

A Study of Bilateral Trade Flows of China and India

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Abstract

Background/Objectives: According to the World Trade Organization data for 2013, China became world's largest trading nation and India became the 15th largest trading nation. Emerging economies gained a lot of momentum in world trade. This study analyses the trade flows of two of the emerging economies namely China and India with an objective to draw a comparison between the determinants of bilateral trade flows of the two nations using data for a period of 9 years (2004-2013). **Methods/Statistical Analysis:** To achieve the objective, gravity model has been applied on a panel dataset for the two countries. The data has been collected from International Monetary Fund (IMF), CEPII's Geodist database and United Nations Conference on Trade and Development (UNCTAD). The study employs random effects panel regression model to establish the relationship between trade flows and different variables including distance, gross domestic product, per capital income, contiguity, common language and common colonizer. It compares the determinants of trade for India with China. **Findings:** The findings of the empirical analysis are in accordance with past literature indicating that India and China trade flows are mostly with geographically closer countries. Additionally, India's trade flows are with countries having higher GDP but with lower per capita income. China's trade is influenced by higher per capita income of the trading partner and common language. When crisis is introduced in the analysis, post crisis, common colony became an important influencer of trade for India. **Applications/Improvements:** This study helps in identifying the key determinants of India and China's trade flows. It also provides a pre and post crisis analysis of the trade partnerships which might have future implications for trade policy and trade relations for the two countries.

Keywords: Bilateral Trade, China, Gravity Model, India

1. Introduction

Bilateral trade has been one of the major drivers of economic development and an important contributor to economic integration. Over centuries countries have been trading with each other and coexisting by facilitating smooth flow of goods and services. There have been a lot of exogenous shocks that the world saw over the past and they have had an impact on the way countries trade. The most recent one has been the financial crisis of 2007-2008. Countries have dealt with such economic shocks in different ways and they have been looking at trade partners in different ways after that. Recovering from the crisis has had policy implications across the globe and has led to rethinking in the way trade has been done.

According to the World Trade Organization data for 2013, China eclipsed USA to become world's largest trading nation and India became the 15th largest trading nation. With emerging nations becoming increasingly visible in world trade, it becomes important to understand the dynamics of trade of these economies. This study analyses the trade flows of China and India with an objective to draw a comparison between the determinants of bilateral trade flows of the two nations using data for a period of 9 years (2004-2013).

Discussed briefly the growth experience of India and China and described the evolution of trade flows at the aggregate level and concluded that China and India would derive substantial benefits from greater economic interaction¹. Also provided trade policy dynamics of the

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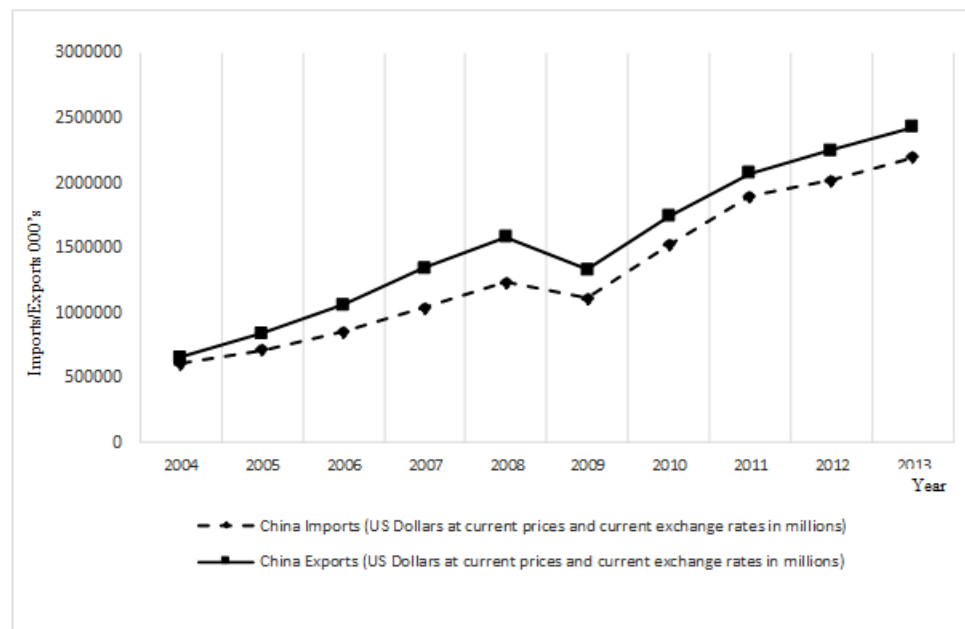
two countries mentioning that there was variation in the trade instrument deployed by both the countries and concluded that while China had established its competitive power in the world as an exporter, India was yet to reach that level². Both the countries provide a perfect settling for this experiment where the determinants of trade flows during the period inclusive of an exogenous shock in the form of financial crisis could be explored.

China's annual trade total trade rose 7.6% over the year 2013 to \$4.16tn and China eclipsed USA to become world's largest trading nation. Chinese economy had been growing at an accelerating growth rate. Foreign Direct Investment had a significant effect on the economic development of China³. Figure 1 highlights the exports and imports for the time period 2004-2013. It shows the phenomenal growth that China witnessed during this period.

In 2013, India became world's 11th largest importer and 20th largest exporter. China surpassed USA as India's largest trade partner and countries like Belgium and Netherlands entered into the top 10 trade partners. Indian economy had been growing at an accelerating growth rate pre crisis. The shift in trade partnerships might have been an outcome of several reasons like trade policies of the nations, bilateral agreements between nations, demand/supply of goods, level of economic integration amongst

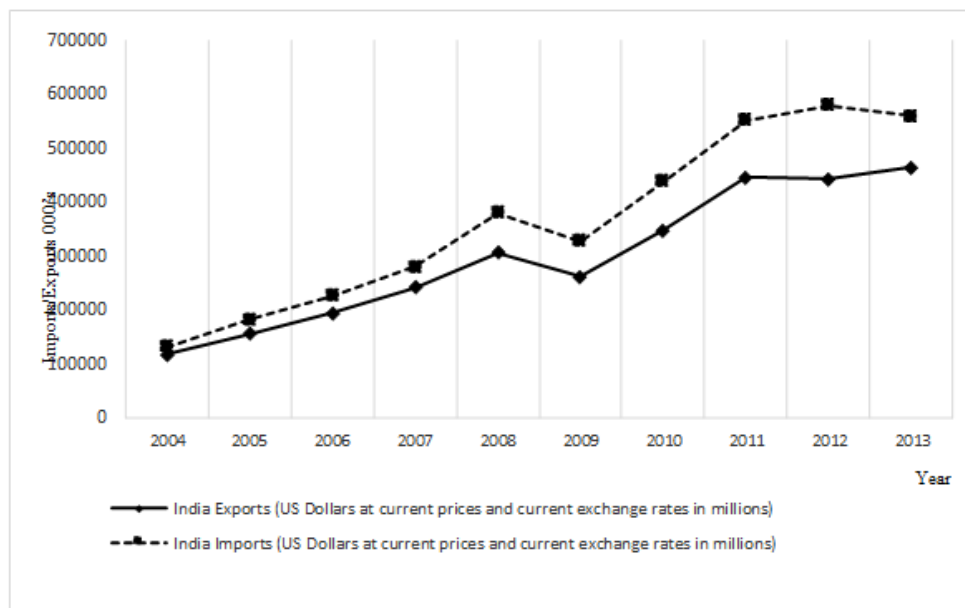
the partners etc. A lot of studies have focused on Regional Trade Agreements and how they have impacted the trade flows of different countries. In this study, our focus is not on the regional trade agreements as a reason of change in trade partnerships but on assessing the way Indian trade has been transformed due to an exogenous shock viz., financial crisis of 2007-2008. On looking at the figures of Indian trade, it can be seen that Indian trade has shown an increasing trend over the years. Figure 2 highlights the pattern of exports, imports and total trade in merchandise goods from 2004 to 2013. The figure indicates a dip in trade during the crisis years and a revival after 2009. It is therefore, necessary to analyze the changes in trade partnerships before and after the crisis.

The two countries provide ground for analysis of their trade flows and the comparisons which can be drawn for the determinants of the trade flows. It can be seen from Figures 1 and 2, that there is a marked difference between the two countries' trade. China being export dependent and India being import dependent. In this paper, researchers bring out the differences at the deeper level and provide an analysis of the two countries 'trade flows' determinants. Also, for both the countries, it can be seen that there is a dip in trade flows during the crisis period. This motivates the researchers to introduce the financial crisis into the analysis.



(Source: UNCTAD data)

Figure 1. China's exports and imports for the time period 2004-2013.



(Source: UNCTAD data)

Figure 2. India's exports and imports for the time period 2004-2013.

Gravity model has been a widely applied model while analyzing bilateral trade flows. Its basic form has been drawn from Newton's law of gravitation. Reviewed the gravity model wherein the movement of goods or labor between two destinations could be explained by the distance between them and the mass of goods supplied and demanded⁴.

Over the years gravity model has been applied by several researchers and in different forms. One of the earliest applications was done⁵ where the model was used to understand the migration patterns in the United Kingdom in the 19th century. The application of the model on trade flows initially concluded that flow of trade between two countries was directly proportional to national income and inversely proportional to distance between them^{6,7}. The model went through a lot of developments later with providing a reduced form gravity model. Incorporation of different variables was also done by researchers in this area. Per capita income⁸, population⁹, historical linkages¹⁰⁻¹², national borders^{13,14}, distance^{15,16} were some of the determinants which were used in various models over the years. Added variables like contiguity, common colony, tariff, common language and regional trade agreements in their version of the model. A monopolistic competition framework was introduced¹⁸. These studies provided several insights¹⁷.

They concluded that trade flows were determined by size of the trade partner. Larger the size more would be the trade. Common language was an important determinant of trade. Also, distance mattered for trade. Some studies also concluded that having a common colonizer influenced trade flows between countries.

These studies have arrived at the generalized conclusions by using cross section data of countries. However, the country-wise differences in application of gravity model have also been analyzed by researchers. McCallum (1995) studied the effects of national borders on trade between USA and Canada. The bilateral trade flows of United States have been widely studied¹⁹. Used the model to assessed potential trade in south east Europe²⁰, have used the model to study the effects of quotas on the foreign trade of Turkey²¹. The determinants of Vietnamese exports using the gravity model²², studied the trade between Baltic states²³. Used gravity model to estimate India's global trade potential while²⁶ used the model to understand Bangladesh's bilateral trade^{24,25}. Chinese bilateral trade flows have been studied^{27,28}. Chinese multinational enterprises and the cultural distance between the home and the host countries²⁹.

Most of the studies on India and China have been to assess their trade potential. This study fills the gap in literature by applying the gravity model on these countries

individually over a period of time and determining the factors which affect their bilateral trade flows.

The impact of financial crisis has been captured in a study for the emerging economies³⁰. However, this study is generalized for all the emerging economies. In this study the researchers try to capture the impact specifically for India and China.

2. Data and Methodology

After reviewing the relevant literature and identifying the research gaps, following objectives were formulated:

- To understand the determinants of trade flows of China and India using gravity model for a period from 2004 to 2013 and test whether the determinants are similar to the literature.
- To understand if the gravity model determinants exhibit change due to an exogenous shock like financial crisis of 2007-2008. This would help in understanding if trade flows are impacted significantly for the emerging economies of India and China due to an economic phenomenon like crisis.

The scope of the study is restricted to India and China and their trade partners. For the sake of simplicity, the trade flows are defined as the flow of merchandise goods from India/China (i) to the trade partners (j). The data was collected for all 226 trade partners of India and 222 trade partners of China for the period 2004-2013. Two datasets were created, one for India and one for China, for the purpose of analysis. After combining the data with respect to the concerned variables, the dataset was comprised of 175 groups in the panel for India and 176 groups for China. The methodology adopted to analyze the datasets is similar to³¹ but the time period used in this study is from 2004-2013. Also, for comparative purposes, balanced panel datasets have been used.

The study used the definition of value of bilateral trade. It has been considered to be a (natural) log-linear function of the independent variables. The model used in the study incorporated additional variables to the basic gravity model. The independent variables included log normal product of the two countries' national incomes, the product of the two countries' per capita incomes and distance (in kilometers) between the economic centers of gravity of the two countries, contiguity, common language and common colony. According to the literature,

trade between India and its trade partners is expected to increase with size, per capita income, contiguity, common language and common colony and to decline with distance. Similar result is expected for China.

The study is undertaken in two parts. The panel dataset for each country are analyzed first and then the financial crisis impact is analyzed.

Two different and unique datasets for India as well as China were created for the purpose of the study. The data is collected from International Monetary Fund, CEPII's Geodist database created by Mayer and Zignago (2005) and United Nations Conference on Trade and Development (UNCTAD).

Panel regression model has been used in the study to estimate the effect³². The model used in this study is the random effects panel regression model which takes the following form (Panda and Sethi, 2015):

$$\text{TRADE}_{ijt} = \beta_0 + \beta_1 \text{Lngdp}_{ijt} + \beta_2 \text{Lnpci}_{ijt} + \beta_3 \ln(\text{DIST}_{ij}) + \beta_4 (\text{CONT}) + \beta_5 (\text{COMLANG}) + \beta_6 (\text{COMCOL}) u_{ijt} + \varepsilon_{ijt} \quad (1)$$

The dependent variable in the model is TRADE_{ijt} which is the log of bilateral trade value between India/China and the partner country in year t. The independent variables include Lngdp_{ijt} which is the log normal product of the two countries GDP at time t, Lnpci_{ijt} which is the log normal product of two countries per capita incomes at time t, $\ln(\text{DIST}_{ij})$ is the distance between the two countries, CONT takes the value of 1 if the two countries are contiguous and zero otherwise, COMLANG takes the value of 1 if the two countries share a common official language and zero otherwise and COMCOL which takes the value of 1 if the two countries had a common colonizer. U_{ijt} is the between entity error term and ε_{ijt} is the within entity error term. The expected signs of the variables are provided in Table 1.

Table 1. Expected relationship of independent variables with the dependent variable

Variable	Variable Name	Expected Sign of Relationship
Lngdp_{ijt}	Gross Domestic Product	+
Lnpci_{ijt}	Per Capita Income	+
DIST_{ij}	Distance	-
CONT	Contiguity	+
COMLANG	Common Language	+
COMCOL	Common Colony	+

For the Pre and Post crisis analysis, Ordinary Least Squares (OLS) regression has been used for the individual years 2005 and 2010.

The OLS model used for this analysis is as follows (Panda and Sethi, 2015):

$$\text{TRADE}_{ij} = \beta_0 + \beta_1 \text{Lngdp}_{ij} + \beta_2 \text{Lnpci}_{ij} + \beta_3 \ln(\text{DIST}_{ij}) + \beta_4 (\text{CONT}) + \beta_5 (\text{COMLANG}) + \beta_6 (\text{COMCOL}) + \varepsilon_{ij} \quad (2)$$

The dependent variable in the model is TRADE_{ij} which is the log of bilateral trade value between India/China and the partner country. The independent variables include Lngdp_{ij} which is the log normal product of the two countries GDP, Lnpci_{ij} which is the log normal product of two countries per capita incomes at time t , $\ln(\text{DIST}_{ij})$ is the distance between the two countries, CONT takes the value of 1 if the two countries are contiguous and zero otherwise, COMLANG takes the value of 1 if the two countries share a common official language and zero otherwise and COMCOL which takes the value of 1 if the two countries had a common colonizer. ε_{ij} is the error term.

The results of the analysis are provided in the next section.

3. Results and Discussion

The panel regression results and financial crisis results for India and China are presented in the sub sections below.

3.1 Panel Regression Results

The panel data regression results are presented in Table 2.

It is evident from the table that for India and China both, distance is coming negative and significant. This means that trade flows are inversely proportional to the distance between the countries. For India, GDP is positive and significant at 1% level of significance which means that Indian trade is positively influenced by the size of the partner's GDP while this is not true for China. However, China's trade flows are positively and significantly impacted by the per capita income of the trading partner while that is not the case with India. Indian trade flows are, in fact, negatively impacted by the per capital income of the trading partners. Another interesting finding is that China's trade flows increase with the countries sharing common language.

Table 2. Comparison of panel regression results for India and China

Variable	India_Model	China_Model
Constant	7.073*** (1.185)	6.889*** (1.205)
Lngdp_ijt	0.057*** (0.015)	-0.050* (0.024)
Lnpci_ijt	-0.063*** (0.018)	0.182*** (0.033)
DISTij	-0.600*** (0.133)	-0.634*** (0.129)
CONT	0.294 (0.410)	-0.077 (0.247)
COMLANG	-0.274 (0.195)	1.035* (0.411)
COMCOL	-0.285 (0.192)	-
Number of Groups	175	176
Number of Observations	1750	1760
R-square overall	0.216	0.154

Note: The standard errors are in parenthesis. Statistical significance is denoted as * $p < 0.01$; ** $p < 0.05$; *** $p < 0.001$

3.2 Pre-Crisis and Post-Crisis Regression Results

A cross sectional dataset for 2 years – 2005 and 2010 was created for this analysis and then Ordinary Least Squares regression was fitted on it. The results for India are provided in Table 3 and those for China are provided in Table 4.

Table 3. Regression results for India for the years 2005 and 2010

Variable	2005	2010
Constant	-7.762*** (1.557)	-8.260*** (1.299)
Lngdp_ijt	0.484*** (0.040)	0.518*** (0.032)
Lnpci_ijt	0.0672 (0.063)	0.024 (0.052)
DISTij	-0.454*** (0.135)	-0.412*** (0.109)
CONT	0.452 (0.417)	0.045 (0.336)
COMLANG	0.238 (0.195)	-0.041 (0.158)
COMCOL	-0.027 (0.200)	0.318** (0.161)
Number of Observations	175	175
R-square	0.627	0.730

Note: The standard errors are in parenthesis. Statistical significance is denoted as * $p < 0.01$; ** $p < 0.05$; *** $p < 0.001$

Table 4. Regression results for China for the years 2005 and 2010

Variable	2005	2010
Constant	-8.930*** (1.044)	-8.116*** (1.095)
Lngdp_ijt	0.456*** (0.019)	0.445*** (0.020)
Lnpcl_ijt	0.024 (0.032)	-0.006 (0.034)
DISTij	-0.075 (0.083)	-0.068 (0.085)
CONT	0.049 (0.158)	0.067 (0.160)
COMLANG	1.010*** (0.257)	0.847** (0.262)
Number of Observations	176	176
R-square	0.834	0.812

Note: The standard errors are in parenthesis. Statistical significance is denoted as * $p < 0.01$; ** $p < 0.05$; *** $p < 0.001$

For the pre-crisis period, it has been found that for both India and China, trade is positively and significantly impacted by trade partner's GDP. Indian trade was impacted negatively by distance pre-crisis while China trade shows no significant impact of distance on its trade flows. However, China's trade pre crisis is positively and significantly impacted by common language.

For the post-crisis year, for China it has been found that there is a slight change in the significance of common language, it became a little less significant. For India, trade flows post crisis were more with countries which shared common colonizer with India along with the pre-crisis variables showing the same significance.

The trade policies for both the countries are different and it can be seen from the empirical results. For India, Distance has come significant in all the models but for China though overall it has come significant but when on looking at pre and post crisis, distance did not matter. Per Capita Income is significant for the overall data but for pre and post crisis years it did not matter. Having a common colonizer does not matter for India in the overall results but it became significant post crisis. China's trade is positively impacted by common language with the trading partner. This result is found in all the models related to China.

4. Conclusion

The gravity model applied in the study for the period 2004-2013 indicates that India and China trade flows are

mostly with geographically closer countries. Additionally, India's trade flows are with countries having higher GDP but with lower per capita income. China's trade on the other hand, is influenced by higher per capita income of the trading partner. Having common language for communication officially is another factor which influences Chinese trade flows. When crisis is introduced in the analysis, post crisis, common colony became an important influencer of trade for India. For China, the results remain almost the same as pre-crisis.

This study provides an insight on India and China's trade flows and partnerships. Many researchers have studied trade flows but change in trade partnerships over a time period for these emerging economies has not been extensively researched upon. This study attempts to bridge this gap and helps in identifying the key determinants of their trade flows. It also provides a pre and post crisis analysis of the trade partnership which might have future implications for trade policy and trade relations. This study is an attempt to apply gravity model in the panel data framework. Further research might be needed to apply the model to trade in services. There is a lot of scope to extend this preliminary analysis and make it stronger empirically.

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