, soda, ash, textiles, vehicles and hides. Thus, one can concluded that resource curse and DD has not hurt the country’s six major exports.

Oomes and Kalcheva (2007) investigated Dutch Disease hypothesis in Russia over the period of 1985-2006. For this purpose, they discussed the symptoms of Dutch Disease, which include: (1) appreciation of real exchange rate, (2) slower manufacturing growth; (3) faster service sector growth; and (4) higher overall wage. The main findings of this study show that the Russia has all of the symptoms and Dutch Disease hypothesis is confirmed for this country.

Egert and Leonard (2008) by using a monetary model and ARDL approach have studied Dutch Disease hypothesis and the effects of exchange rate fluctuations on non-oil exports of Kazakhstan economy. The empirical results of this study indicate that the rise in the price of oil and oil revenues might be linked to an appreciation of the U.S. dollar exchange rate of the oil and non-oil sectors. But appreciation is mainly limited to the real effective exchange rate for oil sector and is statistically insignificant for non-oil manufacturing sector. In another study, Shik Kang et al (2010) have analyzed the Dutch Disease hypothesis in the case of selected developing countries over the period of 1980-2008. The main findings of this paper indicate that the Dutch Disease hypothesis is confirmed in these groups of countries. In next study, Martins (2013) has investigated the Dutch Disease hypothesis in Ethiopia during the 1985-2011. The results of study show that the existence of Dutch Disease is confirmed in this country.

The other study which has been studied on Iranian economy can be stated as follows:

Bakhtiari and Haghi (2001) evaluated the effectiveness of various aspects of oil revenue boom on agricultural sector in Iran by using TSLS approach. Findings show that the Dutch Disease has emerged as a phenomenon of anti-agriculture in Iran, but due to poor communication between the oil and agriculture sectors, the increase of oil revenues has been indirectly on agriculture. Also, One of the causes of the negative impact of oil revenue on the agricultural sector is import’s increasing.

Paseban (2004) studied the effects of oil price volatility on the agricultural production in Iranian economy over the period of 1971-2000. The empirical result of study shows that the Dutch Disease hypothesis is confirmed in Iran and the oil prices volatility has a negative and significant effect on the agricultural sector.

KhoshAkhlag and MosaviMohseni (2006) analyzed the relationship between the Dutch Disease and oil revenue shocks in Iran by using applied general equilibrium model during the 2001. The results of this study indicate that 50 percent shock in oil revenue has resulted a decline of the tradable sectors such as agricultural and industrial sectors.

Nazari and Mobarak (2011) investigated the relationship between natural resource abundance, Dutch Disease and economic growth in the major petroleum exporting countries by using a panel data approach over the period of 1960 - 2008. The main findings of study show that natural resource abundance tends to increase not only the growth of service sector value added and the ratio of sum of the service and manufacturing value added to GDP and decrease the growth of manufacturing value added and share of manufacturing exports in total exports.

Overall, in the case natural resource booms, most of the empirical studies have confirmed the existence of Dutch Disease. Hence, the main contribution of this study is to test of Dutch Disease hypothesis in Iran and main trade partners by using of trade gravity model and panel data technique over the period of 1990-2015.
3. Methodology and Data

Application of the gravity equation in the context of international trade for the first time is traced back to Tinbergen (1962), Poyhonen (1963) and Rose (2000). The gravity analogy comes from the fact that trade between two countries is a function of their GDP, that is their economic mass, and as a measure of distance between these countries. In analyzing trade, the basic gravity trade model which has been used in empirical work over the years was original specified by Tinbergen (1962) and Poyhonen (1963) as follows:

\[
\text{Trade}_{ij} = \alpha \frac{GDP_i^{\beta} \cdot GDP_j^{\beta}}{D_{ij}^{\beta}} \quad (1)
\]

Where represents bi-lateral trade between country i and j, while and denote gross domestic product of home country (i) and foreign trade partner (j). is used as a proxy for bi-lateral distance between two trading countries. In the formula above, are parameters and the sign of are expected to be positive, while that for will have a prior negative sign. Taking logarithm of equation (1), the resulting linear formulation becomes:

\[
\ln \text{Trade}_{ij} = \ln \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \mu_{ij} \quad (2)
\]

Equation (2) is core gravity equation which has been used in empirical studies, though with added right hand side (RHS) variables, with each RHS variable added depending on the particular facet of trade being analyzed, the objectives to be achieved and availability of data.

We follow the model developed by Stijns (2003) & Makochekanwa (2007) and Martins (2013), we extend the gravity model to the non-oil exports of Iran by adding the Dutch Disease indices to right hand side of the equation (2) and other control variables where in this extended model trade flows indicates the non-oil exports of Iran. The final empirical model for Iran has been specified in terms of the logarithm as follows:

\[
\ln (\text{NOEXP}_{ij}) = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \beta_4 DD_{ij} + \beta_5 CB_{ij} + \beta_6 Z_{ij} + \mu_{ij} \quad (3)
\]

The subscripts i and j represent the home country (in this case Iran) and the foreign trade partners respectively and t (=1,...T) The period of time (year).

NOEXP refers to non-oil exports in terms of dollars from country i (Iran) to country j (trade partners) during time of t; GDP: indicates Gross Domestic Product of Iran in terms of dollars (according to base price of 2010), GDP: Gross Domestic Product of trade partners j in terms of dollars (according to base price of 2010); D: geographical distance between Iran (i) and trade partner (j), DD: two variables oil exports of Iran and World oil price in terms of logarithm has been designated as Dutch Disease Indices; CB shows the common border of Iran with the trade partner j (which is dummy variable where text value one if there exist a common border and otherwise zero). Z represents other control variables such as population of Iran (Pi) and trade partner population (Pj) and shows disturbance term in above regression model.

Based on the theories, the expected sign of the coefficients are: , , Indicating that there is inverse relationship between the expanding natural resource exports and non-oil exports, consequently the Dutch Disease hypothesis will hold true in this case, and otherwise this hypothesis will be rejected.
4. Empirical Results

The data on time series of GDP\textsubscript{it}, GDP\textsubscript{jt}, P\textsubscript{it} and P\textsubscript{jt} are annually collected for the period of 1990-2015 from World Bank Indicators (2016) and the rest of data has been extracted from central bank of Iran data base.

The panel data regression model has been used to estimate the main equation 3. At first, the result of variables unit root tests by IPS and ADF-PP are presented in Table 1. The stationary of the panel data is necessary for examining the co-integration relationship among the variables of the model, as most of the time series data has unit root problem which makes regression results spurious. In this study we use ADF and PP unit root test for solving the unit root problem in our panel data series.

Table 1. Results of Unit Roots Test

<table>
<thead>
<tr>
<th>Variables</th>
<th>IPS</th>
<th>ADF-PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln GDP\textsubscript{it}</td>
<td>-3.052709**</td>
<td>-3.433104**</td>
</tr>
<tr>
<td>Ln GDP\textsubscript{jt}</td>
<td>-2.488616**</td>
<td>-2.560738**</td>
</tr>
<tr>
<td>Ln D\textsubscript{ij}</td>
<td>-4.129177**</td>
<td>-5.77677**</td>
</tr>
<tr>
<td>Ln DD</td>
<td>-5.420642**</td>
<td>-5.415577**</td>
</tr>
<tr>
<td>CB\textsubscript{ij}</td>
<td>-4.73254**</td>
<td>-4.17298**</td>
</tr>
<tr>
<td>Ln NOEXP</td>
<td>-5.298616**</td>
<td>-5.690364**</td>
</tr>
</tbody>
</table>

Note: The asterisks ** denote the significant at 5% level.
Source: Authors Computations

The results of both IPS and ADF-PP show that the all variables are stationary at level so we can reject null hypothesis of non-stationary for all variables. In the next step we test the homogeneity of cross section by using of F test which proposed by Leamer (1980). The results indicate that the null hypothesis has been rejected at 5% level and we can use the panel data technique for model estimation. To choose the best methods between random and fixed effects, we use the Hausman test. The results of this statistics show that the random effect method is a suitable method for estimation of model. So, the results of model estimation by this method have been tabulated in table 2.

Table 2. The Results of Random Effects Model

<table>
<thead>
<tr>
<th>Model Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-24.25</td>
<td>-23.22</td>
<td>-23.39</td>
<td>6.08</td>
</tr>
<tr>
<td></td>
<td>* (6.35)</td>
<td>* (-2.39)</td>
<td>* (-3.23)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Ln GDP\textsubscript{it}</td>
<td>0.58</td>
<td>0.75</td>
<td>0.84</td>
<td>2.12</td>
</tr>
<tr>
<td></td>
<td>* (8.24)</td>
<td>* (2.25)</td>
<td>** (2.85)</td>
<td>* (2.74)</td>
</tr>
<tr>
<td>Ln GDP\textsubscript{jt}</td>
<td>0.303</td>
<td>0.32</td>
<td>0.28</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>* (3.10)</td>
<td>* (3.58)</td>
<td>* (2.85)</td>
<td>* (3.56)</td>
</tr>
<tr>
<td>Ln D\textsubscript{ij}</td>
<td>-0.34</td>
<td>-0.72</td>
<td>-0.61</td>
<td>-0.74</td>
</tr>
<tr>
<td></td>
<td>* (-2.89)</td>
<td>* (-3.25)</td>
<td>** (-2.09)</td>
<td>** (-3.36)</td>
</tr>
<tr>
<td>Ln DD</td>
<td>-</td>
<td>0.61</td>
<td>0.66</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* (5.29)</td>
<td>* (4.40)</td>
<td>* (3.71)</td>
</tr>
<tr>
<td>CB\textsubscript{ij}</td>
<td>-</td>
<td>-</td>
<td>0.54</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>*** (1.60)</td>
<td>*** (1.52)</td>
</tr>
</tbody>
</table>
The results of Table 2 reveal that gross domestic product of home country (Iran) as well as foreign countries (trade partners) have positive and significant effects on the non-oil exports of Iran and the geographical distance between Iran and trade partners has negative effect on the non-oil exports. Therefore, the gravity model is still valid in the case of Iran. In addition, the coefficient of DD, Iranian oil export as a representative of Dutch Disease index is not only statistically significant and also positive which indicates the natural resource abundance has enhanced the non-oil exports. Moreover, the estimated coefficient of common boundary variable is positive and shows that the common border has a positive impact on the non-oil exports.

The populations of home and foreign countries have negative effects on the Iranian non-oil exports. Therefore, the population effects reflect inward directions in the exports. As a test of robustness for the empirical results of the Dutch Disease model, the oil exports as a Dutch Disease index is substituted by world oil prices (which is determined exogenously). So the DD in the equation 3 represents the world oil price. This new vision of equation 3 has been estimated by the panel data approach and the results have been shown in Table 3:

### Table 3. Results of Random Effects Model

<table>
<thead>
<tr>
<th>Model</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-57.16</td>
<td>-25.45</td>
<td>-19.57</td>
<td>32.14</td>
</tr>
<tr>
<td></td>
<td>*(-7.59)</td>
<td>** (-3.89)</td>
<td>*(-2.56)</td>
<td>(0.23)</td>
</tr>
<tr>
<td>Ln GDPi</td>
<td>2.31</td>
<td>0.98</td>
<td>0.98</td>
<td>3.23</td>
</tr>
<tr>
<td></td>
<td>* (11.26)</td>
<td>** (2.07)</td>
<td>** (2.07)</td>
<td>*** (1.78)</td>
</tr>
</tbody>
</table>

Note: t statistics reported in parentheses
* *, ** and *** denotes significance at level 1%, 5% and 10%
F statistics represents the significance of panel data approach
Breusch – Pagan statistics represents the significance of random effect
Hausman statistics denotes selection of random effect instead of fixed effects
### Table 3: Results of the Econometric Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-statistic</th>
<th>Coefficient</th>
<th>T-statistic</th>
<th>Coefficient</th>
<th>T-statistic</th>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln GDP$_{ij}$</td>
<td>0.32</td>
<td>* (2.68)</td>
<td>0.32</td>
<td>* (2.34)</td>
<td>0.28</td>
<td>* (2.92)</td>
<td>0.35</td>
<td>* (3.52)</td>
</tr>
<tr>
<td>Ln D$_{ij}$</td>
<td>-0.74</td>
<td>* (-4.28)</td>
<td>-0.75</td>
<td>* (-2.83)</td>
<td>-0.63</td>
<td>* (-2.2)</td>
<td>-0.71</td>
<td>* (-3.33)</td>
</tr>
<tr>
<td>Ln DD</td>
<td>-</td>
<td>0.65</td>
<td>* (3.83)</td>
<td>0.64</td>
<td>* (3.85)</td>
<td>0.53</td>
<td>* (3.33)</td>
<td></td>
</tr>
<tr>
<td>CB$_{ij}$</td>
<td>-</td>
<td>-</td>
<td>0.54</td>
<td>*** (1.76)</td>
<td>0.43</td>
<td>*** (1.52)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln P$_i$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.07</td>
<td>(-1.35)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln P$_j$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.02</td>
<td>(-0.36)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Number of Observation | 396 | 375 | 363 | 351 |
| Number of Countries | 23 | 23 | 23 | 23 |
| $R^2$ | 0.73 | 0.72 | 0.78 | 0.79 |
| F Statistics | 12.05 (prob=0.00) | 12.59 (prob=0.00) | 14.85 (prob=0.00) | 11.53 (prob=0.00) |
| Breusch – Pagan Statistics | 387.76 (prob=0.00) | 412.04 (prob=0.00) | 381.60 (prob=0.00) | 380.27 (prob=0.00) |
| Hausman Statistics | 0.25 (prob=0.88) | 1.29 (prob=0.73) | 1.22 (prob=0.75) | 6.96 (prob=0.22) |

Note: t statistics reported in parentheses
* *, ** and *** denotes significance at level 1%, 5% and 10%
F statistics represents the significance of panel data approach
Breusch – Pagan statistics represents the significance of random effect
Hausman statistics denotes selection of random effect instead of fixed effects

The results of Table 3 confirm the earlier result. The sign of all estimated coefficients of the model consistent with economic theories, except that there is no negative relationship between oil price and the non-oil exports. In other words, the Dutch Disease hypothesis again is rejected. Based on the new evidence, we can conclude that an increase in oil prices indirectly has strengthened the non-oil exports of Iran.

### 5. Conclusion and Policy Implication

The main objective of this research is to evaluate the economic effects of natural resource abundance on the non-oil exports of Iran within a trade gravity model over the 1990-2015.

For this purpose, the empirical econometric model has been specified between Iran and 23 main trade partners and this model is estimated by applying panel data approach. The empirical results of this paper indicate that there is no negative relationship between the Dutch Disease indices and non-oil exports in Iran during the period of study. In other words, the Dutch Disease hypothesis is rejected. This conclusion is consistent with the theoretical framework and historical evidence of the
early globalization over period of 1870-1913 which has been analyzed by Findlay and Lunddahl (1994).

Although the share of the non-oil exports with respect to total exports has been low, but it cannot be attributed to the existence of the Dutch Disease in Iranian economy. As the results of estimations indicate, the trade gravity model still valid for Iran, but the natural resource export booms have not retarded the non-oil exports. On contrary, it can be argued intuitively that the petro dollars has enabled Iran to import capital goods as well as intermediate goods in order to accelerate and facilitate the non-oil production, specially manufacturing sector and expand the non-oil exports. Consequently the low level of non-oil exports can be caused by other factors rather than Dutch Disease and they should be taken into considerations in development policies formulation.

The important policy implications drawn from the results of this study are that the booming oil sector (either by oil revenues or world oil price) by itself has not eroded the non-oil exports, so the attentions of government policies should be focus on correcting other factors. it is suggested that the government should reduced its heavy reliance on the unprocessed raw materials such as oil exports by expanding non-oil exports through enhancing economic diversification and competitiveness. This policy can be achieved by absorbing FDI and using technology transfer. Furthermore, in development policies, the way that oil revenues should be spent in the government budget, the structure of industrial sector, improving institutional quality and other relevant factors should be taken into account.
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