

Gravity Model and Its Relevance in Trade between India and Saudi Arabia

^[1] **Tridisha bayan**

Gauhati University

Tridisha.bayan@gmail.com

^[2] **Dr. Suranjan Sarma**

Damdama College

ssarma1968@gmail.com

ABSTRACT

The trade relationship between India and Saudi Arabia has started in the pre-oil era. India's trade ties with Saudi Arabia and other Gulf Co-operation Council (GCC) over decades have expanded and evolved to the point of interdependence. India and the GCC each have structural profitable advantages whose operation in their relationship is creating solidarity benefits to both mates. In the case of crude oil import by India, Saudi Arabia is the topmost exporter among all other GULF countries. The comparative advantages of the domestic products in the international market are different for different products therefore to see the relative advantages I have analyzed the revealed comparative advantages. Either, a great number of Indian professed workforces are furnishing services in the country. All these different factors lead to a higher volume of trade every time and this paper is explained by assaying analyzing the Gravity model of trade. It shows both qualitative and quantitative advantages of trade with Saudi Arabia as well as the relative significance of trade in the world trade scenario. Therefore, the connection of this trade relation is analyzed with the help of the gravity model in this paper.

Keywords- Gravity model, GULF countries, Relative importance of trade, Saudi Arabia

JEL classification – F1, F6, F20, F23

I. INTRODUCTION-

India and Saudi Arabia are the two strong member countries of the dynamic trade flow in the world. India is one of the fastest developing countries in the South Asian region and Saudi Arabia is one of the major countries of the Persian Gulf region. The newly discovered petroleum reserves and vast petroleum production capacity provide Saudi Arabia with a significant role in the global oil market. The discovery of the oil further strengthened the bilateral economic relationship between the two countries. Saudi Arabia's accession to the World Trade Organization is expected to increase significantly the economic cooperation between these two countries. India and the

Gulf countries share ancient trade links and enjoy strong bonds of friendly relationship in different aspects like cultural, religious, and economic ties that go back to centuries. The historical legacies of international trade between the two countries lead to exchanges of textiles and spices with dates, pearls, and semi-precious stones. This paper is divided into numerous corridors. In part, I, numerous previously worked findings are mooted. In part II the objectives are discussed. In part III methodology is discussed with a proper explanation of the data source and the statistical tools used for analyzing in this paper. In part IV, the gravity model of trade is discussed with its augmented form by including the few non-negligible factors

Tridisha Bayan et al.

affecting trade. In part V, the values of the analysis are explained followed by the interpretation. In the later part, a brief conclusion is given. At the last, references and data used are attached.

II. **Findings of the studies relating to Trade between India and GCC Countries:-**

A gravity model is a reduced form equation of a general equilibrium of demand and supply systems. For each country, a separate trade model on the demand side is deduced by maximizing a constant elasticity of substitution (CES) utility function subject to income situations in importing countries. On the other hand, the trade supply model is deduced from the firm's profit maximization procedure in each exporting country, with resource allocation determined by the constant elasticity of transformation (Bergstrand (1985, 1989)).

Transportation cost is considered to be an important factor of trade. Production of homogeneous kinds of goods in two countries is inconsistent with factor price equalization. Although according to him different trade models may behave differently in the presence of transport costs (Davis and Weinstein 1996).

Frankel (1997) used the gravity model to estimates the trading blocs, part of currency links, etc using cross-section and panel data. Frankel and Wei (1993) have examined bilateral trade patterns throughout the world and anatomized the impact of currency blocs and exchange rate stability on trade.

It is shown by Evenett and Keller (1998) that the standard gravity equation can be attained from the H-O model with both perfect and imperfect product specialization. Some hypotheticals are needed for the empirical success of the model. They are also

of the view that the increasing returns to scale model rather than the perfect specialization interpretation of the H-O model is more likely to explain the success of the gravity equation. Again, as saying the theoretical foundations of gravity equations, they mentioned three types of trade models. They are: (1) technology differences across countries in the Ricardian model, (2) variations in terms of countries' different factor endowments in the H-O model, (3) increasing returns at the firm level in the Increasing Returns to Scale (IRS) model.

It is the limitation of trade theories in explaining the size of trade flows that different trade theories just explain why countries trade in different products but do not explain why some countries' trade links are stronger than others and why the levels of trade between countries tend to increase or decrease over time. Thus, the gravity model is successful in this regard. It allows a few other factors to take into account to explain the extent of trade as an aspect of international trade flows (Paas 2000).

The gravity equation can be deduced assuming either perfectly competition or monopolistic market structure. (Jakab et. al 2001).

. The larger the country is in terms of its GDP/GNP, the larger the varieties of goods offered. The more analogous the countries are in terms of GDP/ GNP, the larger is the volume of this bilateral trade. Therefore with economies of scale and differentiated products, the volume of trade depends importantly on country size in terms of its GDP/GNP (Paas 2000).

Christie (2002) estimates trade potential for Southeast Europe using ordinary least square estimation on cross-section data from 1996- 99.

Kalbasi (2001) has analyzed the volume and direction of trade for Iran in a sample of 76 countries. They divided the countries into groups in developing and industrial countries and trade flows have been examined to determine the impact of the stage of development on bilateral trade. Several studies have analyzed the trade-enhancing impact of preferential trading arrangements. These studies predict the additional bilateral trade that would be a consequence of the economic integration of different economies.

Rahman (2006) attempts to provide a theoretical justification for using the gravity model in the analysis of bilateral trade and apply the generalized gravity model to dissect Bangladesh's trade with its major trading countries using the panel data estimation technique. The main factors of Bangladesh's exports, according to him are - the exchange rate, partner countries' total import demand, and openness of the Bangladesh economy. All these factors affect Bangladesh's exports positively. The exchange rate, on the other hand, has no effect on Bangladesh's imports; rather imports are determined by the inflation rates, per capita income differentials, and openness of the countries involved in the trade.

III. Objectives-

The objective of the paper is to discuss the gravity model and its application in enhancing trade between India and Saudi Arabia despite experiencing a trade deficit every year.

IV. Methodology

Data source-

The data for this study is collected from various national and international sources. The annual data of India's export to the partner countries and imports from different countries

are collected from various issues of the Statistical yearbook, published by the Government of India. The data on GDP, Population, and exchange rates are collected from World development indicators published by World Bank. The data on bilateral distance is collected from www.indo.com/distance.

Statistical tools

Statistical tools such as MS-EXCEL and E-views are used for analyzing the data, and the augmented Gravity model is used for explaining the trade behaviors and the different factors.

Gravity Model

Trade theories only explain trade between products but do not explain why some countries have strong trade links and vice versa and also why levels of trade fluctuate overtimes. This limitation of trade theories is eliminated in this regard by the gravity model. The gravity model takes into account all factors of international trade (Pass 2010). This gravity model can be used to explain the trade link between India and Saudi Arabia between them. The model has been used by Tinbergen (1962) and Poyhonen (1963) for international trade. They defined this model as follows:

$$\text{Trade}_{is} = \alpha [\text{GDP}_i . \text{GDP}_s / \text{Distance}_{is}]$$

Where Trade_{is} is the value of the bilateral trade between countries India and Saudi Arabia, GDP_i and GDP_s are national incomes of India and Saudi Arabia.

The gravity model has the product of the gross domestic product. Trade has positive relation with GDP, because whenever the income increases the demand for the commodities increases and as a result both export and import increases. The coefficient α

Tridisha Bayan et al.

represent that as the product of GDPs increases by one percent, then, trade also increases. Again, the geographical distances are inversely related with trade volume. Logically whenever the distance increases the transportation cost increases, and trade volume reduces. Therefore, it has a negative impact on trade relation of other countries and the coefficient β represent that even if with an increase of one percent in distance between the two countries, trade volume declines. Again, the problem is that we cannot estimate the fixed effect if one of the variable don't change over the time. Geographical distances are something which obviously doesn't change over the time, therefore another variable is formed as remoteness. It is not only the geographical distance but the relative importance of the trade partners in international trade also matters in trade, therefore remoteness is calculated by multiplying the GDP of the partner country with the geographical distances and diving this by world GDP.

Another factor is the GDP differences with the partner countries. According to Ricardo, it has positive effect on trade, whereas, according to new trade theories it has negative effect on international trade. Usually is has a negative effect on overall trade volume, because as countries with high GDP does less export from countries with lesser GDP.

The population variable also has an impact on trade. More population in general leads to more demand for import. It is captured in the model my multiplying the population of the two countries and taking natural afterwards.

As we know that gravity model is a multiplicative model so by taking natural law it will be more convenient for analyzing the model. Also there may be so many

unobservable α effects of different factors which cannot be incorporated in the model in the model and it may create heteroschadasticity problem, so taking natural log is seems to be better. Therefore the model used is-

$$\ln(\text{TRADE}_{is}) = \ln(A) + \alpha \ln(\text{GDP}_i * \text{GDP}_s) - \beta \ln \text{REMOT} + \gamma \ln(\text{Pop}_i * \text{Pop}_s) - \delta \ln \text{EXCH} - \theta \ln (\text{GDP_DIFF}) + \epsilon_{is}$$

By using the abbreviations, we have-
 $\text{LNTRADE} = \text{LNA} + \alpha \text{LNGDPPRO} + \beta \text{LNREMOT} + \gamma \text{LNGDPPRO} + \delta \text{LNEXCHNG} + \theta \text{LNGDPDIF} + \epsilon_{ij}$

V. Description of the result of applying E-views.

The result of analysis done through E-views can be written as follows

Table 1- **Result of particulars**

| Variables | Abbreviation | Coefficient | Significant level |
|--|--------------|--------------------------------|-------------------|
| Constant | LNA | -940.522 (-4.343069) *** | 0.0010 |
| Natural logarithm Product of GDP of the two trading partners | LNGDPPRO | 10.07161 (1.999796))*) | 0.06087 |
| Natural logarithm of remoteness | LNREMOT | -24.197 (-2.786500) ** | 0.0165 |

| | | | |
|--|-----------|-----------------------|--------|
| Natural logarithm of product of population of the two trading partners | LNPOPP RO | 23.90605 (2.845131)** | 0.0148 |
| Natural logarithm of GDP differences | LNGDPD IF | -15.250 (-2.333743)** | 0.0378 |
| Natural logarithm of exchange rate | LNEXCH NG | -9.869 (-4.968954)*** | 0.0003 |
| F- test | | 41.599 | |
| R ² | | 0.94 | |

(Source- Author's Estimation.

Note - *, ** and *** indicates the significance level at 1%, 5% and 10% respectively)

VI. Interpretation of the result

The result shows that India's trade volume is positively determined by the GDP size of the two countries, whereas the remoteness, which includes distance between two nations has affected negatively. Again, the GDP differences have negative effect on trade, as the rich countries trade less with the poorer countries. Also exchange rate has a negative effect on trade volume. Higher the exchange rate, higher will be the cost of trade and lower will be the trade.

We calculate that $R^2 > 0.9$. Thus we can conclude that the explanatory variables in the

model can explain more than 90% of the dependent variable, which is trade. The F-test is 40%, which represents that the model is a good fit. The variables like remoteness, population difference, GDP differences, and exchange rates are significant, as the p-value is less than 0.05.

Gradually the GDP is increasing in both the countries, and population is also increasing. Therefore, the trade between the two countries is increasing. Although India is experiencing trade deficit since last two decades, the trade volume is increasing.

It has been seen from the data collected that the rate of increase in export and import has positive effect on trade volume.

VII. Conclusion

Both the countries are historically having strong trade relations which is increasing although facing a trade deficit by India. It can be further increased by developing export potential sectors of India. In recent years due to the emergence of the covid pandemic, several unexpected factors have hampered global trade relations. During this time period since 2019, we have experienced restrictions in labor mobility. The scarcity in the domestic, as well as foreign markets and instability in markets, are accepted to reduce the spreading of the virus. Few countries started preferring the native citizens in case of health care provisions. Lack of life security results in returns of the migrating people. It results in a further reduction in demand for exports. Gradually with the passage of time, the trade flows reemerge but the destructions in a smaller economy like India needs a few more time to heal. It is highly recommended to develop the export-oriented sectors and maximum utilization of export potentiality in India to reduce trade deficit so that trade can flourish again.

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