

# Determinants of the Exports of India: Trade Blocs, Trade Theory and the Gravity Model

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**Abstract:** The main focus of this study is to analyse the export direction of India with its top 20 trading partners for the years 1991-2017 using the gravity model of trade. The analysis mainly draws conclusion on the selected trading blocs of the partners. Another aspect called Relative factor endowment is also included in the study to check whether H-O theorem holds for India's export with its selected export partners. Most of the export which India creates with ASEAN countries are intra industry in nature and most exports with EU countries are inter industry in nature. So, trade policies should be created in such a way that it takes into account of the trading blocs and nature of trade of that particular country with India. Also, it was observed that bilateral trade agreements (BTA) attracts less exports than multilateral trade agreements.

**Keywords:** Bilateral trade agreements, Gravity model, H-O Theorem, Regional trade agreements, Relative factor endowment, and Trade blocs.

## 1. Introduction

India initiated structural reforms by implementing comprehensive trade reform policies during 1991. According to the World Bank WDI, trade to GDP ratio of India increased after the reform period compared to the pre reform period. The export of goods and services in India have increased from 15 percent in 2000-2001 to nearly 23 percent in 2010-2011. Therefore Export Led Growth Hypothesis is holding for India in the post liberalization period (Agarwal, 2014). However, the share of India's trade in the world exports is just 1 percent which is unimpressive. The foreign policy of India since the 1990s has focused on improving India's trade using economic cooperation and trade agreements with various countries. As a first step, India joined WTO in 1995 for enhancing its trade relations. India signed various trade agreements and the result by various studies show that RTAs significantly lead to an increase in bilateral trade (Frankel, 1997). India is actively negotiating with its other major trading partners into signing Free trade agreements. Newton (1687) first developed the gravity model and the model was later used by economists such as Tinbergen (1962), Anderson (1979) to estimate trade relations. The conventional trade gravity model estimates the effect of GDP, population, and distance on bilateral trade. Additional variables can also be introduced into the model depending on the motive of the analysis. This study primarily focuses on analyzing India's export potential with its

top twenty export trading partners for the period 1991-2017 using an augmented gravity model of trade.

Table 1  
Various Regional Trade Agreements (RTA) and selected members of RTAs taken for the analysis

Agreement	Member countries taken for the analysis	Year of formation
Association of Southeast Asian Nations (ASEAN)	China, Indonesia, Malaysia, Singapore	1967
South Asian Free Trade Area (SAFTA) of SAARC countries	Sri Lanka, Bangladesh	Members ratified SAPTA into SAFTA on 2004.
Gulf Cooperation Council (GCC)	UAE, Saudi Arabia	1981
European Union	Germany, France, Italy, Belgium, UK, Netherlands	1993

Source: Department of Commerce, Ministry of India

The analysis has been done with respect to the trade blocs (GCC, ASEAN, EU, and SAARC) that the top 20 trading partners belong to. RFE (Relative Factor Endowments) measures the difference in terms of relative factor endowments and technology between two countries and takes a minimum value of zero when there is equality in relative factor endowments (Kumar and Ahmed, 2015). The Heckscher-Ohlin model states that international trade is explained by comparative advantage resulting from differences in factor endowments (including labour, capital, natural resources and technology) among nations. Inter-industry trade is likely to be larger when the differences in factor endowments among the countries are high. However, intra-industry trade is likely to be larger among economies of similar size and factor proportion (Erdey and Andrea, 2017). But Krugman's study in 1991 came up with a contradictory conclusion that countries would trade more with each other if they are similar in terms of factor endowment as opposed to the H-O theorem. Motivated by the H-O model and its contradictions, we are interested in exploring the interaction of Relative Factor Endowment (RFE) between India and the selected partner countries broadly on the basis of the trading blocs they belong to. Another major intention of the analysis is to assess the trade creation/trade diversion effect of the blocks and to check if the HO-theory holds in this study context. This study would be the first of its kind to address the

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effect of the interaction of Relative Factor endowment with selected SAARC, EU, GCC and ASEAN export partners of India. We also look upon the effect of bilateral trade agreements in promoting India's export.

## 2. Review of Literature

There are numerous literatures pertaining to the broad theme of our paper. This section presents a broad summary of the various studies we reviewed that helped to form our motivation and support our conclusions. A study by Alam and Ahmed (2018) showed that Diaspora and tariff are the key variables that influence India's export to the GCC countries. When tariff is reduced to 50% or 100% it leads to a great improvement of India's export to these countries. The authors advocate for opening up the economy for free trade and proposes an FTA between India and GCC Countries for the smooth flow of trade. India is also a major trade partner among the Middle Eastern countries due to its geographic proximity and abundance of natural resources (Barman, 2016). According to Habib (2019) India's import from OPEC countries outweighed India's export to these countries, creating a consistent trade deficit for India. According to Prabhir (2006) there is a higher degree of global and regional integration over the last few decades and trade cost showed a decreasing trend over the years. India's trade liberalization policies exhibited a positive impact on India's bilateral trade with EU countries (Gaurav, Mathur 2015).

Chakravarthy and Chakrabarty (2013) used the augmented gravity model of Frankel to estimate India's trade relation with the ASEAN countries for the period of 1971-2010. They came up with a conclusion that India trade flow is higher with relatively richer countries of ASEAN than the poorer countries. There is also an intense swing and fluctuation in India's exports with the ASEAN countries. These fluctuations became less occurring after the post liberalization period. Eichen green and Bayoumi (1997) used the gravity model to analyse the possible effects of regionalism on European trade. The results showed that European Free Trade Association had a trade creating impact and the European Economic Community demonstrated both trade creating and trade diverting effects. EEC increased trade within the member countries and significantly reduced trade with the rest of the world.

Dembatapatiya and Weerahewa (2015) used the gravity model to analyse the effects of Regional trade agreements on South Asian trade. Three types of Bilateral Trade agreements (BTAs) were included in the study, between two South Asian countries, between a South Asian country and a country not in the region, and between two non-South Asian countries. The results showed that BTA have insignificant effect on bilateral trade with South Asian Countries. SAFTA, ASEAN, BIMSTEC and NAFTA failed to exhibit any significant effect on exports. Among the Regional Trade agreements (RTAs) only the EU showed a significant impact on the exports. The results also showed the inability of SAFTA to increase the trade within South Asia. The BTA enhances the South Asian regional trade at a greater extent. Ekanayake *et al.* (2010) used gravity model to study the trade creation and trade diversion effects of Regional trade agreements in Asia for the time period 1980-

2009. The authors used a Relative Factor endowment dummy to capture the technological differences between the countries. It was observed that RTA leads to a significant trade creating effect between the member countries. The Bilateral trade dummy turns out to be insignificant for the members. It shows that multilateral trade agreements should be promoted more than bilateral trade agreements to improve trade. Hassan (2001) used gravity model to estimate the regional trade creating effects of SAARC within the member countries. Compared to other regional trade blocs, the volume of trade between the SAARC countries continues to be relatively low. The results showed that SAARC is yet to achieve its objective of regional cooperation and SAARC Free trade agreement does not lead to any trade creation effects within the member countries. Erdey and Postnyi (2017) analysed the determinants of exports of Hungary with an emphasis given to relative factor endowments. It was found in their study that higher difference in factor endowment leads to less bilateral trade among Hungary and its trading partners as opposed to the H-O theorem. Sani and Aliyu (2013) came with a similar conclusion that differences in the per capita GDP of exporter and partner countries will significantly reduce trade between the countries.

Zarsoso (2003) estimated the effects of trading blocs in creating bilateral trade among the EU and NAFTA. It was found that the intra-EU trade was 177 percent higher and intra-NAFTA trade was 103 percent higher than the normal expected levels of trade. Soloaga and winters (2001) in their study came up with a conclusion that EU, NAFTA and MERCOSUR created more trade among the members and diverted the trade from the non-members. The intra-bloc trade dummy of GCC countries was positive and significant during 1992-1996 and the coefficient of extra-bloc export dummy showed a negative coefficient.

## 3. Motivation and Objective

We find that previous empirical research is limited to studying the effect of particular RTAs on the bilateral trade (unlike export performance) of the country and remains insufficiently explained in the context of India. Although some studies have looked into the Relative factor endowment relations with the trade of India at a country level, a trade block analysis on the export performance has not yet been explored. Such an analysis could be helpful in framing effective trade policies for India. The previous studies also seem to show conflicting results on accepting or rejecting the HO-theory.

Our paper aims to fix this gap in the literature and tries to throw some light on the combined effect of RFE and various RTAs.

### A. Specific Objectives

- Analyze the determinants affecting India's export with its top 20 trading partners for the period 1991-2017 using an augmented gravity setup.
- Explore the presence of trade creation or diversion effects in India's exports with the different trade blocs (SAFTA, ASEAN, GCC, EU).
- Extend the analysis to the interaction of various RTAs

with corresponding RFE to check for theoretical patterns like the Heckscher-Ohlin and Linder hypothesis in this particular study context. Additionally, we also look for favourable conditions on inter-industry or intra-industry trade.

#### 4. Methodology

We employ an augmented gravity model consisting of supply and demand factors (GDP, Population, and Relative factor endowment), trade preference factors (common border, colonial link, regional and bilateral trade agreements) and trade resistance factors (tariff, geographical distance). The choice of Relative factor endowment (RFE) variable is based on the comparative advantage explanation of trade and is defined as the absolute value of the differences between natural logarithm of per capita GDPs between India and country *j*. Thus, the model has been augmented with variables representing factors that could either facilitate or impede exports. The basic gravity model equation is transformed into linear form so that it confirms to the usual regression analysis:

$$\ln EXP_{indj} = B_0 + B_1 \ln GDP_{indt} + B_2 \ln GDP_{jt} + B_3 \ln POP_{indt} + B_4 \ln POP_{jt} + B_5 RFE_{indj} + B_6 \ln TAR_{jt} + B_7 \ln DIST_{jt} + B_8 SAFTA + B_9 ASEAN + B_{10} GCC + B_{11} EU + B_{12} BTA + B_{13} BORD_{indj} + B_{14} COL_{indj} + B_{15} SAFTA\_RFE + B_{16} ASEAN\_RFE + B_{17} GCC\_RFE + B_{18} EU\_RFE + B_{19} BTA\_RFE + e_{ij}$$

We have used panel data methodology for our empirical gravity model of export flows as panels can capture the relevant relationships among variables over time and can monitor unobservable trading-partner-pairs individual effects. Given that our model has time-invariant variables like distance and dummy variable on trade agreements, the random effect model is preferred to the fixed effects model as the latter model has the disadvantage of not being able to evaluate time invariant effects. Both Pooled OLS regression and Random effects model was used for estimating the gravity specification. Later on, we applied the Breusch–Pagan Lagrange multiplier which helped us to decide between a random effect regression and a simple ordinary least-squares regression. The probability (Prob. >chi2) of LM is 0.000 indicated that random effect is appropriate.

#### 5. Data

The panel gravity model data were collected for the period of 1991 to 2017 (18 years) all observations are annual. In order to estimate the panel gravity equation, our study uses data of the top 20 trading partners of India for the period 1991-2017. The export partners considered in the study were chosen based on IMF Direction of Trade Statistics (various issues). Data on export trade flows from India to the 20 top export partners of India, which is the dependent variable in the model is obtained from the World Integrated Trade Solution (WITS) Trade Statistics Database. Data of GDP and per capita GDP in US\$ millions at the constant (2015) price are taken from the United Nations Conference on Trade and Development (UNCTAD) data centre. Data of per capita GDP of specific countries was

Table 2  
Description of variables

Gross domestic product (gdpindt, gdpjt)	In the Gravity model, the flow of trade between two countries is posited to be proportional to the economic size (proxied by GDP) of the trading partners.
Population (popindt, popjt)	Highly populated countries hold a higher market size, which results in higher trade flow
Relative factor endowment (rfeindj)	This variable is chosen based on the standard comparative advantage explanation of trade.
Tariff (tarjt)	Taxes on imports of commodities into a country or region can intervene with the economic activities and hamper trade between nations.
Geographical distance (distindj)	Gravity model takes into consideration the geographical distance between the countries. Studies have shown both positive and negative impact of distance on trade. The immediate consequence of geographical proximity is reduction in transport costs, short delivery time, less interest payments on export credits and low spoilage.
Common border (bordindj)	Dummy, 1 if India shares border with the country
SAFTA	Dummy, 1 for signatories of South Asian Free Trade Agreement
ASEAN	Dummy, 1 for signatories of ASEAN
GCC	Dummy, 1 for signatories of GCC
EU	Dummy, 1 for signatories of EU
BTA	Dummy, 1 for countries with Bilateral trade agreement with India
Safta*rfe, asean*rfe, gcc*rfe, eu*rfe	Interaction variables of RTAs and RFE
Colonial link (colindj)	To control for cultural similarity or historical relation among trade partners.

used to construct the Relative factor endowment variable, RFE<sub>ij</sub> = ln PGDP<sub>i</sub> – ln PGDP<sub>j</sub>. The applied most favoured nation (MFN) tariff data was also obtained from WITS Statistics database. The population data has been taken from the World Bank Open Database. Data of SAFTA, AEAN, GCC, EU, BTA dummy variables are constructed after gathering information from the Department of Commerce, Ministry of India. Country specific variables, such as dummies for border, colonial link and data of distance in miles, which enter the gravity equation are obtained from Centre D’ Etudes Prospectives et D’ Informations Internationales (CEPII). Total observations in this study are 540 from 1991 to 2017.

We estimated the model with annual data of India’s top 20 export partners for the period 1991 to 2017. The countries include US, UAE, China, Hong Kong SAR, China, Singapore, UK, Germany, Bangladesh, Belgium, Italy, Malaysia, Netherlands, Saudi Arabia, France, Japan, Rep. of Korea, Sri Lanka, South Africa, Indonesia, Brazil. The model was estimated using Random effects and Pooled Ordinary least square regression model. The Breusch–Pagan Lagrange multiplier test with probability (Prob. > chi2) was 0.000, this showed that Random effects are more appropriate to the panel than pooled OLS. Therefore, we have analyzed the results of the Random effects estimates in Table 4. Most predicted variables behave consistently with the results of the conventional model, and the estimated coefficients are statistically significant. These values are acceptable for a panel

study and are comparable to those obtained in other studies employing the gravity model to examine trade flows. The adjusted R squared value is 82%.

- The coefficient of the real GDP variable for the partner country is positive in the model estimated and is statistically significant at 1% level of significance. As the income level of the importing (jth) country increases, so does the country's demand for imports and its purchasing power. Interestingly GDP of India which is not significant has an opposite sign as expected from the original gravity model.
- The population coefficient of India is positive and significant. This can be an indication of how India's large market allows for a full exploitation of the economies of scale and the increased variants of products exported. The population coefficient of the partner is negative and statistically significant at 5% level. Coefficient of population of the importers may have negative or positive signs depending on whether the country imports less when it is big (absorption capacity) or whether a big country imports more compared to a small country (economies of scale), (Martinez.et.al,2003) . A negative coefficient estimate for importer population may also reflect tastes and that the income elasticity of demand is unity(Bergstrand,1989)
- The distance and tariff variables have the expected negative sign. The results for the distance variable provide strong support for the hypothesis that transportation and other distance-related costs are an important determinant of export flows. The common border variable has a significant positive sign as this may stimulate export due to various trade-boosting efforts such as the reduction of tariff and non-tariff barriers amongst member countries(Kumar and Ahmed,2015)
- A positive and significant colonial link may suggest the similarity in developments brought in by the common colonizer leading to common tastes in trade among those countries. An example would be the common taste as a result of the introduction of railways, English language, and educational institutions by the British in India, South Africa, Bangladesh and Sri Lanka.

#### A. Trade Bloc Dummy Results

The various Regional Trade agreement dummies are an indicator of trade creation or diversion effects.

- SAFTA dummy is positive and significant and has the highest value compared to other RTA dummies. The highest export creation capacity of SAFTA for India can be attributed to the fact India is a member of SAARC. The coefficient of SAFTA is the highest compared to GCC and ASEAN. This can be due to the fact that SAFTA is an intra-trade bloc. The other reasons could be geographical proximity, common borders and colonial links.

Table 3  
Estimation Results

	Random effects	Pooled OLS
	(1)	(1)
	logEXPindj	logEXPindj
logGDPindt	-0.616 (0.815)	-0.833 (0.904)
logGDPjt	1.873*** (0.696)	2.364*** (0.767)
lnPOPindt	3.051*** (0.737)	2.972*** (0.828)
lnPOPjt	-0.696** (0.303)	-0.906*** (0.334)
RFEindj	-0.909 (0.697)	-1.371* (0.767)
logTARjt	-0.00546 (0.0322)	-0.00346 (0.0361)
logDISTjt	-0.340** (0.169)	-0.183 (0.124)
SAFTA	0.924*** (0.185)	1.148*** (0.183)
ASEAN	0.417*** (0.128)	0.484*** (0.0967)
GCC	0.802*** (0.250)	0.269 (0.229)
EU	-1.179*** (0.289)	-1.414*** (0.307)
BTA	-0.149 (0.0905)	-0.164 (0.100)
BORD	0.308*** (0.0996)	0.366*** (0.0710)
colony_link	0.149*** (0.0466)	0.0960*** (0.0333)
SAFTA_RFE	-1.899*** (0.526)	-1.884*** (0.537)
ASEAN_RFE	-0.259** (0.105)	-0.222*** (0.0775)
GCC_RFE	-0.445*** (0.171)	-0.0456 (0.162)
EU_RFE	0.673*** (0.181)	0.825*** (0.193)
BTA_RFE	0.0446 (0.0773)	-0.00132 (0.0853)
Constant	-50.09*** (11.23)	-46.30*** (12.65)
Observations	528	528
Number of ind	20	0.834
Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1	

Source- Authors estimation using STATA

- ASEAN and GCC dummies are also positive and significant. The higher value of GCC compared to ASEAN coefficient implies that India exports more to GCC countries due to GCCs trade creation effects. Alan and Ahmed (2018) showed that India's export to Gulf countries was positively determined by the Indian diaspora living in Gulf countries.
- The EU coefficient is negative and significant at 1% level. This shows the export diversion pattern of the EU with India. High logistic costs and Indian exports not meeting the stringent standards set by EU can be one of the reasons for this. This result is in line with many studies that have shown that EU countries tend to create more exports with the member countries than the non-members.

### B. Relative Factor Endowment Results

The choice of Relative factor endowment as a variable in our model aims to explain the following:

- To determine whether the H-O model or the Linder hypothesis explains the pattern of export flows of India to countries belonging to particular regional trade agreements.
- To check if intra or inter industry trade is favored between India and its top export partners belonging to specific trade blocs.
- To capture technology differences in explaining export patterns.

The Heckscher-Ohlin model states that countries with dissimilar levels of output will trade more than countries with similar levels, while the Linder hypothesis asserts that countries with similar levels of income per capita will have similar preferences and will thus trade more with each other. The positive sign of the coefficient refers to the H-O model, while the negative sign to the Linder hypothesis. (Erdey and Andrea, 2017). As per table 4, since the RFE variable has a negative but insignificant relationship, we aren't able to draw meaningful interpretation regarding the HO and Linder hypothesis. However, augmenting the model with an interaction between the factor differential and the various RTAs helps in drawing meaningful insights.

- The SAFTA\_RFE coefficient is negative and highly significant and shows that exports change in line with the Linder hypothesis. This means that as the difference in GDP per capita between India and each of the SAARC nations increases, exports from India to these countries would decrease.
- Both ASEAN\_RFE and GCC\_RFE are also favourable coefficients with regard to the Linder model, i.e., India tends to trade more with countries having similar factor endowments including technological advancements.
- The highest effect on exports is from SAFTA\_RFE and this is a convincing result since India and SAFTA is an intra-trade bloc rather than an inter-trade bloc. These three coefficients not only find evidence supporting the Linder hypothesis for the exports of India in the period of 1991–2017, but also suggests that intra-industry trade is likely to be larger among economies of similar size and factor proportion. The example of intra industry exports of India with SAFTA and ASEAN as per the EXIM Report of 2018 would be spices, miscellaneous processed items, and organic/inorganic chemicals. Similarly, with the GCC countries India exports and imports products of the same industry like petroleum, gems and jewelry.
- The interesting finding is that even though the EU dummy on itself is negative and significant, the interaction coefficient between EU and RFE turns out to be positively significant. Its positive sign corresponds to the HO-model and suggests that India's export flows to the EU are related positively to inter-

country differences in the level of technological advancement. It boils down that India exports more to those EU member countries in which there is a higher difference of technology and factor endowments, even though India's total exports to EU countries are less. The largest sectors contributing India's exports with EU are textiles, light industries and services, all of which are mostly labour intensive.

- Both the BTA dummy as well as BTA\_RFE dummy are insignificant. Bilateral trade agreement does not influence the volume of exports of India to the partner countries.

### 6. Conclusion

The study finds that the determinants of India's exports with its top trading partners are in line with the conventional gravity model. Significantly positive additional variables such as common border, colonial link indicates the need to form agreements and hasten the exports from India to those countries. The trade blocs analysis showed that among the GCC, SAARC and ASEAN countries, India traded with countries that are similar to each other in their endowments and technological advancement, thus higher differences reduced India's exports to those countries during 1991–2011. Thereby, totally dismissing the H-O theorem of trade. In the case of the EU, the results were quite interesting. Even though export creation with the EU has been less for India, India exported to those EU members' countries that had higher differences in technological endowments and per capita income; thus, totally supporting the H-O theorem. This explains that the EU engages in trade within the trade bloc than with non-members; an indication of export diversion effects. India's exports except for the EU correspond with the Linder theorem, closer trade relations with similar countries may have a positive effect on the volume of trade and thus on the economy. Thus, this phenomenon should be recognized by the Government and trade policies could be redirected and focused on pursuing negotiations with countries that have similar factor endowments. These results also helped form conclusions that intra-industry exports from India are stronger with the ASEAN, SAFTA, GCC member countries than inter industry exports. This facilitates the need to frame policies such that India's choice of inter or intra industry exports should be based on which trading bloc the export partner belongs to. Also, since the bilateral trade dummy is insignificant in case of Indian exports in this study context, higher concerns should be on forming multilateral trade agreements more than bilateral trade agreements.

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