

Journal of Economics and Business

Sunil, Anamika P., and Fang, Sun. (2020), A Gravity Model Analysis of IFDI - Exports Nexus: A Case Study of Indian Exports. In: *Journal of Economics and Business*, Vol.3, No.4, 1280-1289.

ISSN 2615-3726

DOI: 10.31014/aior.1992.03.04.280

The online version of this article can be found at:
<https://www.asianinstituteofresearch.org/>

Published by:
The Asian Institute of Research

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A Gravity Model Analysis of IFDI - Exports Nexus: A Case Study of Indian Exports

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Abstract

The impact of Inward Foreign Direct Investment's influence on a country's exports to the FDI source is a subject matter of significance. This paper applies an augmented gravity model of international trade with Foreign Direct Investment integrated into it to empirically estimate the factors that influence India's exports to its top ten FDI source countries. The top ten investor countries account for about 87 percent of the total FDI inflows into India and 40 percent of Indian exports in 2018. This paper attempts to examine whether the Inward Foreign Direct Investment flows from these nations influence the exports to these nations from India. To this end, IFDI stocks that the top ten investing countries hold in India and the exchange rate between Indian Rupee and their currencies are embedded into the augmented gravity model for international trade. Findings indicate that IFDI stocks have a highly significant and positive role to play in India's exports to the ten FDI source countries. Besides, the economic size of the investor nation, geographical distance, and geographical distance are significant determinants of the export volume as expected. However, the limited period of data used in the panel data regression may have affected the results. The findings may change if this element is altered. Further study, with a longer period, should be conducted to test the IFDI - Exports Nexus confirmed in this paper. In general, the government of India should continue improving the investment policies as well as undertake further export-oriented reforms in the economy to push India's exports.

Keywords: India, IFDI, Gravity Model, IFDI - Exports Nexus

1. Introduction

1.1 Inward Foreign Investment and Exports

In this era of globalization, international trade and investment are becoming increasingly popular. Exports, for all nations, serve as a method to generate the foreign exchange essential for funding the import of goods and

services; obtaining economies of specialization, scale, and scope in production; and for benefiting from the experience in export markets. Furthermore, export success serves as a measure of industry competitiveness of a country. Foreign Direct Investment, on the other hand, is an important source of capital for growth in developing economies. Developing countries frequently suffer from capital shortage, which is reflected in the savings-investment and import-export. To bridge this gap, inflows of foreign capital and growth in exports are deemed necessary.

Majority of the empirical literature supports that FDI and trade have a relationship. UNCTAD (2004) estimates that Multinational Corporations (MNCs) account for two-thirds of world exports. Since MNCs are responsible for a large proportion of world trade, it can be inferred that there is a close link between flows of FDI and trade. MNCs' production in a host country can generate demand for intermediate goods from the parent, resulting in a complementary relationship between flows of FDI and exports (Majeed and Ahmed, 2007). FDI traditionally played an important role in natural resource exports (ESCAP /UNCTAD 1994), and its role is growing in the exports of certain processed agricultural products. It is also playing an increasing role in services (UNCTAD 1998).

1.2 The Case in India

In 1991, the Government of India resorted to macro-economic reforms and structural adjustments (New Economic Policy/NEP) intending to bring in unison the real savings of the country and the needed investment in view. FDI inflows started pouring into Indian shores in 1991-92. The adoption of liberal and open policy measures concerning the private sector, FDI, trade, technology, and competition significantly facilitated the rapid growth phase for the Indian economy after 1991. The policy helped increase the FDI inflow into India and the increased inflows of FDI led to the expansion of cross-border production by multinational enterprises and their networks of closely associated firms in India. The improved policy and legal environment coupled with an abundant supply of cheap factors of production attracted foreign investors from various countries to invest in India. Consequently, the registered Foreign Direct Investment stocks in India rose to a cumulative level of US\$ 609,838 million in March of 2019 (Department for Promotion of Industry and International Trade, Government of India). Export-oriented FDI has been driving rapid export growth in many developing countries including India. It helps overcome barriers and difficulties arising from the 'country of origin' issues.

The top ten largest FDI source countries for India from 2000 to 2018 are Mauritius, Singapore, Japan, Netherlands, U.K., U.S.A., Germany, Cyprus, UAE, and France. These countries account for approximately 87 percent of the total FDI inflows into India and 40 percent of the export volume in 2018. Figure 1 shows the average exports from India to its top ten FDI source countries along with the average investment inflows to India from these countries for the time from 2014 to 2018 (the time-period in this study). The values are in million US\$.

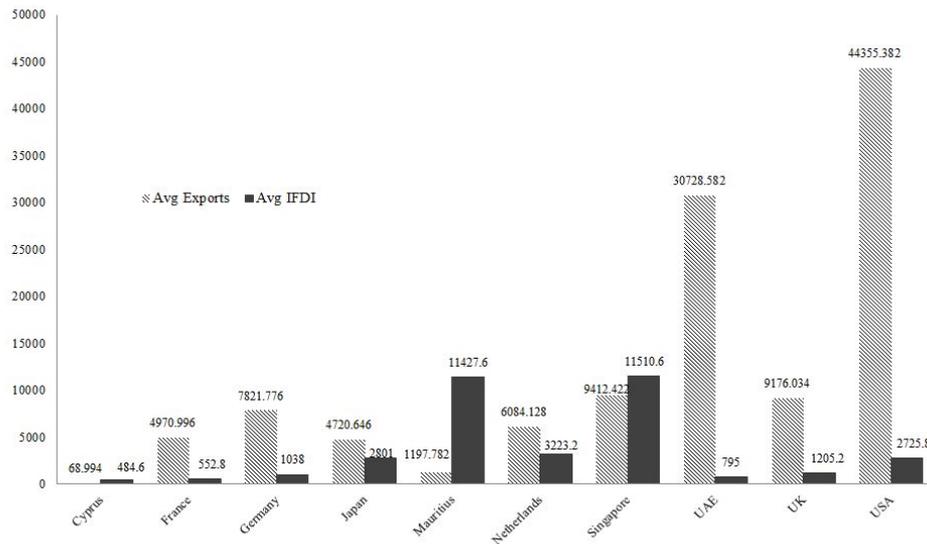


Figure 1. Indian Exports to its top ten FDI source countries

Figure 2 presents the cumulative IFDI according to each country’s share in the total volume. It can be seen that Mauritius has the largest share and France has the smallest share among the top ten countries holding IFDI stocks in India.

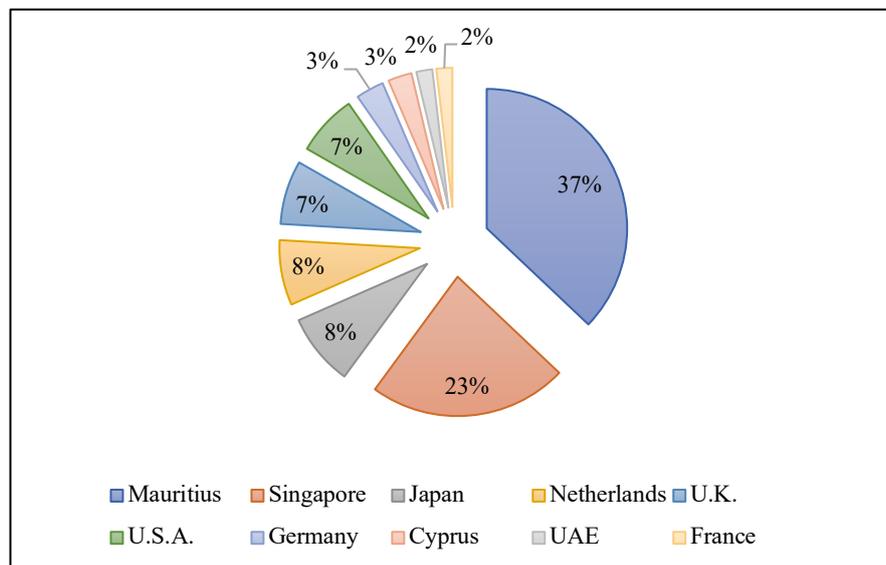


Figure 2. Cumulative IFDI from the top ten source countries

1.3 Literature Review

The relationship between FDI and trade has attracted extensive attention from many scholars (Mundell, 1957; Vernon, 1966, Dunning 1988, etc.). The role played by inward FDI in the export performance of developing countries is one of the intensely debated issues in the literature of development economics.

Comparative advantages vary across countries. Developing countries have a comparative advantage mostly in labor and natural resource endowments. Multinational enterprises relocate their production units into countries with cheap labor and natural resources. Dunning’s (1988) eclectic paradigm of international production combines three main factors in explaining international production: ownership factors (O) specific to firms, location factors (L) specific to home and host countries, and internalization factors (I) of firms (OLI framework).

MNCs are utilizing their ownership advantages through controlling specific assets in facilitating their foreign subsidiaries to reduce costs and generate returns. One of the most important location factors that act as an incentive for firms to invest abroad relates to lower costs of production. It is suggested that a firm's decision will have a pro-export bias in a high-cost host country and a pro-investment bias in a low-cost host country (Liu et al., 2016).

The differences in comparative advantages between countries play a determinative role in explaining the FDI-trade nexus (Helpman et al., 2004). The main purpose of MNE investing abroad is occupying local markets by direct green-field investments. Using host countries as an export platform is another motivation. The latter form of FDI, which is export-oriented, considerably boosts the exports of FDI host countries. Emerging outsourcing activities in the last decade is a typical example of export-oriented FDI.

Many studies find that FDI promotes the exports of FDI recipient countries. Aitken et al. (1997), in their study, established that FDI has a significant impact on exports. They examined the case of Bangladesh and found that the entry of a single Korean Multinational in garment exports led to the establishment of many domestic export firms, creating the country's largest export industry. Hu and Khan (1997) attribute the spectacular growth rate of the Chinese economy during 1952 to 1994 to the productivity gains largely due to market-oriented reforms, especially the expansion of the non-state sector, as well as China's "open-door" policy, which brought about a dramatic expansion in foreign trade and FDI. Magalhaes and Africano (2005) observed a strong complementary relationship between inward FDI and Portuguese exports while outward FDI has no impact on the exports. Greenway et al. (2004) and Kneller & Pisu (2007) observed that Multinational Corporations (MNCs), generated positive export spillovers and significantly increased the exports from local firms. Conversely, Barrios et al. (2003) found no evidence of export spillovers to local firms from the existence of MNCs in Spain. Ruane and Sutherland (2004) agree with Barrios' findings using the case of Ireland.

Sahoo and Mathiyazhagam (2003), in their study about IFDI in India, noticed that a positive correlation existed between FDI and exports. Chaturvedi (2011) analyzed the sector and country-wise FDI inflow to India and observed that Mauritius, Singapore, the USA, and the UK invest in India in the computer hardware and telecommunication sectors. The study revealed that foreign investment flows led to an increase in exports. UNCTAD (1999) stated that Transnational Corporations (TNCs) can uplift export competitiveness. Contrary to the above, the study by Hanson (2001) reported weak evidence in favor of the positive impact of FDI on the host countries. However, the country experiences with respect to the role of MNEs in export promotion vary a great deal because MNEs are highly selective about the location of export-platform, export-orientation, or offshore production (Kumar & Siddharthan, 1997).

For testing the FDI-export nexus in the context of India, the gravity model in this paper, as it is the most successful empirical trade device. The traditional gravity model of trade as proposed by Tinbergen (1962) follows the theory that bilateral trade flow is directly proportional to home and partner's GDP (economic size) and distance between two countries (transportation costs etc.), i.e., "the higher the national income, the higher the import demand, and since greater distance increases transport cost and thus increase the price of imported items" (Kabir & Salim, 2010). Kalirajan (2008) observes that including other factors than GDP and geographical distance can better describe trade possibilities and provide more consistent and adequate results.

Geographical distance serves as a proxy for transaction costs in gravity models. For geographically close countries, the transportation costs will be lower making exports easier and faster. However, geographical distance alone may be an inadequate estimate. Therefore, it is often enhanced with other proxies in academia. Adjacency, both in geographical proximity as well as cultural aspects, may lead to increased trade between countries. Countries that are culturally close to each other share similar tastes and preferences. It is also assumed that the past colonial relationship between trade partners will lead to more trade (Frankel et al., 1995). All these elements affect international trade and complete the geographical distance variable to reflect the economic distance. As such this paper will use all the variables above to study the Indian exports.

Rahman et al. (2006), using the gravity equation, revealed in his study that Bangladesh's trade is determined by the size of the economy and distance. Blomqvist (2004) applied the gravity model for Singapore and found that GDP and distance variables are important variables for Singapore's trade flows.

This basic model can be augmented with many factors, including FDI inflows. If a country is a recipient of export-oriented FDI, its export volume would be larger (Xuan & Xing, 2006). This is consistent with the theory that the products of FDI firms simply substitute the domestically made ones at the FDI source country. Given this unique impact of FDI on exports, it is reasonable to integrate IFDI into the augmented gravity model. Furthermore, exchange rates between the FDI source and the host country may play an important role in the inward FDI flows and export volumes.

One drawback of using gravity equations to study exports as a whole is that it overlooks the biases in estimation due to the use of the same parameters for different components of exports. Exports consist of inter-industry as well as vertical and horizontal intra-industry parts. Each part is different and is explained by a different trade theory. Therefore, one should remove unnecessary restrictions from the gravity model to account for the differences in components of exports.

Insights into the FDI - exports relationship will contribute towards a better understanding of the process of internationalization and its potential impacts on exports. There is hardly any study that conducted panel data estimation on the effects of IFDI from the top ten FDI source countries on exports from India to these specific countries. The objective of the study is, therefore, to find out if there is a positive relationship between IFDI and exports- with these specific countries in mind- using an augmented gravity model with IFDI embedded into it.

A panel framework allows the assessment of how the variables evolve through time and the evaluation of the specific time or country effects. Previous studies have used time series, non-specific (investing country-wise), data, and ARDL models to study the impact of IFDI on exports. Consequently, this paper contributes to the existing literature by presenting a different perspective. However, the limited time-period may have influenced the findings in this research.

The role played by inward FDI in the export performance of developing countries is one of the intensely debated issues in the literature of development economics (Teodora & Marinela, 2011; Elbeydi et al., 2010). This study attempts to analyze the impact of IFDI from these major investing countries to India on Indian exports to these countries (export performance). The paper suggests the existence of a positive relationship between the IFDI and export with regard to the major ten FDI source economies for India.

2. Method

2.1 The Model: An application of the Gravity Trade Theory

The gravity equation has been traditionally used to predict trade flows across countries. It was originally inspired by Newton's universal law of gravitation in physics which states that gravitational attraction between the two objects is proportional to their masses and inversely related to the square of the distance between them (Zhang & Kristensen, 1995; Christie, 2002).

The gravity model is expressed as follows:

$$F_{ij} = \frac{M_i M_j}{D_{ij}^2} \quad (1)$$

where,

F_{ij} is the gravitational attraction

M^i and M_j are mass of two objects i and j

D_{ij} is the distance between i and j

The gravity model for trade is parallel to this law: "the trade flows between the two countries is proportional to the product of each country's economic mass generally measured by GDP, and each rise to the power of

quantities to be determined divided by the distance between the countries respective economic centers of gravity, generally their capitals, raised to the power of another quantity to be determined” (Christie, 2002). The gravity model for international trade was first introduced by Tinbergen (1962) and Pöyhönen (1963) to interpret the bilateral trade flow patterns among the European countries. Ever since then, the gravity model has been used and progressively improved in empirical studies of international trade flows.

The gravity model belongs to the class of empirical models concerned with the determinants of interactions (Karagoz & Saray, 2010). The traditional gravity model forecasts that exports X_{ij} from region i to region j is proportional to the output Y_i of the exporter region and the expenditures Y_j of the importer region and inversely proportional to the distance D_{ij} between the two regions.

The classic gravity equation can be written as follows (after taking natural logarithms on both sides):

$$\ln X_{ij} = \alpha + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} \quad (2)$$

where,

X_{ij} is the export volume between country i and country j

Y_i and Y_j are the economic masses of the two countries i and j , represented often by GDP

D_{ij} is the distance between i and j

If a country is a recipient of export-oriented FDI, its export volume would be larger (Xuan & Xing, 2006) as the products of FDI firms simply substitute the domestically made ones at the FDI source country. Therefore, IFDI stocks will be integrated into the augmented gravity model to study the exports to the top ten IFDI investor nations. Furthermore, exchange rates between the FDI source and the host country may play an important role in the inward flow of FDI and export volume. Therefore, adding the exchange rate variable is also reasonable.

The concept of distance does not only imply the geographical distance (i.e. transportation costs) but also to elements influencing transaction costs such as a common language, free trade/preferential trade agreement, colonial links, etc. Frankel et al. (1995) show countries with colonial links trade more with each other.

A drawback of the model is the absence of a persuasive derivation of the model based on economic theory. Various researchers, notably Anderson (1979), Bergstrand (1985), and Deardorff (1998), have tried to render the model with a theoretical basis. Nevertheless, none of these derivations generate the gravity model in its most general form. Another imperfection of the gravity model is the absence of substitution between flows and disregard of third party effects on bilateral trade.

2.2 Data, Definition of the Variables, and Estimation of the Empirical Model

To analyze the pattern of Indian exports to its major FDI investor nations, panel data covering the period from 2014 to 2018 for ten country pairs (India- country j pair, where j is the FDI investor in India) is set up. There are 5 observations for each pair and a total of 8 variables including the dependent variable. In the traditional gravity model, IFDI is not included as a standard independent variable. The analysis in this paper, however, includes IFDI. Consequently, the endogeneity between GDP and IFDI may cause multicollinearity. To trim down the possible bias induced by the multicollinearity, the GDP of India from the right side of the gravity equation is removed and substituted into the dependent variable as the ratio of exports to the GDP of India ($\ln(X/Y)_{ijt}$). Subsequently, the possible multicollinearity caused by the correlation between India's GDP and IFDI is eliminated. At the same time, the impact of India's GDP is not ignored.

Based on the results of recent empirical studies on the relationship between the IFDI and exports, and to ensure an adequate examination of the Indian evidence, this study will be required to answer the following hypothesis (in the case of India):

H₀: There is a positive relationship between export to source country and IFDI stocks from the source country in India

H1: There is no positive relationship between export to source country and IFDI stocks from the source country in India

The study uses the following augmented gravity model with IFDI:

$$\ln(X/Y)_{ijt} = \beta_1 + \beta_2 \ln Y_{jt} + \beta_3 \ln IFDI_{stock_{jit}} + \beta_4 \ln ER_{ijt} + \beta_5 \ln Dist + \beta_6 CLang + \beta_7 BTA_t + \beta_8 ColLink + e_{ijt} \quad (3)$$

where,

- (1) \ln = Natural logarithms; e_{ijt} = error term, β represent the coefficients;
- (2) $(X/Y)_{ijt}$ = Ratio of exports to GDP in year t from country i (India) to country j (10 countries that invest the most in India); Export volumes collected from Department of Commerce, Government of India, GDP of India from World Bank database.
- (3) Y_{jt} = Country j 's GDP in year t (in US \$ millions); collected from the World Bank database.
- (4) $IFDI_{stock_{jit}}$ = Foreign Direct Investment stock in India from country j at time t (measured in US \$ millions); retrieved from Department for Promotion of Industry and International Trade, Government of India.
- (5) ER_{ijt} = Exchange rate between Indian Rupee and country j 's currency (Direct quotation); collected from the World Bank database, calculated w.r.t US\$.
- (6) $Dist$ = Distance between capital cities in the countries i and j ; taken from CEPII geodist calculations (2011).
- (7) $CLang$ = Dummy variable: 1 if country pair (i and j) shares a common official language, 0 otherwise.
- (8) BTA_t = Dummy variable: 1 if country pair (i and j) has bilateral agreements between them at time t , 0 otherwise; data from Department of Commerce, Government of India.
- (9) $ColLink$ = Dummy variable: 1 if country pair (i and j) shares common colonial history (same colonizers), 0 otherwise.

Matyas(1997), Egger (2000), etc., suggested the use of panel data in the gravity model since panel data is a general case of cross-sectional and time-series data. A panel framework allows the assessment of how the variables evolve through time and the evaluation of the specific time or country effects.

Table 1. Descriptive statistics of the variables

Variable	Obs	Mean	Std Deviation	Min	Max
$\ln(X/Y)_{ijt}$	50	-20.0105	1.7510	-24.4600	-17.7260
$\ln Y_{jt}$	50	27.4116	0.0927	23.1704	30.535
$\ln IFDI_{stock_{jit}}$	50	9.7830	0.9628	8.0210	11.8091
$\ln ER_{ijt}$	50	3.2910	1.7052	-0.5996	4.6537
$\ln Dist$	50	8.6186	0.4071	7.7463	9.3976

Tips: All values are rounded to 4 decimal places

3. Results and Discussions

The estimated results obtained from the model in this study have similarities with previous studies in the application of the gravity model to evaluate bilateral trade and foreign direct investment. The regression results for the augmented gravity model for Indian exports are reported in Table 2 below. The gravity model of India's exports has been estimated by Random Effect Model. The null hypothesis is rejected and the alternate hypothesis that IFDI has a significant and positive effect on the exports to FDI source countries is accepted. Estimated coefficients had nearly all the expected signs except for Exchange Rates between the countries' currencies and the bilateral trade agreement effect.

Table 2. Results of Panel Gravity Model Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-45.9797	9.0196	-5.10	0.000***
$\ln Y_{jt}$	1.4016	0.1631	8.59	0.000***
$\ln IFDI_{stock_{jit}}$	1.0244	0.3183	3.22	0.002***

LnER _{ijt}	-0.0796	0.0847	-0.94	0.353
LnDist	-2.6459	0.5740	-4.61	0.000***
CLang	0.4934	0.5519	0.89	0.376
BTA	-2.3852	0.4566	-5.22	0.000***
ColLinks	2.1859	0.8157	2.68	0.001**
R-squared :	0.8427	F(7,42) :		32.14
Adj R-squared :	0.8165	Prob > F :		0.0000

Tips: *, ** and *** denote 10%, 5% and 1% significance level, respectively

As it is seen, the export ratio of India with its top ten investor countries is significantly affected by the IFDI stocks and economic size of the investing countries. Greater levels of IFDI lead to greater levels of exports. Specifically, a one percent increase in IFDI stock will boost exports ratio (exports/GDP) to the FDI source country by 1.02 percent. Besides, the higher the GDP of the investor, the higher is the volume of exports from India to it. Distance is negatively related to exports, as expected. Increasing distance between the partners decreases the export volume. The coefficient for Exchange Rates is insignificant. This may be because it is the home country's MNCs in India that are exporting most of the products to the home country, and as such exchange rates may not matter. However, it is not verified (further study is required). The negative coefficient for bilateral trade agreement may be because, in the presence of a bilateral trade agreement, investments from source countries are not required. The bilateral trade agreements, by themselves, will allow exports from India to these 10 nations. Therefore, in presence of a trade agreement, IFDI is deemed unnecessary. The home countries will not invest in India, India will not receive export-oriented FDI and India's exports to these countries will be determined solely by demand for Indian goods in these countries. However, this is just a theory and further in-depth study is essential to understand this phenomenon.

Colonial links are seen to have a positive influence on exports, as expected. However, sharing a common official language does not have any significant effect on the exports to FDI source countries. The R-squared value is 84.27% (percent of variance explained), implying that the model is acceptable and the model is well fitted.

4. Conclusions

The macroeconomic reforms and structural adjustments in the Indian economy in mid-1991 liberalized trade and investments and greatly enhanced India's economic growth, export performance, and FDI inflows. India ranked fifth in the top 10 investment nations list in 2018 (Times of India). It also emerged as the top recipient of Greenfield FDI Inflows from the Commonwealth (The Commonwealth trade review in 2018). The top ten investor nations in India accounted for a whopping 87 percent of the total IFDI in India from 2000 to 2018. Besides, the exports to these ten countries accounted for roughly 40 percent of India's total exports in 2018. As such, a need arises to investigate whether the FDI inflows have an impact on the exports, with respect to India and its top ten IFDI source nations.

The main purpose of this study is to examine the effect of IFDI stocks that the ten countries included in the study hold in India on India's exports to them. The study employs the gravity model of trade to analyze Indian exports to ten major investors. The traditional gravity model is augmented to include the IFDI stocks variable along with the exchange rate, colonial links, common language, and bilateral trade agreements, the final three being dummy variables. Estimation results indicate that IFDI stocks have a very significant influence on exports. A one percent increase in IFDI stocks would give rise to a 1.02 percent increase in the exports to GDP ratio. It is also revealed that exports between India and the top ten investors in India are mainly affected by the economic size of the investing country, geographical distance, bilateral trade agreements, and colonial links. Positive relations are found between exports and economic size/GDP of the investing nation and colonial links. Geographical distance, as expected, adversely affects exports. However, the negative coefficient for existing bilateral trade agreements is unexpected and needs further analysis.

The study also has some limitations. The time period used is in the panel data regression only ranges from 2014 to 2018. Analysis with large scale data of space and time should be conducted to get improved results. Exports are studied in general; analysis based on inter-industry and intra-industry trades or whether the exports are manufactured goods or natural resources may give interesting and different results. However, the study was successful in explaining the IFDI - exports nexus and the results are in accordance with most of the existing literature.

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