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DOES DISTANCE MATTER FOR BANGLADESH'S EXPORTS?

Abstract

Geographical proximity plays an important role in international trade. The gravity model of modern trade theory reveals that the closer the two countries the greater the volume of their bilateral trade. Bangladesh's export trade has demonstrated impressive performance over the last one and a half decades. The exports are still dependent heavily on Readymade Garments (RMGs) for which the major destinations are distantly located countries, which is opposite to the prediction of the gravity model. Geographical diversification in destination has become an important policy priority for the existing mix of export items in the current and recent past export policies of the country, which is supposed to reverse the current role of distance. Given this context, the present paper is an attempt to examine whether the direction of distance has changed in the country's export with panel data econometric model. An export weighted distance index has been developed to reveal the relative change in economic geography of Bangladesh for its major export destinations. The empirical results reveal that the policy initiatives of geographical diversification have obtained mixed results, but they have not been significantly successful to reverse the direction of distance in exports.

1. Introduction

Geographical distance is important in international trade. The gravity model of modern trade theory demonstrates that the closer the geographical location of the two countries the greater the volume of their bilateral trade given their economic size, factor endowments and similarity of preference. This prediction of the standard gravity model prevails in the typical circumstances where the traded items, economic size and product preference of the trading partners are identical. However, the prediction may not work if the demand for majority of traded items of the origin is located in distant destination.

Bangladesh's export trade has demonstrated impressive performance over the last one and a half decades even though the export basket has remained highly concentrated on a very few products. The exports are still dependent mostly on textiles and clothing, especially Readymade Garments (RMGs) for which the major destinations are distantly located countries. This pattern of the country's exports seems to be opposite to the prediction of the gravity model. Nevertheless, the country's

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Seventh Five Year Plan (2016-2020) as well as the current and recent past export policies identified geographical diversification in destination as an important priority for the existing mix of export items of the country.[1] The policy priority is expected to reverse the current role of distance, *i.e.*, Bangladesh is expected to gradually export more in terms of proportion of its total exports with nearer countries.

Market analysis of Bangladesh's export items demonstrates that only two major destinations explain about 72 per cent of total export earnings in fiscal year 2016-17, which were the European Union (EU) with US$19.35 billion (55.6 per cent of total exports) and the United States (US) with US$5.85 billion (16.78 per cent). The two other most important export destinations were Canada with US$1.08 billion (3.09 per cent) and Japan with US$1.01 billion (2.91 per cent). Conversely, in 2008-09 the major export destinations were the EU (52.86 per cent) and the US (26.1 per cent) with the joint market share of about 79 per cent of the total export destinations. The other notable partners were Canada (4.3 per cent) and Turkey (2.1 per cent).[2] All these locations are geographically distant from Bangladesh despite a number of initiatives by the Government of Bangladesh (GoB) to increase export earnings from nearer destinations, such as India and China. This export outcome is opposite to the prediction of the standard gravity model. However, the relative share of the top two destinations has decreased, which implies that the share of other export destinations has increased in this period. However, from this data it is unclear whether the share of the nearer destinations has been increasing significantly, which can be attributed to the policy initiatives and efforts of the government.

Given this context, the present paper is an attempt to examine whether the direction of distance has changed significantly in the country's export in the most recent period. In doing so, it adopts a gravity model augmented for four distance variables with panel data of top 20 export destinations of the country each year for the period of nine years. It is the first kind of analysis to understand the importance of distance exports in country-disaggregated panel.

The rest of the paper has been organised as follows. Section 2 presents a detailed review of literature of the import contributions in this field of study. Section 3 describes the methodology and data sources of the present paper. Section 4 presents the findings and analysis of the paper. The paper ends with concluding remarks in section 5.

[1] See, for detailed policy and outcomes on export diversification, General Economics Division, *Seventh Five Year Plan FY 2016-FY2020*, Dhaka, Bangladesh: Planning Commission, Government of Bangladesh, 2016, pp. 184-203; and Ministry of Commerce, *Export Policy 2015-2018*, Dhaka, Bangladesh: Government of Bangladesh, 2015.

[2] Based on the database of Export Promotion Bureau of Bangladesh. Available at www.epb.gov.bd, accessed on 29 December 2017.

2. A Review of Literature

In the earliest form, using the gravity model to explain bilateral trade flows and potential of the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) countries can be expressed in the following basic form, where value of bilateral trade flow is directly proportional to home and partner's Gross Domestic Production (GDP) and inversely proportional to the distance between two countries. Following Newtonian 'force of gravity' function, Tinbergen[3] shaped the gravity equation to explain trade between countries. In the other earliest gravity models, for example Pöyhönen[4] and Pulliainen[5], bilateral trade flows depend only on the national income of the importer and exporter, and the geographical distance between two countries (r_{ij}). In the 'basic' form, the gravity model can be described as follows to explain the exports of country *i* to *j*:

$$c_{ij}=cc_ic_j\left(\frac{y_i^a y_j^b}{r_{ij}^d}\right) \quad (1)$$

where, y_i and y_j are the gross national income of the two countries, c_i and c_j are their export and import parameters, r_{ij} is the distance between them and *c* is a scale factor.[6]

The GDP of importers and exporters are trade enforcement variables. The output of an exporter implies the ability to supply and the output of an importing country represents the propensity to demand. The higher the national income of traders the more the trade flows, and thus $a,b>0$. The distance is a trade resisting factor and thus $d<0$, since greater distance increases transport cost and thus increases the price of traded items. Close geographical distance and regional proximity help increase trade flows and thus are favourable for economic regionalism in attaining mutual gains.[7] As Krugman noted,

> "Even casual inspection of such gravity-type relations reveals the strong tendency of countries to focus their trade on nearby partners; that is, in spite of modern transportation and communications, trade is largely a neighbourhood affair. …they make it overwhelmingly clear that distance still matters and still creates natural trading blocs.… geography has already given international trade a strong regional bias … allowing free trade agreements at a regional level will lead to a Prisoners' Dilemma a minor one."[8]

[3] J. Tinbergen, "An Analysis of World Trade Flows", in J. Tinbergen (ed.), *Shaping the World Economy*, New York, USA: The Twentieth Century Fund, 1962.
[4] P. Pöyhönen, "Toward a General Theory of International Trade", *Ekonomiska Samfundets Tidskrift*, Vol. 16, No. 2, 1963, pp. 69-77.
[5] K. Pulliainen, "A World Trade Study: An Econometric Study of the Pattern of the Commodity Flows in International Trade, 1948-60", *Ekonomiska Samfundets Tidskrift*, Vol. 16, No. 2, 1963, pp. 78-91.
[6] B. Balassa, "Trade Creation and Trade Diversion in the European Common Market", *Economic Journal*, Vol. 77, No. 305, 1967, pp. 1-21.
[7] P. R. Krugman, "The Move toward Free Trade Zones", *Proceedings*, Kansas, USA: Federal Reserve Bank of Kansas City, 1991, pp. 7-41.
[8] *Ibid*., pp. 19-21.

The national income of importers and exporters and distance between them are the basic determinants of bilateral trade in the gravity model. Previous studies find negative and significant coefficient of distance. Athukorala[9], Bussière and Schnatz[10], and Kandogan[11] are some of the most important evidences in favour of trade discouraging impact of distance of partner countries.

The distance elasticity has been found to be negative in Wolf[12], Bussière *et al.*[13], and Helpman *et al*.[14] among others, which indicates that the proportion of trade increases if the bilateral distance decreases proportionately. Disdier and Head[15] examined 1,467 distance effects estimated of 103 studies and observed that the estimated negative impact of distance on trade increased around the middle of the twentieth century and has been persistently high since then. Based on bilateral real trade flow data from 1970 to 1999, Fratianni and Kang[16] demonstrated that significant heterogeneity existed in the distance elasticity in gravity models. They also revealed that distance elasticity, which ranges from 0.73 to 1.47, crucially depended on whether trading partners belonged to the Organisation for Economic Co-operation and Development (OECD) and whether they were Christian or Muslim countries.

Conversely, based on data of 776 industries of 100 reporting countries and 179 partner countries for the period of 1985-2005, Berthelon and Freund[17] found that homogeneous commodities, bulky items and high tariff goods became significantly more distance sensitive, while changes in tariffs and freight costs reduced the significance of distance. Upon reviewing the literature on international trade and distance, Leamer and Levinsohn[18] revealed that the effect of distance on the patterns of trade was not diminishing over time. In an augmented gravity model using data of

[9] P. Athukorala, "The Rise of China and East Asian Export Performance: Is the Crowding-Out Fear Warranted?", *World Economy*, Vol. 32, No. 2, 2009, pp. 234-266.
[10] M. Bussière and B. Schnatz, "Evaluating China's Integration in World Trade with a Gravity Model Based Benchmark", *Open Economies Review*, Vol. 20, No. 1, 2009, pp. 85-111.
[11] Y. Kandogan, "Consistent Estimates of Regional Blocs' Trade Effects", *Review of International Economics*, Vol. 16, No. 2, 2008, pp. 301-314.
[12] H. C. Wolf, "International Home Bias in Trade", *Review of Economics and Statistics*, Vol. 82, No. 4, 2000, pp. 555-563.
[13] M. Bussière, J. Fidrmuc and B. Schnatz, "EU Enlargement and Trade Integration: Lessons from a Gravity Model", *Review of Development Economics*, Vol. 12, No. 3, 2008, pp. 562-576.
[14] E. Helpman, M. Melitz and Y. Rubinstein, "Estimating Trade Flows: Trading Partners and Trading Volumes", *Quarterly Journal of Economics*, Vol. 123, No. 2, 2008, pp. 441-487.
[15] A. Disdier and K. Head, "The Puzzling Persistence of the Distance Effect on Bilateral Trade", *Review of Economics and Statistics*, Vol. 90, No. 1, 2008, pp. 37-48.
[16] M. Fratianni and H. Kang, "Heterogeneous Distance-Elasticities in Trade Gravity Models", *Economics Letters*, Vol. 90, No. 1, 2006, pp. 68-71.
[17] M. Berthelon and C. Freund, "On the Conservation of Distance in International Trade", *Journal of International Economics*, Vol. 75, No. 2, 2008, pp. 310-320.
[18] E. Leamer and J. Levinsohn, "International Trade: The Evidence", in G. M. Grossman and K. Rogoff (eds.), *Handbook of International Economics* (Vol. 3), New York, USA : Elsevier, 1995, pp. 1387-1388.

130 countries for the year 1962-1996, Brun *et al.*[19] also found that it was not decreasing in a quite long period - a 10 per cent increase in distance decreased bilateral trade by 13.5 per cent in 1962 and by 12 per cent in 1996.

The common border or "zero distance" between two countries leads to increased trade, and it is found to be positive and significant in various estimates, *e.g.*, Wolf[20]; Eaton and Kortum[21], and Gil-Pareja *et al.*[22] Kandogan[23] revealed positive and significant trade effect of common border and common language of various economic blocs. Using Canadian input-output data of 1988, McCallum[24] finds that Canadian provinces trade about twenty times more with one another than they do with the US states of a similar economic size and proximity. This result suggests a substantially large 'home bias' in international trade, since the national border between these two countries is considered to be one of the most easily drivable lines in the world and has negligible trade effect. Based on the EU data from 1979 to 1990, Nitsch[25] found that the impact of national borders of the EU members on intra-bloc trade was about ten times higher than the international trade with an EU partner country of similar size and distance. Conversely, Okubo[26] revealed border effect in Japan to be much lower than that of the US and Canada, which was highest, 10.38 in 1970, and declined to 3.41 in 1990 for all traded goods.

In analysing the global bilateral trade in capital equipment in cross-section data, Eaton and Kortum[27] observe that common border has positive but insignificant impact on trade of manufacturing items, but its impact is negative as well as insignificant in equipment trade. Conversely, the impact of common language is found to be positive and significant in both manufacturing and equipment trade across the world. Eaton and Kortum[28] estimate the bilateral trade in manufactures from nineteen OECD countries in 1990 and find positive and significant impact of common border.

[19] J. Brun, C. Carrère, P. Guillaumont and J. Melo, "Has Distance Died? Evidence from a Panel Gravity Model", *World Bank Economic Review*, Vol. 19, No. 1, 2005, pp. 99-120.
[20] H. C. Wolf, 2000, *op. cit.*
[21] J. Eaton and S. Kortum, "Technology, Geography and Trade", *Econometrica*, Vol. 70, No. 5, 2002, pp. 1741-1779.
[22] S. Gil-Pareja, R. Llorca-Vivero, J.A. Martínez-Serrano and J. Oliver-Alonso, "The Border Effect in Spain", *World Economy*, Vol. 28, No. 11, 2005, pp. 1617-1631.
[23] Y. Kandogan, 2008, *op. cit*.
[24] J. McCallumn, "National Borders Matter: Canada-U.S. Regional Trade Patterns", *American Economic Review*, Vo. 85, No. 3, 1995, pp. 615-623.
[25] V. Nitsch, "National Borders and International Trade: Evidence from the European Union", *Canadian Journal of Economics*, Vol. 33, No. 4, 2000, pp. 1091-1105.
[26] T. Okubo, "The Border Effect in the Japanese Market: A Gravity Model Analysis", *Journal of the Japanese and International Economies*, Vol. 18, No. 1, 2004, pp. 1-11.
[27] J. Eaton and S. Kortum, "Trade in Capital Goods", *European Economic Review*, Vol. 45, No. 7, 2001, pp. 1195-1235.
[28] J. Eaton and S. Kortum, 2002, *op. cit*.

Anderson and van Wincoop[29] assessed the comparative static trade and welfare effects of borders. They revealed that if borders are removed, the increase in welfare of the OECD countries would be only 6.4 per cent for the US, but 51.7 and 37.3 per cent for Canada and the rest of the world, respectively. Furthermore, according to Anderson and van Wincoop[30], the impact of border barriers on bilateral trade flows is negative. Borders decrease the US-Canada trade by 44 per cent and trade among countries of the rest of the world by 29 per cent. Gil-Pareja *et al*.[31] examined border effects of trade in Spain using a panel gravity model, which reveals positive and significant border effect in both exports and imports, although such effect is greater for imports than for exports. They interpret the border effect as the presence of unspecified national trade barriers that might have significant welfare consequences if removed.

Lawless[32] decomposed the gravity model into extensive (number of firms) and intensive (average export sales per firm) margins. The study found negative and statistically significant coefficient of distance in exports for benchmark gravity model, procedures and costs of trade model, language and communications infrastructure model, accessibility model and extended gravity model.

Hanson and Xiang[33] allowed fixed export costs to have both bilateral and global components. The bilateral components are incurred each time a producer enters a new export market; the global components are incurred once, when a producer starts exporting. The study found that the coefficient of log of distance to the US was negative and statistically significant for average sales ratio and gravity trade barriers.

Assuming a world of N countries where each country runs balanced trade, Song[34] showed that specialisation is not necessary for gravity equations, which contradicts the popular theoretical models. He demonstrates that the simple gravity equation holds, if and only if the market share of an exporting country is constant across all importing countries, where specialisation is only one special case satisfying this condition. The paper found that distance elasticity is negative and statistically significant in gravity, specialisation and intra-industry trade model.

[29] J. E. Anderson and E. van Wincoop, "Borders, Trade and Welfare", *Working Paper 8515*, Massachusetts: National Bureau of Economic Research, 2001.
[30] J. E. Anderson and E. van Wincoop, "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, Vol. 93, No.1, 2003, pp. 170-192.
[31] Gil-Pareja *et al*., 2005, *op. cit*.
[32] M. Lawless, "Deconstructing Gravity: Trade Costs and Extensive and Intensive Margins", *Canadian Journal of Economics*, Vol. 43, No. 4, 2010, pp. 1149-1172.
[33] G. Hanson and C. Xiang, "Trade Barriers and Trade Flows with Product Heterogeneity: An Application to US Motion Picture Exports", *Journal of International Economics,* Vol. 83, No. 1, 2011, pp. 14-26.
[34] E. Y. Song, "On Gravity, Specialization and Intra-industry Trade", *Review of International Economics*, Vol. 19, No. 3, 2011, pp. 494-508.

Novy[35] derives a micro-founded gravity equation based on a translog demand system allowing for flexible substitution patterns across goods. In contrast to the standard CES-based gravity equation, the analysis argues that translog gravity generates an endogenous trade cost elasticity, as trade costs have a heterogeneous impact across country pairs. It adopted a demand system fundamental to understanding the trade cost elasticity. It found negative distance elasticity for translog and constant elasticity gravity models, while negative distance coefficient was also found in testing constant elasticity gravity, additional trade cost variables and alternative distance specifications.

Kabir and Salim[36] examined the effect of Intellectual Property Rights (IPRs) on China's global export of electrical and electronic products. It adopts a gravity model for unbalanced panel data of China's 146 important trading partners over the period of 2002-2012. The results reveal that the level of IPR protection in destination countries has a positive impact on China's flow of exports. In all the models the distance elasticity has been found to be negative and statistically significant.

Based on the findings of the above literature, the present paper applies the empirical techniques and insights to the exports trade of Bangladesh in order to understand the importance of distance. It applies an augmented gravity model for panel data to explain the dynamics of distance and why it still continues to dominate the pattern of the country's exports.

3. Model and Data

The present paper adopts a distance-augmented gravity model based on a recent gravity model used by Kabir and Salim.[37] The empirical gravity model takes the following form:

$$lnEXP_{ijt} = \alpha_1 + \alpha_2 lnTGDP_{it} + \alpha_3 lnGDP_{jt} + \alpha_4 lnDIST_{ij} + \alpha_5 lnDISTCAP_{ij} + \alpha_6 lnDISTW_{ij} + \alpha_7 DISTW_{ij} + e_{ijt} \quad (1a)$$

$$lnEXP_{ijt} = \alpha_1 + \alpha_2 lnTGDP_{ijt} + \alpha_3 lnRFE_{ijt} + \alpha_4 SIM_{ijt} + \alpha_5 lnDIST_{ij} + \alpha_6 lnDISTCAP_{ij} + \alpha_7 lnDISTW_{ij} + \alpha_8 DISTWEC_{ij} + e_{ijt} \quad (2)$$

[35] D. Novy, "International Trade Without CES: Estimating Translog Gravity", *Journal of International Economics,* Vol. 89, No. 2, 2013, pp. 271-282.
[36] M. Kabir and R. Salim, "Is Trade in Electrical and Electronic Products Sensitive to IPR Protection? Evidence from China's Exports", *Applied Economics*, Vol. 48, No. 21, pp. 1991-2005.
[37] *Ibid*.

where,

EXP = Bangladesh's exports in US$

TGDP = Sum of Gross Domestic Product (GDP) of Bangladesh (*i*) and destination country (*j*)

RFE = Relative Factor Endowments

e = Error term with usual statistical properties

t = Time period (2008-09 to 2016-17)

In addition,

$$RFE_{ijt} = \left| \ln PCGDP_{it} - \ln PCGDP_{jt} \right|$$

$$SIM_{ijt} = 1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}} \right)^2 - \left(\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}} \right)^2$$

The paper has added up of the two GDPs to yield *TGDP* instead of separate GDP for Bangladesh and its selected importers. It measures the overall economic space of the two countries, where the larger the *TGDP* the greater the volume of trade between the two for given relative size and factor endowments. To incorporate the element of New Trade Theory, the indices of *RFE* and similarity (*SIM*) are incorporated in the specification. The higher is the *RFE*, the larger is the difference between factor endowments of the trading countries, which indicates a higher volume of inter-industry and a lower share of intra-industry trade. Serlenga and Shin[38], and Kabir and Salim[39] apply this econometric specification in their analysis for panel data.

According to Egger[40], RFE_{ij} takes a minimum of zero if both countries exhibit equal GDP or production. The range of *SIM* is given by $0 \leq SIM_{ij} \leq 0.5$; where 0.5 means 'equal' and zero implies 'absolute divergence' in country size. In a 'factor box representation' of trade model, *TGDP* can be related to the length of the diagonal of the box, *SIM* with the location of the consumption point along the diagonal, and *RFE* to indicate the distance between production and consumption points along the relative price line.

[38] L. Serlenga and Y. Shin, "Gravity Models of Intra-EU Trade: Application of the CCEP-HT Estimation in Heterogeneous Panels with Unobserved Common Time-Specific Factors", *Journal of Applied Econometrics*, Vol. 22, No. 2, 2007, pp. 361-381.

[39] M. Kabir and R. Salim, *op. cit*.

[40] P. Egger, "A Note on the Proper Econometric Specification of the Gravity Equation", *Economics Letters*, Vol. 66, No. 1, 2000, pp. 25-31.

Greater similarity with respect to GDP per capita implies increased similarity in size of the country-specific product diversity in the differentiated goods sector.[41] Due to variety in consumers' taste, increased similarity yields an increased trade volume and therefore $\alpha_3>0$. The Linder hypothesis predicts that an increased difference between per capita GDP of source and destination countries will decrease trade of monopolistically competitive products under the assumption of differentiated tastes, and thus $\alpha_2<0$. Bergstrand[42] reveals that within the developed world, bilateral trade is inversely related to the difference in *RFE* or positively related to the similarity in preferences, which supports the Linder hypothesis. On the other hand, Krugman[43] shows that the nature of trade depends on similarity of countries in terms of factor endowment (which supports the Linder hypothesis), and trade between countries increasingly becomes intra-industry as they become more similar.

Baltagi *et al.*[44] observe that the Heckscher-Ohlin-Samuelson theorem imply that $\alpha_2>0$. Helpman[45] argues that its failure in explaining modern trade is due to ignoring economies of scale, product differentiation and transportation costs, laying the foundation of New Trade Theory. In the gravity model, $\alpha_1>0$ and $\alpha_3>0$ support this hypothesis.

Geodesic distances are based on the great circle formula, which uses latitudes and longitudes of the most important cities or agglomerations (in terms of population) for the DIST variable and the geographic coordinates of the capital cities for the DISTCAP variable. Two additional distance variables, *viz*. DISTW and DISWEC have been used based on Mayer and Zignago.[46] The general formula developed by Head and Mayer [47] and used for calculating distances between trading partners *i* and *j* is

$$d_{ij}=\left[\sum_{k\in i}\left(\frac{pop_k}{pop_i}\right)\sum_{l\in j}\left(\frac{pop_l}{pop_i}\right)d_{kl}^{\theta}\right]^{\frac{1}{\theta}}$$

where pop_k designates the population of agglomeration *k* belonging to trading partner or country *i*. The parameter θ measures the sensitivity of trade flows

[41] F. Breuss and P. Egger, "How Reliable Are Estimations of East-West Trade Potentials Based on Cross-Section Gravity Analyses?", *Empirica*, Vol. 26, No. 2, 1999, pp. 81-94.
[42] J. H. Bergstrand, "The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-Industry Trade", *Economic Journal*, Vol. 100, No. 403, 1990, pp. 1216-1229.
[43] P. R. Krugman, "Intraindustry Specialisation and Gains from Trade", *Journal of Political Economy* Vol. 89, No. 5, 1981, pp. 959-973.
[44] B. H. Baltagi, P. Egger and M. Pfaffermayr, "A Generalized Design for Bilateral Trade Flow Models", *Economics Letters*, Vol. 80, No. 3, 2003, pp. 391-397.
[45] E. Helpman, "The Structure of Foreign Trade", *Journal of Economic Perspectives*, Vol. 13, No. 2, 1999, pp. 121-144.
[46] T. Mayer and S. Zignago, "Notes on CEPII's Distances Measures: The GeoDist Database", *CEPII Working Paper No. 2011-25*, Paris, France: CEPII, 2011.
[47] K. Head and T. Mayer, "Illusory Border Effects: Distance Mismeasurement Inflates Estimates of Home Bias in Trade", *CEPII Working Paper 2002-01*, Paris, France: CEPII, 2002.

to bilateral distance. For the DISTW calculation, $\theta = 1$ is set and for calculation of DISTWCES, $\theta = -1$ is set corresponding to the usual coefficient estimated from gravity models of bilateral trade flows.

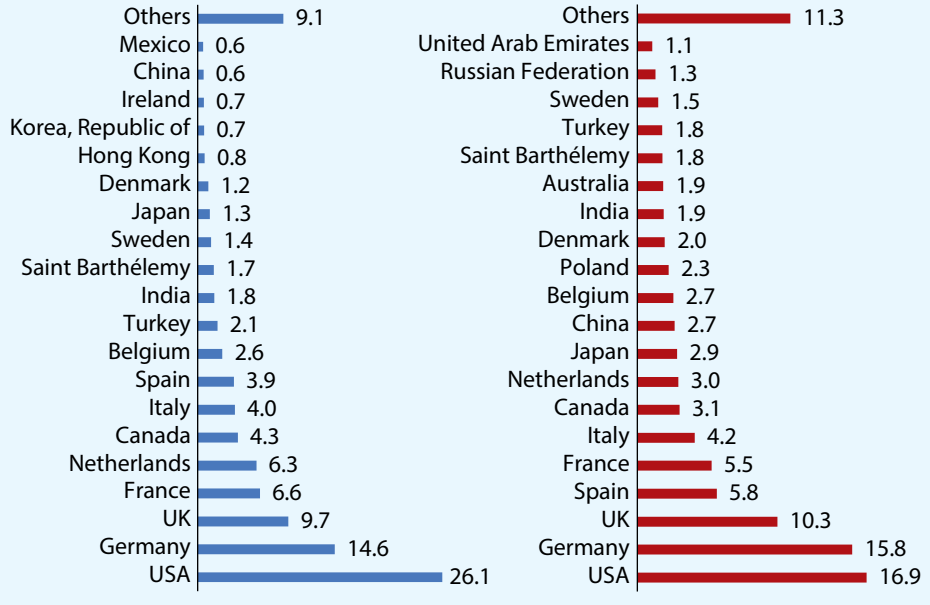
Data used for the paper comes from three sources — World Development Indicators for GDP and CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) for distance, and Export Promotion Bureau of Bangladesh for annual country-wise time series export data for Bangladesh. The subsequent calculation of variables is based on these data.

4. Results and Analyses

The preliminary analysis demonstrates that the share of Bangladesh's many export destinations has been increasing though it remains meagre. For example, Figure 1 demonstrates that 15 out of the top 20 destinations had at least 1 per cent share in total export earnings in fiscal year 2008-09, while all 20 top destinations had at least 1 per cent share in 2016-17. However, most of the destinations have miniscule share in the latest year. The share of India, the closest country of Bangladesh's top export destinations, has declined from 11th to 14th position from 2008-09 to 2016-17 although the amount of share has increased marginally, from 1.8 to 1.9 percent. Nevertheless, a more meaningful sense of the role of distance in export earning can be revealed from an index of export earnings by individual destinations over time.

[48] Author's calculation.

Figure 1: Relative Change in Economic Geography: Per Cent of Total Export Receipt from Bangladesh's Top Destinations (2008-09 left and 2016-17 right)[49]



The following index is used to measure the relative importance of distance in Bangladesh's export earnings[49]:

$$TDIST\ it = \frac{EXP_{it}}{TEXP_{t}} \times DIST_{j} \qquad (3)$$

where,

TDIST = Total distance in length between the two countries (in km)

EXP_i = Bangladesh's export earnings from top countries/territories ($i = 1, 2, \ldots, 20$)

TEXP = Bangladesh's total export earnings

DIST = Distance as defined above

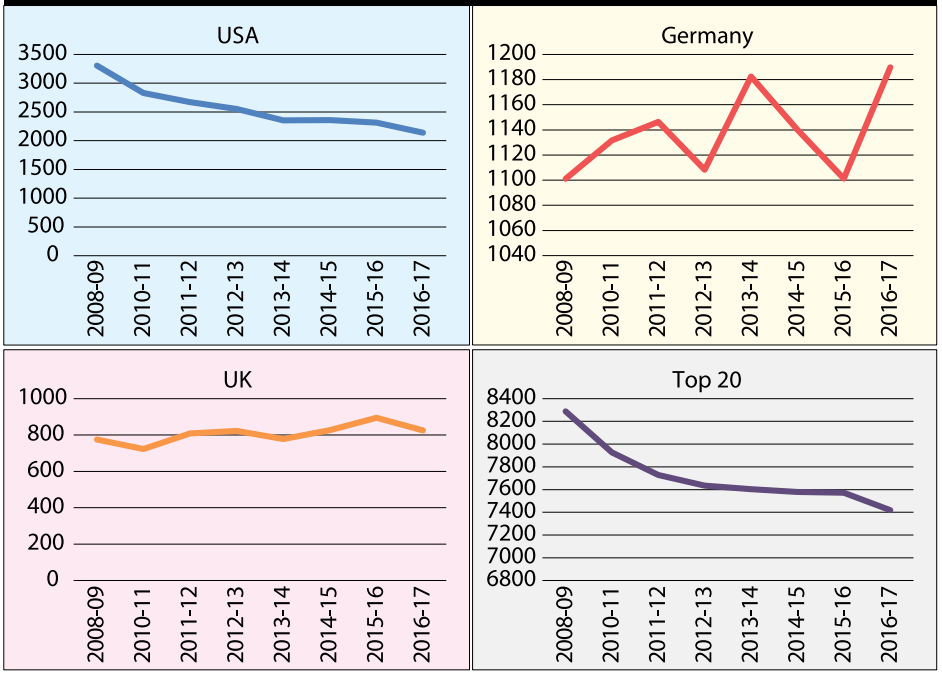
t = time period, from 2008-09 to 2016-17

An increasing trend in the index value indicates that distant countries continue to remain increasingly important export distance and vice versa. Based on the above index, individual country-wise and total indices have been calculated and presented in Figure 2 and in Table 1. The results demonstrate that the relative weight of Bangladesh's closer countries or territories in export earnings are gradually

[49] Author's index.

increasing. For example, the index values of the top 20 export destinations that account for about 90 per cent of Bangladesh's export earning as well as the US, the top export destination, have been decreasing over time. It indicates that the country's export market is becoming geographically more diversified with relatively high exports to nearer destinations.

Figure 2: Trend of Export Weighted Distance Index for Bangladesh[50]



The index analysis demonstrates mixed results in individual destinations as the index values of some destinations are increasing while some are decreasing. Overall, the index value for all 20 top destinations is decreasing. Nonetheless, from this result it cannot be ascertained clearly whether the combined effect of the gradually increasing share of the other destinations is influencing to statistically alter the direction of distance in Bangladesh's exports.

[50] *Ibid.*

Table 1: Distance-Weighted Trade Index for Bangladesh's Important Destinations[51]

Destination	2008-09	Destination	2011-12	Destination	2014-15	Destination	2016-17
USA	3,306	USA	2,669	USA	2,360	USA	2,139
Germany	1,101	Germany	1,146	Germany	1,140	Germany	1,190
UK	775	UK	808	UK	826	UK	825
France	526	France	451	Spain	489	Spain	506
Netherlands	480	Spain	410	France	444	France	432
Canada	534	Canada	511	Italy	325	Italy	309
Italy	290	Italy	295	Canada	413	Canada	388
Spain	335	Belgium	237	Belgium	242	Netherlands	231
Belgium	203	Netherlands	218	Japan	144	Japan	143
Turkey	127	Japan	122	Netherlands	207	China	83
India	25	Turkey	136	China	77	Belgium	205
Saint Barthélemy	137	India	29	Turkey	138	Poland	152
Sweden	96	Saint Barthélemy	143	Denmark	151	Denmark	143
Japan	64	Denmark	123	Australia	177	India	28
Denmark	82	China	50	Poland	126	Australia	172
Hong Kong	18	Sweden	100	India	24	Saint Barthélemy	146
Korea, Republic of	27	Australia	130	Sweden	100	Turkey	109
Ireland	55	Poland	92	Saint Barthélemy	108	Sweden	104
China	19	Hong Kong	25	Russian federation	53	Russian Federation	74
Mexico	89	Korea, Rep of	33	UAE	34	UAE	40

The results of panel data econometric model for Equation (1a) have been presented in Table 2. The estimates are corrected for panel heteroscedasticity and serial correlation as tested by Green's[52] Modified Wald test for group-wise heteroscedasticity and Wooldridge's[53] serial correlation tests for the regression model. The results demonstrate that the coefficients of GDP of Bangladesh (GDP_B) and the destinations are positive and statistically significant, which is in accordance with the expectations. Economic size of the two trading partners plays export-enhancing role for Bangladesh. Nevertheless, all distance variables individually turn out to be positive

[51] Author's calculation based on data of CEPII and Export Promotion Bureau of Bangladesh.
[52] See, for details, William H. Greene, *Econometric Analysis*, Seventh Edition, New Jersey, USA: Prentice Hall, 2012.
[53] See, for details, J. M. Wooldridge, *Econometric Analysis of Cross Section and Panel Data*, Second Edition, Cambridge MA and London, UK: The MIT Press, 2010.

and statistically significant in models 1 to 4. Conversely, all the distance variables are taken together in Model 5. In this econometric specification, coefficient of all distance variables turns out to be positive. On the other hand, all distance elasticities are statistically significant except DISTWCES. This result implies that greater distance still plays positive role in encouraging export of Bangladesh. It is perhaps because the gradually increasing shares of the bottom destinations in the selected countries of the panel are still among the distant destinations.

Table 2: Regression Results for Panel Gravity Equation (1a): Dependent Variable lnEXP

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
$lnGDP_B$	1.891*** (0.320)	1.891*** (0.322)	1. 902*** (0.316)	1.902*** (0.315)	2.025*** (0.249)
$lnGDP_j$	0.418*** (0.046)	0.418*** (0.047)	0.405*** (0.045)	0.418*** (0.045)	0.458*** (0.038)
lnDIST	0.00012*** (0.00001)				0.0006*** (0.0002)
lnDISTCAP		0.00012*** (0.00002)			0.0029*** (0.0003)
lnDISTW			0.00013*** (0.00002)		0.002*** (0.000)
lnDISTWCES				0.00013*** (0.00002)	0.0003 (0.0005)
Constant	-40.608*** (8.212)	-40.608*** (8.212)	-40.835*** (8.114)	-40.905*** (8.098)	-45.172*** (6.410)
Wald χ^2	204.27***	199.49***	213.15***	214.63***	441.36***

Note: *** indicates that the respective coefficient and test statistics are significant at 1 per cent level.

From the estimated results presented in Table 2, it is not possible to understand why distance continues to remain important in encouraging the country's exports. Therefore, the estimated results of Equation (2) have been presented in Table 3. The results reveal that the coefficients of TGDP and SIM are positive in models 1 to 3, while the coefficient of SIM is negative in models 4 to 5. The coefficient of RFE turns out to be negative and statistically significant in all specifications. It proves the Linder hypothesis that an increased difference between GDP of Bangladesh and its top 20 destination decreases exports.

Table 3: Regression Results for Panel Gravity Equation (2): Dependent Variable lnEXP					
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
lnTGDP	1.155*** (0.160)	1.155*** (0.161)	1.159*** (0.158)	1.160*** (0.157)	1.243*** (-0.905)
lnRFE	-0.698*** (0.215)	-0.722*** (0.217)	-0.742*** (0.213)	-0.746*** (0.213)	-0.905*** (0.185)
SIM	0.328 (1.232)	0.124 (1.242)	0.003 (1.220)	-0.037 (1.217)	-1.046 (1.163)
lnDIST	0.00012*** (0.00001)				0.0004 (0.0003)
lnDISTCAP		0.00012*** (0.00001)			-0.0028*** (0.0003)
lnDISTW			0.00012*** (0.00001)		0.002*** (0.000)
lnDISTW-CES				0.00013*** (0.00001)	0.0004 (0.0005)
Constant	-40.795*** (8.240)	-40.637*** (8.296)	-40.837*** (8.143)	-40.884*** (0.157)	-44.721*** (6.414)
Wald χ^2	204.43***	199.52***	213.15***	214.63***	444.41***

Note: *** indicates that the respective coefficient and test statistics are significant at 1 per cent level.

The distance elasticities in specifications in models 1 to 4 for individual distance variables become positive and statistically significant. In specification 5, the distance elasticity between Dhaka and the capitals of major destinations is negative and statistically significant. However, the capitals of the trading partners are neither the production hub or agglomerations nor represent the most consumption for exportable. Therefore, the result of specification 5 of Table 3 does not truly represent the actual role of distance in determining the direction of exports from Bangladesh. In other words, greater distance is still important in Bangladesh's flow of exports in its top destinations.

5. Concluding Remarks

The present paper is an attempt to examine the role of distance in explaining the export earnings from Bangladesh's top destinations. In doing so, it adopts a distance-augmented gravity model for the panel of 20 top destinations for the period of 2008-09 to 2016-17. The panel data econometric model is estimated for different specifications. The empirical results reveal that the distance elasticities are positive and statistically significant in explaining greater export flow to distant

destinations despite the fact that the share of destinations of the US in total exports has decreased significantly from 2008-09 to 2016-17 and the share of other countries has been either stable or gradually increasing. However, although the total distance-weighted export index shows a declining trend over this period, the distance elasticity still remains positive over the period of the present analysis. It implies that the policy initiatives of geographical diversification have not gained statistically significant success to reverse the past direction of distance, *i.e.*, the country is still exporting more to relatively distant destinations. Therefore, government's policies should continue to pursue the effort of exploring other markets where distance is lower since a notable proportion of the value chain network for the RMG sector is located at the nearer trading partners. It would help diversify the export geography of the country to averse the risk in foreign currency and reduce considerable transportation costs of the export items, which could be used for productive purposes and well-being of the global consumers of Bangladesh's products.