

India and Selected Multilateral Free-trade Blocs: Augmented Gravity Model

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Abstract

The study examined India's trade enhancement through the role of selected multilateral free-trade blocs like ASEAN, SAARC, NAFTA and EU through the augmented gravity model. The study used the augmented gravity model, the extension of simple gravity. Besides GDP and Distance, the augmented gravity model added other predictors such as regional trade blocs and WTO membership, which are captured as dummy variables to test the hypotheses. The result showed that predictors such as GDP, Distance, members of WTO, trading blocs like NAFTA and EU explained the moderate changes in Export than imports. The study applied various econometric techniques like ordinary least square (OLS) and Random effect on the augmented gravity model. The current study findings very much aligned with the previous studies in the literature.

“A day will come when the only fields of battle will be markets opening up to trade and minds opening up to ideas”

– Victor Hugo, 1849

1. Introduction

Post liberalization witnessed drastic changes in the Indian economy. Last three decades, India's average annual GDP growth rate is six to seven per cent. In the upcoming years, India's role in a global economy is imperative, especially in the Asia-Pacific context, she may play counter competitive to China. Among the trade bloc from Asia, such as ASEAN and SAARC and in the north part of the globe, NAFTA and EU needed India's role in their economic growth and in turn, India depends on their technology and investments. In this context, the current study is important to assess the what are the contributing factors for India's trade value, which included both export and import with various other countries and trading partners. The study used the augmented gravity model, a simple gravity model dealt with the trade flows between two countries, a country trade value is determined by-product of GDP of two countries which is positively related and distance is inversely related. However, this study extends the simple model by adding other factors such as trade blocs, member of WTO, religion, contiguity, common language and colony. The extended gravity model is known as the augmented gravity model. The following section covered various literature from the previous studies. Besides article covered Methodology and Data, Empirical Analysis, findings of the study and it also highlighted the policy implications and limitations of the study.

2. Review of literature

The gravity model is derived from the Newtonian gravity of law. Tinbergen and Pöyhönen are well known for their pioneer work in the simple gravity model. The volume of trade (Import, Export and FDI) between two countries is proportional to the product of GDP and negatively related to their Distance. The gravity model is widely covered in two domains, one from bilateral trade relationships from International relations and the other on International business and management domains. In both, domains various authors contributed the understanding and implications of the gravity model on bilateral and regional trade blocs. This study dealt with the augmented or extended gravity model suggested by the previous literature. Country relations with FTA cannot be straight because of diverse backgrounds and obstacles from both nations' political, strategic, economic, and security. India does not very agile like China on maintaining the bilateral and multilateral trade relationship; however,

it showed remarkable improvement in the recent days Tuli Sinha.¹ India started developing bilateral relationships with the North and South parts of the globe, even the central Asian region (CAR). Ishfaq Ahamd Malik and M Afzal Mir² used an augmented gravity model to evaluate the potential trade relationship with India and the Central Asian region. The study's outcome showed there is regional cooperation between India and CAR is improved, but still, there is much space to improve both sides, especially financial services, changing rules & regulations, and customs duties.

The gravity model is not only used well only for goods and commodities; the study focused on what are all the challenges and barriers between India's services trade flow and developed nations. a study suggested India can expand its services exports by signing MRAs on professional qualification with developed partner countries Prabir De.³ International trade experts have sceptics whether regional trade blocs hindrances multilateralism, however findings of the study showed, post-agreement with regional trade blocs, drastic improvement between member countries and India's trade value Manoj Pant and Amit Sadhukhan.⁴ Many studies took regional trade bloc as one key parameter to determine the trade flow between two nations; the study tested the coexistence of inter-and intra- industry trade and estimated a model for India in negotiating the regional trade agreement with other developing countries in Asia. India trade relations can be improved by maintaining good relations with the major partners like the USA, the UAE, EU. Bilateral trade relationship bring down the higher tariff rate, which in turn enhance the trade flow between India and partners Manoj Pant and Anusree Paul⁵

EM Ekanayake, Amit Mukherjee, and Bala Veeramacheneni⁶ showed the effects of the regional trade agreement on trade flow among the Asian countries; findings emphasized that bilateral trade is influenced by the GDP of both exporter and importers and population negatively related with trade flows. Both countries economic and political climate determines the success of the economic integration in the region of Asia. Most of the study dealt with empirical data collected from a public source. Using simulation analysis, between India and ASEAN Preferential Trade Agreement is analyzed. Besides the gravity model, the study used

¹"India-ASEAN Free Trade Agreement," *A Survey of Literature: IPCS Special Report*, no. 75 (2009).

²"India's Trade Potential with Central Asia: An Application of Gravity Model Analysis," *International Journal on World Peace* 31, no. 3 (2014): 53.

³"Assessing Barriers to Trade in Services in India: An Empirical Investigation," *Journal of Economic Integration*, 2013, 108-43.

⁴"Does Regionalism Hinder Multilateralism: A Case Study of India," *Journal of Economic Integration*, 2009, 222-47.

⁵"The Role of Regional Trade Agreements: In the Case of India," *Journal of Economic Integration* 33, no. 3 (2018): 538-71.

⁶"Trade Blocks and the Gravity Model: A Study of Economic Integration Among Asian Developing Countries," *Journal of Economic Integration*, 2010, 627-43.

a partial equilibrium modelling approach to quantitative assessment. The study revealed that imports might hit the domestic farmers, but it can benefit the consumers C Veeramani and Gordhan K Saini.⁷ Turan Subasat and Sotirios Bellos⁸ brought different results, poor governance of trade partners attraction of multinationals companies in selected Latin America region. These findings demand a further investigation to verify the author's claims. Many studies determine the FDI through the gravity model; one such study from Alena Dorakh⁹ tested the gravity model using Poisson Pseudo-Maximum-Likelihood models to account for both country-time-specific and country-pair variables, and study come out with FDI is increased to non-EU countries after they are integrated with EU.

One of the most diverged studies on the gravity model established the multidimensional factor on determining the bilateral trade value between the countries Min Zhou.¹⁰ This study not only diverged but was also robust in terms of model and sample considered. It captured 1950 to 2000 various bilateral trade. The study covered a five-decade of data, which captured the various dynamism of political-economic scenarios of the trading world. The highlighted geographical Distance difference in political culture between trade countries hampered the trade volume. All the differences are barriers to the fully integrated global economic system. Whether Regional Integration Promote the Multilateralization of Trade Flows?. Jérôme Trotignon¹¹ answer the question through gravity model using panel data. The study comes out with findings of regional trade blocs, and their integration stimulates the intra-bloc and extra-bloc of both importers and exporters.

2.1 More on Dependent variable (trade value)

Trade value can be defined by taking only Import or Export or combining both. Massimiliano Porto.¹² Used Import as an outcome variable, but there are studies such as Dorakh,¹³ Shigeru T Otsubo and Tetsuo Umemura¹⁴ that used FDI as an outcome variable. In India's context,

⁷"Impact of ASEAN-India Preferential Trade Agreement on Plantation Commodities: A Simulation Analysis," *Economic and Political Weekly*, 2011, 83–92.

⁸"Governance and Foreign Direct Investment in Latin America: A Panel Gravity Model Approach," *Latin American Journal of Economics* 50, no. 1 (2013): 107–31.

⁹"A Gravity Model Analysis of FDI Across EU Member States," *Journal of Economic Integration* 35, no. 3 (2020): 426–56.

¹⁰"Multidimensionality and Gravity in Global Trade, 1950–2000," *Social Forces* 88, no. 4 (2010): 1619–43.

¹¹"Does Regional Integration Promote the Multilateralization of Trade Flows? A Gravity Model Using Panel Data," *Journal of Economic Integration*, 2010, 223–51.

¹²*Using r for Trade Policy Analysis: R Codes for the UNCTAD and WTO Practical Guide* (Springer Nature, 2020).

¹³"A Gravity Model Analysis of FDI Across EU Member States."

¹⁴"Forces Underlying Trade Integration in the APEC Region: A Gravity Model Analysis of Trade, FDI, and Complementarity," *Journal of Economic Integration*, 2003, 126–49.

Rajesh Panda and Madhvi Sethi¹⁵ used trade value as the dependent variable.

2.2 More on explantaory variable

On the study's objective, different studies used different parameters to execute the gravity model. Many studies used GDP, Per capita income and Distance as explanatory variables in the simple gravity model. Augmented gravity model used multidimensional factors like polity, culture, religion, language, colony etc. Subasat and Bellos¹⁶ collated the various independent variables in their studies and showed the expected sign between the explanatory variables and dependent variable. The table is shown in Annexure C.

2.3 Rational behind choosing trade blocs (ASEAN,SAARC,NAFTA and EU) and their contributions

The current study chooses four trade blocs, namely, ASEAN, SAARC, NAFTA and EU; the first two represent the Asian region focus, and the other two is the Global North region. Table 1 shows the regions contributed close to 50 per cent on export category and on imports of India this region contributed to 25 per cent. NAFTA and the EU share similar contributions to India's exports among the four trade blocs. ASEAN and SAARC close to six to eight per cent. Though this study does not consider APEC to determine India's trade value, a past study showed APEC is the key trade bloc that contributed to India's Export and Import, Otsubo and Umemura¹⁷ showed inward FDI determinant direction of intra-APEC trades among the members.

2.4 Research Gap

From the literature, it is known there is a gap in the domain of the gravity model concerning India. Past studies have not considered data to test their model till 2020. Many studies on India considered a few simple gravity models like GDP and Distance, but this study considered the augmented gravity model. Past studies used only two blocs on regional blocs, either from South or North global, but this study comprehensively covered four blocs, two from South and north, respectively.

¹⁵"India and Bilateral Trade: A Gravity Model Approach." *International Journal of Business Insights & Transformation* 8, no. 2 (2015).

¹⁶"Governance and Foreign Direct Investment in Latin America."

¹⁷"Forces Underlying Trade Integration in the APEC Region."

Table 1 Export contribution

Year	Export ('000 cr)	ASEAN	EU	NAFTA	SAARC	Trade Bloc Contrb.
2017	288116790	0.07	0.18	0.18	0.07	0.50
2018	314500388	0.07	0.18	0.19	0.08	0.51
2019	315818779	0.06	0.18	0.19	0.07	0.50
2020	270762852	0.06	0.17	0.20	0.07	0.51

from the table 2, it is depicted that, NAFTA and EU contributes eight and ten percent respectively in India's import. Other two blocs ASEAN and SAARC may not contribute much to the India's import.

Table 2 Import contribution

Year	Import ('000 cr)	ASEAN	EU	NAFTA	SAARC	Trade Bloc Contrb.
2017	429423659	0.05	0.1	0.08	0.01	0.23
2018	605514285	0.05	0.1	0.08	0.01	0.25
2019	472729933	0.06	0.1	0.09	0.01	0.26
2020	362918022	0.05	0.1	0.09	0.01	0.26

3. Research Question

This research is attempted to answer the following research question through empirical analysis.

- Which trade bloc contribute higher enhancement of India's trade value
- Do other non-trading variables (religion, contiguity, common language and colony) contributes to India's trade value

3.1 Objective of the study

The study has the primary objective of

- Understanding the role of Free-trade Blocs on enhancing India's trade value
- Examining the role of non-trading variables in the gravity model
- Evaluating the predictor's role in explaining the changes in Import or Export or Both

4. Methodology and Data

This study applied typical econometrics statistical techniques. Since the study took both the year and countries as units of analysis, the panel data is used. From 2017 to 2020, data is captured on various gravity model parameters. Data sourcing is dependent on multiple sources of public sites. Data are taken from UN COMTRADE on Import and Export of various countries. USITC to get the data points for gravity model and nations GDP data from the world bank. Various data sources use their nomenclature, and data points may not be available for various parameters. A lot of data cleaning and management is done to make data for the analysis form.

5. Empirical Results

Than theory, the gravity model is very much aligned with the empirical model. The estimation of the model based on the Ordinary least method and random effect are used. The study followed the broad approach suggested by Porto.¹⁸ The study used basic R code from Porto and used other packages like stargazer to report the regression analysis Marek Hlavac.¹⁹ This study used three dependent variables, 1. Import, 2. Export and 3. Trade value, a combination of both Import and Export. The reason to use three dependent variables is to know among three which can be explained by the predictors better than others. As a first attempt, the basic model which limited to only the trade bloc with the outcome variable. One of the objectives is to find the statistically significant relationship between trade value and regional trade blocs. This study took four major blocs: ASEAN, SAARC, NAFTA, and EU. A study runs simple linear regression before it gets into the gravity model. Two regression is conducted, one for Import and the other for Export. In Import output, SAARC would not establish the relationship with Import, but other trade blocs obtained a significant statistical relationship. Similar to Export, all the blocs established a relationship. The output indicated that most of the trade blocs contribute trade value for India. The output is given below in table 1.

Table 3 Trade Bloc on Trade value (Import and Export)

=====				
	Dependent variable:			

	log_trade			
	(1)	(2)	(3)	(4)

Constant	23.803***	23.832***	23.808***	23.512***
	(0.226)	(0.226)	(0.221)	(0.237)
ASEAN	3.104***			
	(1.051)			
SAARC		2.825**		
		(1.122)		
NAFTA			7.956***	
			(1.674)	

¹⁸ *Using r for Trade Policy Analysis.*

¹⁹ *Stargazer: Well-Formatted Regression and Summary Statistics Tables* (Bratislava, Slovakia: Central European Labour Studies Institute (CELSI), 2018), <https://CRAN.R-project.org/package=stargazer>.

EU				2.890*** (0.612)

Observations	692	692	692	692
R2	0.012	0.009	0.032	0.031
Adjusted R2	0.011	0.008	0.030	0.030
Residual Std. Error (df = 690)	5.807	5.817	5.750	5.751
F Statistic (df = 1; 690)	8.723***	6.339**	22.578***	22.313***
=====				
Note:	*p<0.1; **p<0.05; ***p<0.01			

Table 2 showed the three models, which tested the augmented gravity model. The basic formula is shown below which used log of imports as dependent variable and rest of the variable as independent variable. The following equation is applied to test the model ,

$$\begin{aligned}
 \log_imports = & \alpha + \beta_1(\log_gdp_od) + \beta_2(\log_distance) + \\
 & \beta_3(colony) + \beta_4(religion) + \beta_5(contiguity) + \\
 & \beta_6(common_language) + \beta_7(member_wto_joint) + \beta_8(NAFTA) +, \quad (1) \\
 & \beta_9(EU) + \beta_{10}(ASEAN) + \beta_{11}(SAARC) + \\
 & \epsilon
 \end{aligned}$$

Similar way other two equation also shown, using log of exports and log of trade value as dependent variable. All 3 models used OLS regression techniques which is used by many studies.

$$\begin{aligned}
 \log_exports = & \alpha + \beta_1(\log_gdp_od) + \beta_2(\log_distance) + \\
 & \beta_3(colony) + \beta_4(religion) + \beta_5(contiguity) + \\
 & \beta_6(common_language) + \beta_7(member_wto_joint) + \beta_8(NAFTA) +, \quad (2) \\
 & \beta_9(EU) + \beta_{10}(ASEAN) + \beta_{11}(SAARC) + \\
 & \epsilon
 \end{aligned}$$

and ,

$$\begin{aligned} \log_trade = & \alpha + \beta_1(\log_gdp_od) + \beta_2(\log_distance) + \\ & \beta_3(colony) + \beta_4(religion) + \beta_5(contiguity) + \\ , & \beta_6(common_language) + \beta_7(member_wto_joint) + \beta_8(NAFTA) +, \quad (3) \\ & \beta_9(EU) + \beta_{10}(ASEAN) + \beta_{11}(SAARC) + \\ & \epsilon \end{aligned}$$

In all the above three equations, Only dependent variables are changed in all the above three equations, but independent variables are the same. Log GDP is the product of both countries, and Log Distance is the Distance between origin and destination, colony whether a trading country is under colony regime earlier, religion is about common or different religion by partners, common language about official language followed in both countries, contiguity between nations, member of WTO, and regional trade bloc which it is used in a previous regression equation. In model 1, log GDP is positively related with log Imports, and Distance and common language are inversely related, member of WTO is significant, which is expected, and on regional trade bloc, NAFTA is positively related. SAARC is negatively related, but the other two trade bloc is not statistically significant. Model 1 showed the Adjusted R square of .304 or 30%. $F = 28.46$ and $P < .001$ and RMSE is 2.94. In Model 2, the log of Export is the dependent variable, where Adjusted R square is improved compared to the previous model, which is .407 or 40%. RMSE is 1.94, which is reduced moderately, and $F = 44.12$ and $P < .001$. On significant variable relationship, NAFTA and EU become significant, but other blocs are non-significant. The third model RMSE is drastically increased, which is 4.62; NAFTA and SAARC are significant besides log of GDP, Distance, and member of WTO.

On evaluating the three models, model 2 seems to be better in terms of RMSE, R square and significant relationship. Across the three models, log GDP, Distance, NAFTA are consistently showed their significant relationship with the dependent variable and all these predictors obtained expected sign which is quite aligned with prior literature of gravity model.

Dependent variable:			
log_imports			
(1)	(2)	(3)	(4)

Constant	11.582*** (0.137)	11.637*** (0.137)	11.593*** (0.134)	11.419*** (0.144)
ASEAN	1.854*** (0.635)			
SAARC		0.765 (0.681)		
NAFTA			4.297*** (1.016)	
EU				1.654*** (0.370)

Observations	692	692	692	692
R2	0.012	0.002	0.025	0.028
Adjusted R2	0.011	0.0004	0.024	0.027
Residual Std. Error (df = 690)	3.511	3.529	3.487	3.482
F Statistic (df = 1; 690)	8.511***	1.262	17.900***	19.939***

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4 Ordinary Least Square method

Dependent variable:			
	log_imports (1)	log_exports (2)	log_trade (3)
Constant	17.767*** (2.198)	17.695*** (1.450)	35.462*** (3.470)
log_gdp_od	0.009*** (0.001)	0.006*** (0.001)	0.016*** (0.001)
log_distance	-1.555*** (0.237)	-1.310*** (0.156)	-2.866*** (0.374)
colony	0.402 (0.886)	0.636 (0.585)	1.038 (1.399)
religion	0.197 (1.763)	0.889 (1.163)	1.086 (2.783)

contiguity	0.614 (0.895)	0.683 (0.590)	1.297 (1.412)
common_language	-0.552** (0.237)	-0.027 (0.156)	-0.579 (0.374)
member_wto_joint	1.642*** (0.346)	1.811*** (0.228)	3.453*** (0.546)
NAFTA	3.958*** (0.885)	3.478*** (0.584)	7.436*** (1.397)
EU	0.453 (0.340)	0.431* (0.224)	0.884* (0.536)
ASEAN	0.208 (0.595)	-0.304 (0.393)	-0.096 (0.940)
SAARC	-1.953** (0.843)	-0.643 (0.556)	-2.596* (1.331)

Observations	692	692	692
R2	0.315	0.416	0.376
Adjusted R2	0.304	0.407	0.366
Residual Std. Error (df = 680)	2.945	1.943	4.649
F Statistic (df = 11; 680)	28.406***	44.121***	37.287***
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Note:	*p<0.1; **p<0.05; ***p<0.01		

$$\begin{aligned}
\widehat{\log_imports} = & 17.77 + 0.01(\log_gdp_od) - 1.56(\log_distance) + \\
& 0.4(colony) + 0.2(religion) + 0.61(contiguity) - \\
& 0.55(common_language) + 1.64(member_wto_joint) + 3.96(NAFTA) + \\
& 0.45(EU) + 0.21(ASEAN) - 1.95(SAARC)
\end{aligned}
\tag{4}$$

Model 2 showed that when the unit change in GDP leads to a change in the Export for 1%, on Distance, 1 unit increase leads to reduce the 1.31 of export values. A country that belongs to WTO members can enhance the trade value by 1.81. India's bilateral relationship with NAFTA increased trade values by 3.48; similarly, for EU is .43.

$$\begin{aligned}\widehat{\log_exports} = & 17.69 + 0.01(\log_gdp_od) - 1.31(\log_distance) + \\ & 0.64(colony) + 0.89(religion) + 0.68(contiguity) - \\ & 0.03(common_language) + 1.81(member_wto_joint) + 3.48(NAFTA) + \\ & 0.43(EU) - 0.3(ASEAN) - 0.64(SAARC)\end{aligned}\tag{5}$$

$$\begin{aligned}\widehat{\log_trade} = & 35.46 + 0.02(\log_gdp_od) - 2.87(\log_distance) + \\ & 1.04(colony) + 1.09(religion) + 1.3(contiguity) - \\ & 0.58(common_language) + 3.45(member_wto_joint) + 7.44(NAFTA) + \\ & 0.88(EU) - 0.1(ASEAN) - 2.6(SAARC)\end{aligned}\tag{6}$$

Random effects

Major econometrics techniques extended from the OLS model to fixed effect and random effect; this data is more suitable for a random effect based on Hausman the test. Advantage of random effect panel regression, which factored both cross-section and time-series data. The random effect is better than the OLS method in terms of rigour. The random effect has run for all three models. The study followed econometrics principles suggested by Yves Croissant and Giovanni Millo²⁰ to obtain the random effect.

From the table below, random effects, a model is explained. The random effect is very much similar to the OLS result. GDP, Distance, WTO membership, NAFTA and EU become statistically significant. Across three models, the Adjusted R square is slightly higher in the export model, which is .104 or 10.4%, however, unexpectedly, GDP is not significant on Export, but GDP is significant on import and trade value.

Table 5 Random effects

Dependent variable:		
log_imports	log_exports	log_trade
(1)	(2)	(3)

²⁰“Panel Data Econometrics in r: The Plm Package,” *Journal of Statistical Software* 27, no. 2 (2008): 1–43, <https://doi.org/10.18637/jss.v027.i02>.

Constant	23.543*** (4.091)	23.230*** (2.755)	47.056*** (6.572)
log_gdp_od	0.002*** (0.001)	-0.0002 (0.0003)	0.002*** (0.001)
log_distance	-1.769*** (0.464)	-1.515*** (0.313)	-3.295*** (0.747)
colony	0.453 (1.745)	0.684 (1.180)	1.139 (2.813)
religion	-0.268 (3.470)	0.443 (2.347)	0.153 (5.595)
contiguity	1.100 (1.757)	1.149 (1.188)	2.272 (2.833)
common_language	-0.503 (0.466)	0.020 (0.315)	-0.481 (0.752)
member_wto_joint	2.522*** (0.647)	2.655*** (0.436)	5.220*** (1.039)
NAFTA	5.059*** (1.721)	4.533*** (1.163)	9.645*** (2.773)
EU	0.890 (0.660)	0.849* (0.446)	1.760* (1.064)
ASEAN	0.205 (1.172)	-0.307 (0.793)	-0.102 (1.890)
SAARC	-2.346 (1.658)	-1.020 (1.121)	-3.385 (2.672)

Observations	692	692	692
R2	0.093	0.118	0.104
Adjusted R2	0.078	0.104	0.089
F Statistic	69.555***	91.372***	78.921***

Note: *p<0.1; **p<0.05; ***p<0.01

6. Findings

The current study findings very much aligned with previous studies; trade is expected to enhance with size, per capita income, common language, common colony and contiguity,

and to reduce with Distance between the trading partners Panda and Sethi.²¹ The current study showed that GDP, common language, contiguity could enhance the trade and distance decline. However, only GDP and Distance is statistically significant. In addition to this, the member in WTO is significant; the member who belongs to WTO can contribute to the country's trade. Across all the models, NAFTA and the EU increased India's trade on trade blocs. Across the year, the gap between Export and India is reduced in all the four blocs.

7. Discussion and Policy Implications

Though the study showed that Distance reduces the trade value between members, for India, in terms of geographical Distance, ASEAN and SAARC are much closer when compared with NAFTA and EU. However, the trade contribution on exports and imports is not remarkably enhanced; this empirical evidence brings some exogenous variables to model the gravity model on the empirical ground. Both Tariff and Non-tariff barrier needs to be regulated to enhance more trade among the members; however, some studies highlighted that what is beneficial for the bilateral relationship may put the state into trouble in domestic policy.

8. Limitations and Future Directions

The study has limitations from empirical result perspectives; both OLS and Random estimates showed the mixture result across three models of export, import and trade value; this needs further investigation to address why it is inconsistent between OLS and random effect across three different models. The study did not consider key blocs like APEC, and not much speak about bilateral trade relationship with African trade blocs COMESA and MERCOSUR. Most past studies considered the polity and population; however, it is not considered in the current study.

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Annexure A - Countries selected for the study

Afghanistan	Cameroon	Georgia	Lao.PDR	Niger
Albania	Canada	Germany	Latvia	Nigeria
Algeria	Central African Republic	Ghana	Lebanon	North Macedonia
Andorra	Chad	Greece	Lesotho	Norway
Angola	Chile	Greenland	Liberia	Oman
Antigua and Barbuda	China	Grenada	Libya	Pakistan
Argentina	Colombia	Guatemala	Lithuania	Palau
Armenia	Comoros	Guinea	Luxembourg	Panama
Aruba	Congo, Rep.	Guyana	Macao SAR, China	Papua New Guinea
Australia	Costa Rica	Haiti	Madagascar	Paraguay
Austria	Cote d'Ivoire	Honduras	Malawi	Peru
Azerbaijan	Croatia	Hong Kong	Malaysia	Philippines
Bahamas, The	Cuba	Hungary	Maldives	Poland
Bahrain	Curacao	Iceland	Mali	Portugal
Bangladesh	Cyprus	Indonesia	Malta	Qatar
Barbados	Czech	Iran, Islamic Rep.	Mauritania	Russian Federation
Belarus	Denmark	Iraq	Mauritius	Rwanda
Belgium	Djibouti	Ireland	Mexico	Samoa
Belize	Dominica	Israel	Moldova	San Marino
Benin	Dominican Republic	Italy	Mongolia	Saudi Arabia
Bermuda	Ecuador	Jamaica	Morocco	Senegal
Bhutan	Egypt	Japan	Mozambique	Serbia
Bolivia	El Salvador	Jordan	Myanmar	Seychelles
Botswana	Equatorial Guinea	Kazakhstan	Namibia	Sierra Leone
Brazil	Estonia	Kenya	Nauru	Singapore
Brunei	Ethiopia	Korea, North	Nepal	Slovak Republic
Bulgaria	Finland	Korea, South	Netherlands	Slovenia
Burundi	France	Kuwait	New Zealand	Somalia
Cambodia	Gambia	Kyrgyz	Nicaragua	South Africa

Annexure B - Independent variable and their sign

Gravity variables	Sign	Governance variables	Sign	Control variables	Sign
GDP target	+	Bureaucratic quality (T)	+	Same language	+
GDP source	+	Law and order (T)	+	Same religion	+
Distance	-	Democratic accountability (T)	+	Oil	+
		Control of corruption (T)	+	Difference in per capita GDP	+
		Regulatory quality (T)	+	Landlocked (T)	-
		Bureaucratic quality (S)	-	Landlocked (S)	-
		Law and order (S)	-	Inflation (T)	-
		Democratic accountability (S)	-	Inflation (S)	-
		Control of corruption (S)	-	Religion in politics (T)	+
		Regulatory quality (S)	-	Religion in politics (S)	-
				Government stability (T)	+
				Government stability (S)	-
				Socioeconomic conditions (T)	+
				Socioeconomic conditions (S)	-

Annexure C - Export from Major Trade Blocs 2017-2020

