

Empirical Analysis of India's FDI inflow with Gravity and Trade Model Variables

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Abstract

This paper analyses the FDI inflow in India from major trade blocs which includes EU, NAFTA and ASEAN i.e. whether the FDI inflow indeed affected by the Import, Export, and core gravity model variables by applying Gravity Model on the panel data from the period of 1996 to 2017. The panel data is examined by the Multi-level mixed-effect model with linear regression and ML method of estimation is used for estimating the model. The study will attempt to examine FDI Inflow relationship with the import, export and gravity model variables i.e. whether FDI Inflow is significantly dependent on the trade and gravity model variables. The study found that that export has a positive relationship with the FDI inflow in India in the case of ASEAN and EU whereas with NAFTA it has a negative relation with the export. Variables like per capita Income of India and per capita income of partner trading blocs shows a positive relationship with the FDI Inflow in India.

Keywords: FDI, Trade, Import, Gravity Model.

INTRODUCTION

Recently with rapid growth of Foreign Direct Investment (FDI) along with the international trade and FDI agreements has provided a push to FDI and trade at the national and international levels, and also redirect attention towards FDI and trade relationship. Businesses and policymakers alike must understand the inter-linkages between trade and FDI. Increasing globalization of trade and investment policies at the national and international levels contributed to the impressive growth of FDI and trade (Nunnenkamp & Spatz, 2003). As there are many numbers of countries indulging in the trading blocs their scope continues to rise in the world economy which results that more or less every nation in the world is now a member of some form of economic alliances, each country has its priorities and objectives and every countries are on a different trajectory of regional integration (Switky, 2000). At the macro level, many countries are also following the policies of globalization, privatization, and deregulation of the market and removing of structural distortions so that they will integrate with the rest of the world which also leads to increase the trade and FDI inflow. Trade blocs along with Inter and Intra trade also focus on the foreign investment from the outside which is also a vital component of their structure. When a country indulged in a trade bloc establishment it has many advantages which mainly

includes economies of scale, foreign direct investment, competition, market efficiency and trade effects.

In the present paper, we are taking three main developed trade blocs which include EU, ASEAN and NAFTA as these trade blocs are the result of the economic and regional integration so after this integration whether it becomes beneficial for nonmember country like India in terms of FDI inflow from these trade blocs and is there is any relation between FDI and trade this mainly what we are trying to find.

After the arrival of the new globalization era, the FDI inflows in the developing countries have been increased reasonably and it becomes a vital agent for the economic growth, employment and increasing the efficiency in the host countries. Majority of the developing countries have been liberalizing their FDI regimes by various ways of reforms in the various sectors in the hope of obtaining access to developed countries' advanced technologies with technical and management knowhow into their domain. It also increases the foreign currency and foreign reserves and reduces the balance of trade deficit. It is a significant means to channelize technology transfer from the developed countries towards the emerging economies (Bose and Kohli, 2018). Inflows of FDI to the developing countries increased remarkably in the 1990s and now accounts for about 47% of global FDI (UNCTAD, 2017).

India has been liberalizing their economy since 1991 in an effort to stabilize the economy and to uplift the economy from the crises. Trade and FDI inflows experiencing a sharp increase especially after the reforms which cause us to find the reason and logic of it. There are important questions regarding the trade and FDI i.e. are FDI and trade show some kind of relationship? Can it be substituted with each other? Is there any relationship between FDI and economic size and distance? And whose answer we are trying to find via this paper. Any form of relationship between FDI and GDP, Distance and other gravity model variables? Can gravity model predict the relationship between the variable for the developed trade blocs and India? These are some few questions which are arising in our mind.

METHOD

The gravity model which we use in the present paper has been developed and used in the recent literature also to find out the dependency of FDI inflows on trade and gravity model variables. This paper determines the relation between trade, Gravity model variables and FDI inflows in between India and trade blocs (EU, NAFTA, and ASEAN). This present paper specifies a Gravity model that is based on the Tinbergen (1962) and Linneman (1966) bilateral model of trade. A typical gravity model expresses bilateral trade flows between a pair of countries as a function of the two countries' economic size, their income levels, geographical distance between the two, populations, and also qualitative factors such as adjacency, a common language, membership in RTAs etc. This paper seeks to find whether the FDI Inflow indeed effected by the GDP, Import, export, Geographical Distance in case of India and trade blocs from the time

period of 1996 to 2017. In this study, the gravity model is specified and re-parameterized into a time series and cross-sectional framework. We have time-series data for the Import and Export and cross-section data for the distance which we assume as a proxy of transportation costs and time in the trade. The equation of the model is most useful in our study for several reasons. The sign of the coefficient of the FDI variable viz., the dependent variable will indicate the nature of the relationship between trade (Import and Export) and FDI i.e., if positive, we can infer a complementary relationship, while a negative sign of the coefficient would indicate a substitution relationship between the two. In this paper, FDI is taken as dependent variables whereas import, export, distance, GDP and per capita income is taken as an independent variable.

The gravity-type equation for our purpose takes the following form:

$$\text{Log (FDI)}_{rpt} = \beta_0 + \beta_1 \text{logimport}_{rpt} + \beta_2 \text{logexport}_{rpt} + \beta_3 \text{logGDP}_{pt} + \beta_4 \text{logGDP}_{rt} + \beta_5 \text{logpcGDP}_{rt} + \beta_6 \text{logpcGDP}_{pt} + \beta_7 \text{logDistance} + \varepsilon_{rpt} \quad (1)$$

Where FDI_{rpt} in the equation represents total FDI inflow between home and partner country, where subscripts r and p identify the reporting (home) country and partner country, respectively. The independent variable Imports_{rpt} represents imports of reporter(r) country from its partner (p) at time t while Exports_{rpt} represents exports of reporter(r) country from its partner (p) at time t . The variable GDP_{rt} represents the GDP of the reporter country and the variable GDP_{pt} represents the GDP of the partner country. The coefficient betas on imports and exports (β_1 and β_2) i.e. β_1 is the coefficient of Imports_{rt} and β_2 is the coefficient of the Exports_{pt} . The variable pcGDP_{rt} represents the per capita income of the reporter country and the variable pcGDP_{pt} represents the per capita income of the partner country. The coefficient betas of the variables (β_3 and β_4) i.e. β_3 is the coefficient of the GDP of reporting country whereas β_4 is the coefficient of the GDP of the partner country. The distance_{rp} variable captures the trade distance in Km between the trading country pairs. The distance variable has a negative relation with the trade between the two countries as per the gravity model. The coefficient β_5 represents the coefficient of the distance variable. This, the equation states the FDI flows between two countries depend on each country's GDP, distance, Import, Export and per capita income of each country.

Maximum Likelihood (ML) is the method of estimation for the estimation of the model in equation 1. Preliminary data analysis is employed to ensure that the Multilevel mixed-effect model with linear regression and ML method of estimation is appropriate for estimating the model. This estimation is done for the trade blocs which include ASEAN, EU, and NAFTA. First, we apply this regression method to estimate the results regarding the gravity model variables between India and ASEAN. Data which we used for the estimation of the results between India and ASEAN is based on the assumption that Singapore, Malaysia, Indonesia, and Thailand the main members of ASEAN and they represent the ASEAN. As we assume that countries with major GDP are big in economic size has more capability to invest in the other country. Similar is the case with the other

trade bloc which is EU whose estimation result acquire with this similar method of estimation as used for ASEAN. So, data which we used for the estimation of the results between India and EU are based on the assumption that UK, Germany, Netherlands, Cyprus, Belgium, Italy, France and Spain which are the main members of EU and represent the EU. As we know Germany, France, UK, Netherlands, Cyprus, Belgium, Italy, and Spain is the major economy of the EU in terms of GDP is a concern and in terms of share of FDI inflow in India. In this study, we consider the UK still as a member of the EU. As far as NAFTA is a concern we are considering only the US and Canada for the analysis, Mexico is excluded due to the negligible share of FDI inflow from it towards India. We apply the regression upon the variables mention in the model and estimate the result of the gravity model.

The analysis has been performed for a few major countries within the trade blocs like only eight major countries of the EU, Four major economies of the ASEAN and two countries of NAFTA. So, countries which we have taken into the account for the trade blocs their result will represent the result with the blocs. However, countries which are not taken into concern for the calculation of the result and because of their insignificant share of FDI inflow in the host country and also the insufficient data for the variables taken into account. There are many types of gravity equations were given by various economists to evaluate the effects of different variables like GDP, distance, etc on the FDI inflow. Gravity models have been augmented with variables representing factors that could either facilitate or impede trade. We use Multi-level mixed effect technique in STATA package to obtain results of the mentioned model in equation (1).

Database

For present study, data have been collected for bilateral trade, exports & imports, and FDI inflows for the selected group of trading countries, during the period of 1996 to 2017. Given our focus on the trade blocs, we centre our countries assortment around the four major economic Association/Summit of ASEAN, eight major economies of EU and two NAFTA member nations. Data on GDP for India and the EU (UK, Germany, Netherlands, Spain, Belgium, France, and Italy), ASEAN (Indonesia, Thailand, Singapore, and Malaysia) and NAFTA (USA and Canada) economies were obtained from the World Bank (World development indicators). Data on per capita GDP were also taken from the World Bank Development Database through the WDI data query (<https://dvddata.worldbank.org/data-query>). Data on India's export & import with all its trading partners in US\$ has been taken from the Direction of Trade Statistics, IMF. The data for distance is taken from Centre D'etudes Prospectives Et D'informations Internationales.

The data for bilateral FDI inflows are obtained from indiastat.com and Department for Promotion of Industry and Internal Trade (DPIIT). Since the models estimate FDI inflows from 1996 to 2017 per capita GDP figures from the World Bank database query were used. All Trade volume figures are in millions of U.S. dollars and both GDP and per capita GDP figures are stated in PPP(constant

201 1 US \$) terms. Missing data for the variables is treated as zero values. The data for the Import and Export, Distance, GDP, FDI inflow and per capita GDP are converted to natural log form. The data for this analysis is unbalanced and the period for this analysis is from 1 991 to 201 7.

RESULTS AND DISCUSSION

Among the member countries of the trade blocs, Singapore, UK and USA were among the countries that have the highest share of FDI inflow in India. In which Singapore is the only member country of ASEAN who is the topmost investing countries in India in terms of FDI inflow with the share of above 1 8.78% i.e. 80.1 2 billion US\$ from the time period of 1 991 to 201 8. USA contributes a major share of FDI inflow i.e. 93% among NAFTA members however India's investment in the US is also picking up (Ministry of external affairs report, 201 7). EU members which include the UK, Cyprus, Germany, France, and the Netherlands are among the topmost investing countries in India in terms of FDI inflow. Majority of FDI which we would call FDI from EU members in India has been contributed by the UK from 1 991 to 201 8 with a share of above 55% of total FDI inflow from the EU. UK is the largest source of FDI inflow in India among the EU members with a share 6.36% i.e. 27.1 6 billion US\$ followed by Germany, Cyprus, France, and Italy (Ministry of Commerce and Industry, Govt. of India, 201 8). Empirical results of the gravity model for three trade blocs viz., ASEAN, EU, and NAFTA with India as a reporting country are given step by step with their interpretations. The significant coefficient of the gravity model will strengthen the study that trade and FDI inflow between India and Trade blocs will reside on the gravity model. Present study reports the panel data estimation's result of the gravity equation for trade flows in between 1 996 and 201 7 in Table 1 , Table 2 and Table 3 when FDI is the dependent variable, and Import, Export, GDP, Distance and Per capita Income as the independent variable. Table 1 reports the results of the gravity model for India and ASEAN. Table 2 reports the results of the gravity model for India and EU and lastly, table 3 reports the results of the gravity model for India and NAFTA.

Table 1 , Table 2 and Table 3 provide the results of the gravity models estimated for India as a reporting country with ASEAN, EU, and ASEAN as a partner based on equation 1 . The unbalanced panel data regression model has been estimated for the ti h combination of reporting (r) country (i.e., India) with trade bloc over the study period; i.e. for trade blocs (ASEAN, EU, and NAFTA). The model has been estimated using the multilevel mixed-effect regression estimation technique.

The variable per capita GDP of partner bloc viz., ASEAN and export are significant at 1 % level of significance while the other variable GDP of ASEAN and distance is significant at 5% level of significance. The Variable export of India, GDP of ASEAN, and per capita income has a positive impact on the FDI inflow from ASEAN to India. The coefficient of export variable shows that with 1 % increase in the export of the reporting country leads to on an average 0.99% increase in the FDI inflow. The other significant variable viz., per capita income of

partner bloc leads to an average 3.81 % increase in FDI inflow with 1 % rise in the per capita income of ASEAN during the time period of 1996 to 2017. The variables distance, GDP of ASEAN, Export, Import and per capita Income has the expected theoretical signs while the GDP of the reporting country have unexpected theoretical signs. So, the FDI inflow in India links positively with the export variable. So as far as the relation of FDI with the gravity model variables in concern it has a positive relationship with the GDP of the partner bloc (ASEAN) as the income of the partner member countries of the ASEAN expands it boost the FDI inflow in India. FDI has a negative relation with the geographical distance in the case of ASEAN. As variables which are highly significant in case of ASEAN are export and per capita income of the partner bloc and both has positive relation with the FDI Inflow. So, we predict that for more FDI Inflow India needs to increase export and as the per capita income of the bloc increases it ultimately leads to the increase in FDI inflow in India. FDI inflow does not depend much on the gravity models variables.

Table 1: Gravity Model estimates of India and ASEAN for FDI Inflow						
Mixed-effects ML regression			Number of obs = 87			
Log likelihood = -85.423025			Wald chi2(8) = 278.82			
			Prob > chi2 = 0.0000			
FDI _{rpt}	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]	
Logimport _{rp}	.0006	.47485	0.00	0.999	-.9308	.9313
LogExport _{rp}	.9943***	.3859	2.58	0.010	.2379	1.7509
LogGDP _r	-17.3519	12.90	-1.34	0.179	-42.649	7.9461
LogGDP _p	2.5239*	1.3900	1.82	0.069	-.2005	5.2483
Logdistance	-1.5923*	.86403	-1.84	0.065	-3.2857	.1011
LogpcGDP _r	18.6546	16.0541	1.16	0.245	-12.8109	50.1202
LogpcGDP _p	3.8118***	.9587	3.98	0.000	1.9327	5.6908
_cons	112.6244	108.4364	1.04	0.299	-99.907	325.1559
Random-effects Parameters		Estimate	Std. Err.	[95% Conf. Interval]		
Var(Residual)		.4172251	.0632595	.3099642	.56160	
28						
Notes: ***=Significant at 1%, **=Significant at 5%,*=Significant at 10%.						
Source: Author's Calculation						

TABLE 2: GRAVITY MODEL ESTIMATES OF INDIA AND EU FOR FDI INFLOWn					
Mixed-effects ML regression				Number of obs	= 176
Log likelihood = -175.01526				Wald chi2(7)	= 614.72
				Prob > chi2	= 0.0000
FDI _{rpt}	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
Logimport _{rp}	.5455	.177	3.09	0.002	.1989 .8921
LogExport _{rp}	-.006	.299	-0.02	0.985	-.5918 .5802
LogGDP _p	.333	.205	1.63	0.104	-.0682 .7349
LogGDP _r	.417	.728	0.57	0.567	-1.0101 1.8433
Logdistance	2.454	.210	11.67	0.000	2.0423 2.8669
LogpcGDP _r	1.535	1.017	1.51	0.131	-.4580 3.5291
LogpcGDP _p	1.469	.422	3.48	0.001	.6413 2.2984
_cons	-29.035	6.623	-4.38	0.000	-42.018 -16.0534
Random-effects Parameters		Estimate	Std. Err.	[95% Conf. Interval]	
Var(Residual)		.4278	.0456051	.3471	.5272

Table 3 reports that the trade variables (export and import) are significant at 1 % level of significance while the other variables GDP, Distance, and Per capita Income are not significant in the case of NAFTA. The variables such as import, GDP of partner bloc and per capita Income has a positive impact on the FDI inflow in India, whereas GDP and per capita income impact are not significant. The variable export, GDP of reporting country and distance harms the FDI inflow in India. The coefficient of import variable shows that with 1 % increase in the import leads to on an average 0.82% increase in the FDI inflow during the period of 1996 to 2017.

Table 3: Gravity Model estimates of India and NAFTA for FDI Inflow					
Mixed-effects ML regression				Number of obs	= 44
Log likelihood = 10.573868				Wald chi2(7)	= 935.30
				Prob > chi2	= 0.0000
FDI _{rpt}	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
logimport _{rp}	.828103***	.2885729	2.87	0.004	.2625104 1.393696
logExport _{rp}	-2.895899***	.6958958	-4.16	0.000	-4.25983 -1.531968
logGDP _p	3.301328	14.53282	0.23	0.820	-25.18247 31.78512
logGDP _r	-8.759776	10.9242	-0.80	0.423	-30.17081 12.65126
Logdistance	-8.144851	204.3862	-0.04	0.968	-408.7345 392.4448
logpcGDP _r	15.0595	11.60694	1.30	0.194	-7.689693 37.80869
logpcGDP _p	3.636258	15.36789	0.24	0.813	-26.48426 33.75678
_cons	41.72846	852.1555	0.05	0.961	-1628.466 1711.922
Random-effects Parameters		Estimate	Std. Err.	[95% Conf. Interval]	
var(Residual)		.0362068	.0077193	.0238404	.0549879
Notes: ***=Significant at 1%, **=Significant at 5%,*=Significant at 10%.					
Source: Author's Calculation					

Table 4: Comparison of Coefficients for ASEAN, EU and NAFTA for FDI as dependent Variable						
	ASEAN		EU		NAFTA	
Variable	Coefficient	p> z	Coefficient	p> z	Coefficient	p> z
Logimport _{rp}	0.0006	0.999	.5455***	0.002	0.828***	0.004
LogExport _{rp}	.9944***	0.010	-.006	0.985	-2.895***	0.000
LogGDP _p	-17.352	0.179	.333	0.104	3.301	0.820
LogGDP _r	2.524*	0.069	.417	0.567	-8.759	0.423
Logdistance	-1.592*	0.065	2.454***	0.000	-8.144	0.968
LogpcGDP _r	18.655	0.245	1.535	0.131	15.059	0.194
LogpcGDP _p	3.811***	0.000	1.469***	0.001	3.636	0.813
Notes: ***= Significant at 1%,**= Significant at 5%,*=Significant at 10%.						
Source: Authors Calculation						

From the analysis of table 4, we can say that import variable significantly impacting the FDI inflow for EU and NAFTA and highly insignificantly for ASEAN. By comparing these coefficients with each other it may be concluded that the coefficient of import variable for NAFTA has the largest effect on the FDI inflow and the coefficient of EU comes in the second rank while the coefficient for ASEAN has the lowest effect on the FDI inflow and for this, it is also insignificant.

CONCLUSION

The paper aims to analyze the nature of the relationship between FDI Inflow with import, export, and gravity model variables with an emphasis on India and developed trade blocs. This paper shows the effects of different economic variables on the FDI inflow which is taken as the dependent variable. The following variables act as independent are import, export, GDP of reporting country with the partner member countries as a whole, a distance of reporting country with a partner, per capita income of the reporting country, per capita income of the partner bloc member countries as a whole. By applying the gravity model of bilateral trade flows between India and trade blocs, we found that some of these variables have a significant impact on the FDI inflow.

So from the above empirical evidence, we can conclude that that import variable significantly impacting the FDI inflow for EU and NAFTA and highly insignificantly for ASEAN and the coefficient of import variable for NAFTA has the largest effect on the FDI inflow as compare to others blocs. Export has a positive relationship with the FDI inflow in India in the case of ASEAN whereas for NAFTA and EU it has a negative relation. Export variable impacts significantly for the ASEAN and NAFTA whereas in case of EU it does not impact significantly. So trade variables show a significant impact on the FDI inflow, especially for the NAFTA. The distance coefficient of ASEAN and NAFTA is negatively affecting the inflow while the coefficient of EU impacting positively in the inflow. The distance

coefficient in the case of EU is much higher than the ASEAN and highly significant than it also. So, in the case of EU distance plays a key role in the FDI inflow. The variable per capita GDP of partner bloc has positively affected the FDI inflow in India for each trade bloc taken into concern and the coefficient of ASEAN and EU has a large and significant effect on inflow.

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