Analysing India's Export Potential with G-20 countries

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Abstract

The study uses an augmented gravity model to analyse India's export potential with G20 countries, for furthering economic cooperation. It examines trade relations between India and the G20 countries with the help of the gravity model of international trade. Panel data from 1999 to 2019 were reviewed for the analysis of 42 trade partners. The results obtained confirm that there is export potential with G20 countries. Trade freedom and common language facilitate export and have positive impact on it. However an interesting relationship emerges with the economic complexity index where a significant negative impact of economic complexity is seen on India's export to the G20 countries.

It is estimated that India has an untapped export potential with twenty-four countries out of the 42 trade partners in G20 group.

Introduction

At both the national and international levels, trade is a huge part of economic study. Trade happens when all of the production elements aren't available at the same time at the place of production. Manufacturing, investment, and consumption activities do not all occur in the same place, but are all dispersed all over the world. Every producer must borrow the necessary resources from a region where they are plentiful. It also aids in lessening the negative effects of an unequal geographical distribution of economic resources (Ohlin, 1952). As a result, the diversity of productive resources influences international trade and is crucial to a country's economic development (Krueger, 1980). As a result, every nation engages in international trade in order to meet the demands and requirements of its economy and to build strong trade and economic links among nations.

The G20 is a major international economic cooperation forum that brings together leading industrialised and emerging economies. The G20 meets each year under the leadership of a different member, thanks to its rotating presidency and secretariat. India will head the G20 for the first time in 2023, determining the agenda, hosting the Leaders' Summit, and hosting discussions with ministers, government officials, and civil society.The G20 countries collectively account for around 80% of worldwide economic output, nearly 75% of global exports, and roughly 60% of the world's population. These percentages have stayed remarkably consistent.

The G20 Process appears to be evolving throughout two decades of operation, with a significantly broader breadth of engagement among member states. The agenda of the G20

Summit has shifted from a focus on finance to hard-core development issues. The following are the areas of cooperation for G20.

- Trade and investment promotion,

- Poverty alleviation,

- Job creation,

- Health and education,

- Environment protection,

- Climate change,

- Social inclusion and other mutually beneficial development concerns

The endeavour through this paper is to assess if India has any substantial benefits to reap from economic cooperation with G20 countries through the channel of trade and how should it shape its trade engagements with G20 economies.

1. Literature Review

Among the many studies using the gravity framework, a high percentage shares the research task of predicting trade potentials. Rahman (2003) has estimated trade potential for Bangladesh using panel data approach with economic factors like openness, exchange rates etc rather than natural factors. Christie (2002) estimates trade potential for Southeast Europe using ordinary least square estimation on cross section data from 1996-99. Kalbasi (2001) has analyzed the volume and direction of trade for Iran in a 76 country sample. The group of countries has been divided into developing and industrial countries and trade flows have been examined to determine the impact, if any, of the stage of development on bilateral trade.

Several studies have analyzed the trade enhancing impact of preferential trading arrangements. These studies predict the additional bilateral trade that would be a consequence of the economic integration of a set of economies. Both the cross section and panel data approach has been used by these studies. The cross-section as also the panel data approach is mainly static and refers to a long run relationship. Frankel (1997) has used the gravity model to investigate a host of issues like the estimates of trading blocs, role of currency links etc using cross-section and panel data. Frankel and Wei (1993) have examined bilateral trade patterns throughout the world and analyzed the impact of currency blocs and exchange rate stability on trade.

The most recently developed gravity model, by UNCTAD-WTO Trade Centre is *TradeSim.* This is being used for the estimation of trade potentials for countries with limited trade relations in the past, in particular transition economies. The model is in general being used to analyze the bilateral trade flows of developing countries with their trading partners.

2. Conceptual Framework

Newton's law of gravitation provides the foundation for the gravity model of mapping economic ties between two countries, or even multiple topics in some situations.
The gravity model of economic interaction was founded on Newton's universal gravitation theory. The gravity model of economic integration, first proposed by Tinbergen in 1962, is based on the idea that the relationship between economies is a direct proportion of economic mass and an indirect proportion of the distance between the economies being studied. The model can help in finding evidence in trade conglomerates as well as other features like migration, investment, and so forth.
According to Anderson and Wincoop (2003), in the case of a two-country scenario, the gravity model of economic interaction takes the following mathematical form:

$$X_{ij} = Y_i E_j / d^2_{ij}, \qquad ----- (1)$$

Where i signifies the country of origin; j — the country of destination; d — the distance between the two countries i and j.
The X_{ij} component measures the amount of goods/labour or any other factor of production that has passed between source i and destination j, and It is positively associated to the economic mass of both the origin and destination countries, while it is negatively related to the distance between the two economic units. This distance can encompass all of the elements that limit or obstruct trade. However, it was discovered that the volume of commodities and factors of production flow corresponded to well to the forecast when numerous dummy variables were added in the traditional gravity model, such as common political boundaries, same dialect or language, similar trade arrangements, similar cultural and historical foundations, and much more of a similar nature.

The model has been shown to be consistent with theories of trade based on imperfect competition models as well as the Hecksher – Ohlin model by trade theorists. The standard gravity model is credited to Helpman and Krugman (1985) by Frankel (1997). Helpman's derivation of a proportionate link between trade flows and country size does not take distance into account. However, there are various reasons why distance was included as an explanatory variable. The following are some of these explanations:

- Distance serves as a proxy for transportation expenses.
- The term "distance" refers to the amount of time that has passed since the shipment began. The probability of perishable commodities remaining intact decreases as travel time increases.
- Costs of synchronisation: when manufacturers integrate several inputs, the time of these inputs must be coordinated to avoid bottlenecks. The cost of synchronisation rises as the distance between two points grows.
- Transaction expenses: the costs of looking for trading opportunities and establishing confidence amongst possible trading partners may be connected to distance.

- Cultural distance: It's probable that greater geographic distance is linked to higher cultural differences. Cultural differences can stymie trade in a variety of ways, including obstructing communication, clashing bargaining methods, and so on.

The inclusion of the fundamental variables – income and distance – is justified by trade theories based on imperfect competition and the Hecksher-Ohlin model. Most studies, on the other hand, have incorporated extra variables to account for differences in geographic factors, historical relationships, and economic issues such as overall trade policy and exchange rate risk.

The optimal theoretical model for describing the empirical findings of the gravity model is a point of debate. The essential point is that the gravity model equation appears to be derivable from a range of prominent hypotheses. It's been claimed that the equation has gone from a shocking lack of theoretical foundations to an embarrassment of riches!

Therefore it is a suitable model for studying India's export potential with G20 countries.

Gravity model has been augmented over time to take into account various factors that influence trade and in the following analysis we'll come across variable that have been used for gravity model's augmentation.

3. Data and methodology

In addition to the basic gravity model equation we estimate an augmented gravity model equation to first analyze international trade flows and then estimate the export potential for India with its trading partners. The model is "augmented" in that, several conditioning variables that account for other factors that may affect trade have been included over and above the (the natural logarithms of) income and distance. The models basic and augmented as formulated for estimation are as follows:

As stated earlier basic gravity model the gravity model in its most basic form explains bilateral trade (TT) (exports or imports) as being proportional to the product of GDPiand GDPj and inversely related to the distance between them.

LnX_{ij} or LnM_{ij} or $LnTT_{ij} = LnGDP_i + LnGDP_j + LnDist_{ij}$

To account for other factors that may influence trade levels, other variable and a dummy variable have been added to the basic model. The augmented gravity equation is thus expressed as follows:

$LnXij = LnGDP_i + LnGDP_j + LnDistance_{ij} + ECIi + ECIj + TFIi + TFIj + Common\_ethno$

Justification for choice of variables:

i. **Trade Freedom Index (TFI)** as prepared and published by the Heritage Foundation annually, has been used as one of the explanatory variable to assess the impact of trade freedom in India and its partner countries on its exports. The Trade freedom index is based on two indicators: the trade-weighted average tariff rate and non-tariff barriers (including quantity, price, regulatory, customs and investment restrictions, and direct government intervention).

    The central mandate of G20 has been to safeguard the multilateral trading norms and regulations as highlighted in the very first Leaders' Summit in 2008. In fact, the G20 modified its stance on trade, switching from its steady commitment to "fighting protectionism" in its communiqués since 2008 towards "will strive to realize a free, fair, non-discriminatory, transparent, predictable and stable trade and investment environment, to keep our markets open" last year. In view of this TFI has been chosen as one of the variable in the augmented model.

ii. **Economic Complexity Index:** Hausmann and Hidalgo developed the Economic Complexity Index (ECI), which attempts to evaluate capabilities indirectly by looking at the mix of products that countries export. **Diversification and Ubiquity are the two main dimensions.**

    The ECI takes data on exports, and reduces a country's economic system into two dimensions:

    (i)   The 'diversity' of products in the export basket- . Diversity is the number of products that a country can export competitively

    (ii) The 'ubiquity' of products in the export basket, it is the number of countries that are able to export a product competitively.

    A country with higher ECI score has a more diversified and a less ubiquitous export basket. This variable has been chosen in view of G20's focus on Global Value Chain integration of economies.

    Increasing the country's share of GVC value added is linked to moving toward a more upstream position in production and increasing economic complexity. Second, encouraging GVC participation and increasing the share of domestic value added in a value chain necessitates efforts to lower trade barriers, improve infrastructure, foster human capital development, support research and development, and improve institutions. (Cheng, Rehman, and colleagues, 2015).

iii. **Common Language (official or commercial)** Dummy has been used traditionally in gravity models to see if countries sharing a common language have more propensity to trade. Common language is expected to reduce transaction costs as speaking the same language helps facilitate trade negotiations.

Table 1: Description of variables

Variables	Code	Unit	Database
Export and Import	X and M	Current USD '000	UN Comtrade
GDP	GDP_i	Current USD Billion	World Development Indicators
Trade Freedom Index	TFI	-	The Heritage Foundation
Economic Complexity Index	ECI_i	-	Observatory of Economic Complexity
Distance	Dist	Kilometers	CEPII, database developed by Head & Mayer(2002)
Common Language	Common_ethno		

Source: Author's compilation.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LnX	882	13.1731	1.985558	8.062441	17.80982
LnM	882	13.10189	2.510301	1.268074	18.31974
IndiaLnGDP	882	7.112277	.6178773	6.128659	7.962243
PartnerLnGDP	882	5.767994	1.761999	1.403524	9.972698
LnDist	882	8.731826	.3544471	8.02393	9.668899
India_ECI	882	.2763488	.0906352	.164277	.533074
Partner_ECI	861	1.01966	.6852646	-.871798	2.824203
India_TFI	882	49.10476	20.17854	19.6	72.6
Partner_TFI	882	79.38594	9.682436	38.2	88.4

Source: Author's calculation.

Table 2 provides a statistical description of the panel data structure that is considered for econometric analysis. The log transformation was done to make the data normal and linear, and suitable for gravity analysis.

4. Empirical results and their discussion

Table 3: Basic Gravity Model

Dependent Variable	India_LnGDP	Partner_LnGDP	LnDist
LnX	0.81(0.00)*	0.75(0.00)*	-0.13(0.75)
LnM	0.90(0.00)*	1.12(0.00)*	-0.515(0.24)
LnTT	0.795(0.00)*	0.943 (0.00)*	-0.347(0.36)

In testing for basic gravity model, it found that that the economic mass i.e. the GDP of India and partner country is significant in explaining the flow of trade however the distance is surprisingly found to be insignificant.

Table 4(a): Pooled OLS, Random Effect and Fixed Effect Model Estimation

Dependent Variable- LnX	India_ LnGDP	Partner_L nGDP	India_E CI	Partner_E CI	India_TF I	Partner_ TFI	Distance	Common Lang (Dummy)	Consta nt	R²
Pooled	0.65 (0.001)*	1.011 (0.00)*	-0.246 (0.487)	**-0.41** (0.00)*	-0.0011 (0.855)	0.0034 (0.298)	**-0.697** (0.00)*	0.43 (0.00)*	8.87 (0.00)*	0.797
Random	0.86 (0.00)*	0.66 (0.00)*	-0.41 (0.00)*	0.22 (0.003)*	-0.0019 (0.598)	**0.0091** (0.006)*	-0.26 (0.576)	**0.79** (0.048)*	4.63 (0.207)	within = 0.8455 between = 0.7034 overall = 0.7238
Fixed	0.93 (0.00)*	0.54 (0.00)*	-0.46 (0.001)*	0.230 (0.00)*	-0.002 (0.285)	**0.012** (0.001)*	Omitted	Omitted	2.39 (0.00)*	within = 0.8464 between = 0.6505 overall = 0.6636
Hausman Taylor Estimates	0.884 (0.000)*	0.624 (0.000)*	-0.427 (0.001)*	0.248 (0.00)*	-0.002 (0.366)	**0.0100** (0.003)*	0.081 (0.874)	-	1.73	-

Values in parenthesis are p values, *significant at 5% significance level

Table 4(b)

Augmented Gravity Model	Pooled OLS	Random	Fixed	Hausman Taylor Statistic
F-Statistic/Wald Chi-Square	419.25 (0.00)*	4485.21 (0.00)*	747.77 (0.00)*	4552.03 (0.00)*
Hausman Test			31.90 (0.0)*	
LM statistic		5854.68 (0.00)*		
*Significant at 1% level				

Values in parenthesis are p values, *significant at 5% significance level

Table 4 presents four different estimation methods along with reliable and consistent results. Firstly, pooled OLS was used to establish a linear relationship with the diagnostic test. But it turned out that the pooled OLS method is unable to capture the heterogeneity
effect of the panel data. Therefore, preliminary modelling is used to capture the unobserved effect of the panel data when the fixed effect model (FEM) estimates are analogous to the standard regression method. Intercept is considered in terms of cross-section units, but it doesn't work for time-invariant cross-section unit variables. Distance is a time invariant variable that is a vital component of the gravity estimate for the study. Therefore, a random effect model (REM) was adapted to collect distance information for analysing exports.

Additionally, the Hausman test was used to check which model was reliable and consistent among FEM and REM, whereas the Buresch-Pagan LM test was used
to see if Pooled OLS is a good estimation technique in this case or not. Keeping in mind the results as shown in Table4(b), as all the models give similar signs and indicate significance for the variables analysed therefore we may proceed with the identified variables for our policy analysis.

- India's GDP and Partner's GDP has a positive impact on Exports.
- Trade Freedom Index of partner countries have a significant and positive relationship with India's exports to G20 countries.
- Unexpected results are seen in the case
  Distance- Insignificant in both basic and augmented model.
  Economic Complexity Index- India's ECI has a significantly negative relationship with the exports.

Explanation:

"The more the partner's GDP is large, the less the distance is an obstacle to trade", Vêlayoudom Marimoutou, Denis Peguin, Anne Peguin-Feissolle. G20 is a group industrialized and emerging economies with relatively high GDP as compared to the global average. Distance in gravity model is nothing but the cost of entry, G20 countries with highly sophisticated and efficient trade logistics have virtually made the role of distance insignificant in trade.

Just eyeballing the Logistics Performance Index (LPI)Data reveals that almost all the G20 countries fall below the rank of 60 in the set of 163 countries analysed for LPI. Which implies that these countries are doing relatively well in the following areas as covered under LPI

a. Customs Clearance
b. Infrastructure
c. Tracking and Tracing
d. Ease of international shipments
e. Logistics service quality
f. Timeliness

Due to paucity of historical data a meaningful analysis couldn't be carried to validate the intuition here. However, an improved trade related logistics, combined with a liberalized economic environment, can increase trade volume and economies of scale and scope in distribution and production activities (Lakshman et al., 2001).

A significant negative relationship is seen with the estimated coefficient of India's Economic Complexity Index(ECI) and a significant positive one with partner country's ECI with India's exports.

This result is intuitively challenging, owing to which India's export profile was analysed from 1998 to 2018. If Indian exports are categorized into two baskets A and B then Basket A encompasses products with high worldwide value but low Indian share, such as machinery, electronics, and transportation equipment, which account for 37% of global goods export basket. However, our export share in worldwide exports of each of these is small. 0.9 percent for machinery, 0.4 percent for electronics, and 0.9 percent for transportation products. Here are some more examples of our low market share in key products. Integrated circuits (0.03%), computers (0.04%), solar cells (0.3%), LED TV (0.02%), and mobile phones (0.03%). (0.9 per cent).

And India has a substantial percentage of global exports of Basket B products, although the value of global commerce in these products is minor. India, for example, accounts for 5.9% of worldwide textile exports. Textiles, on the other hand, are a minor category, accounting for only 1.3 percent of global exports. India has a large share of the maritime products market, accounting for 5.4%. However, marine items account for only 0.6% of worldwide exports.Cut and polished diamonds (28.8%), jewellery (13.5%), rice (35%),

shrimps (25.4%), and sugar are some examples where the worldwide export value is tiny but India has a big share (12.4 per cent).

Basket B's limited size imposes a limit on its expansion. Because most of these products are labor-intensive and low-tech, they are vulnerable to competition from low-cost countries.

Most of the G20 countries rank high on ECI, their exports are diverse and unique. Focus of economic energies on improvement of their ECI leads them to purchase low-value added products from other countries. Maybe this explains positive relationship between Partner ECI and India's Export.

Estimated coefficient of the trade freedom index of partner countries show a positive and significant association with India's exports. In order to appreciate this relation it would be helpful to understand that the concept of "water" in international trade. Water is a common WTO word that refers to a country's ability to increase an import duty on a commodity if necessary. It is the gap between a product's bound and applied duty. Bound duty can be seen of as a ceiling obligation that, if crossed, would be in violation of WTO commitments. So, if a product's bound duty is 40% and the applied duty is 10%, water will be 30%, and the country will have the ability to increase the applied duty from 10% to 40%.The higher the water, the more flexibility a country has in raising duty. On most commodities, the water, or the difference between bound and imposed duty, in the United States is now less than 1%. Water makes up less than 2% of the EU, Japan, and most other affluent countries. China, a latecomer to the WTO, is the only developing country required by the United States to have an average water content of 0.1 percent. The majority of poor countries, on the other hand, retain more water. As per EXIM bank's study a negative correlation is detected between tariffs and non-tariff measures. G20 countries that have low average tariff rates have imposed more of non-tariff measure to restrict unwanted imports. However, with lowering of existing tariffs or/and removal of non-tariff measure India's exports increase to the G20 countries.

Cumulative trade coverage of G20 import-restrictive measures in force since 2009
(USD billion and %)

Import restrictions in force (left axis) — % of G20 imports (right axis)
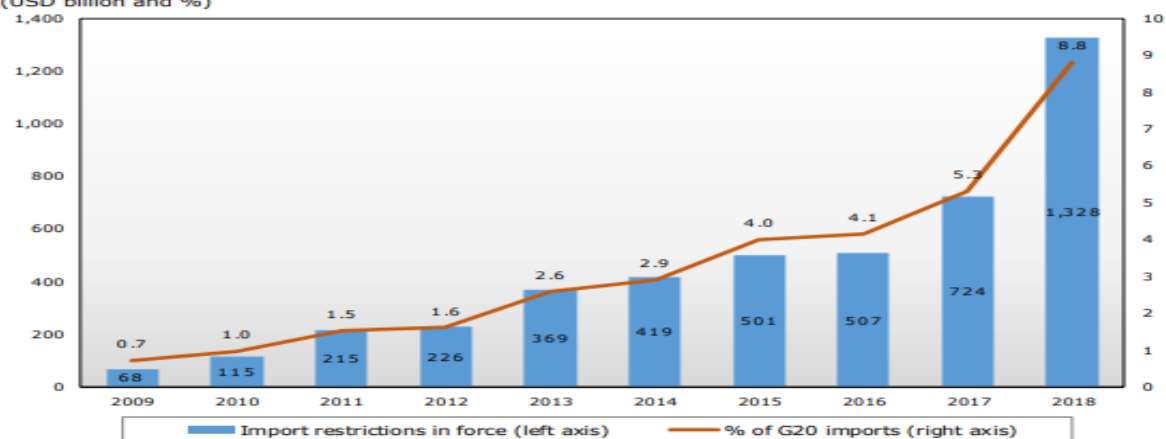
Note: The cumulative trade coverage estimated by the Secretariat is based on information available in the TMDB on import measures recorded since 2009 and considered to have a trade-restrictive effect. The estimates include import measures for which HS codes were available. The figures do not include trade remedy measures. The import values were sourced from the UNSD Comtrade database.

Source: WTO Secretariat.

Non-tariff measure notifications between1st January 1995 to 31st December 2018

SI. No.	Country	Nos.
1	USA	4293
2	Canada	2245
3	Brazil	1875
4	China	1299
5	EU	1245
6	Peru	964
7	Chinese Taipei	793
8	Chile	769
9	New Zealand	746
10	South Korea	741
11	Japan	656
12	Australia	617
13	Philippines	567
14	Mexico	538
15	Colombia	520
16	Saudi Arabia	447
17	Thailand	372
18	Costa Rica	279
19	Argentina	269
20	Ecuador	250
21	India	249
22	Russia	226
23	Albania	206
24	UAE	202
25	Bahrain	202

Non-tariff Measures (NTMs)	No.	% Share
Technical Barriers to Trade (TBT)	33563	52
Sanitary and Phytosanitary (SPS)	23979	37
Anti-dumping	2106	3.2
Quantitative Restrictions	1636	2.5
Special Safeguards	1347	2
Tariff-rate quotas	1274	1.9
Export Subsidies	429	0.6
Countervailing	218	0.3
Safeguards	69	0.1
Total	64858	100

Source: WTO-Integrated Trade Intelligence Portal (I-TIP)

In order to identify countries among G20 member nations, Predicted Exports is divided by actual exports and the countries for which this value >1 have been identified as countries with which India has an untapped export potential.

1. South Korea
2. Indonesia
3. China
4. Saudi Arabia
5. Finland
6. Ireland
7. Greece
8. Denmark
9. Belgium
10. Romania
11. Sweden
12. South Africa
13. Japan

14. Lithuania

15. Estonia

16. Australia

17. Austria

18. Germany

19. France

20. United States

21. Mexico

22. Portugal

23. Canada

24. Hungary

In the above list few countries such as South Korea, China, Saudi Arabia, Germany and United states already are among India's top 10 export destinations therefore strengthening trade ties with them might be easier and consequently untapped export potential maybe exploited.

5. Conclusion

On the basis of the augmented gravity model used here it can be suggested that India under its presidency of G20 may encourage lowering of non-tariff measures.
India must focus on enhancing its trade competitiveness by diversifying its export basket and making specialized products however attention needs to be paid to market creation for these products as India's export destinations are currently those countries that buy low value added products from India.

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