Structural Gravity Model and Globalization: An Empirical Analysis between Bangladesh, China, India and Pakistan

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ABSTRACT

The globalization process during last two hundred years has influenced the world's social, cultural and economic positions. Consequently, world's output, trade and population have been increased significantly. As a result, wellbeing of nations has been improved. However, at the same time in equality among the rich and poor nations of the world has also increased which is evident from the "Gini coefficient" reported by the World Trade Organization (WTO), 2013. Therefore this study aims to investigate export determining factors for four neighboring countries namely China, India, Pakistan and Bangladesh. It is an empirical analysis based on the structural gravity model. The study employees a relatively new technique of panel data (PPML-Estimator) for the comparison between countries. The findings reveal that factors such as income, expenditure and geographical distance in all four countries are in line with the theoretical literature as well as consistent with gravity theory. However, the dummy variables for language, contiguity and the Regional Trade Agreement (RTAs) have mixed results. Notably, the RTAs in case of China, India and Pakistan have negative and significant impact. In another model, in order to capture the impact of globalization, this study used overall globalization index (GI) and its proxies like Political Globalization Index (PGI), Social Globalization Index (SGI), Economic Globalization Index (EGI) and Information Flow Index (IFI). The results suggest that the proxies have mixed results whereas; the overall globalization has positive and significant effect on the exports. On the basis of these finding, it may be concluded that political conflicts among these neighboring nations are the main hurdle for their mutual beneficial trade. Although, Pakistan's socio-economic set up is responsive towards globalization wave however, factors like poor management, energy crises, corruption and terrorism have hampered its trade performance.

Keywords: *Structural Gravity Model, Globalization, PPML-Estimator, International Trade*

INTRODUCTION

Since mid-1800s the population of world has been increased by six folds, the world output rose by sixty fold and international trade grew upto140 fold. "This virtuous circle of deepening integration and expanding growth is what we now refer as "globalization" (Madisson, 2008). Though, there is no consensus over the definition of globalization. However, in economics perspective globalization is a process in which the commodity market, labor market and capital market of an economy is integrated into the world economy. The history of globalization may be traced back more prominently at least over the past 200 years. In early 1800s the international monetary system "Gold Standard" backed by British pound sterling joined forces with industrial revolution. This phase of globalization is referred as "first age of globalization" in which migration, communication, technology and capital flow were moving across the nations. But earlier to this; there was an age of "steam-power" in which advancement in steam ship, steam railways engine industry and navigation led to explore new sea route to America,

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Asia and Africa for Europe, Madisson, (2008).

The first phase of globalization was interrupted by World War-1, Great Depression and World War-II. The recovery from the World War-II brought extensive development in the field of science and technical innovation that speeded up the process of globalization. The main driver of globalization in the context of technical innovation; are rapid inventions in transportation and communication. Another important driver is revolutionary innovations in the field of information and communication technology. These innovations have reduced considerably the cost of communication and transportation for international trade, WTO, (2013).

The recent phase of globalization has brought significant improvement in output, international trade and wellbeing of societies around the world. According to World Trade Report, 2013 during the period of 1950-73, the world GDP grew 3 percent and merchandize trade increased by 8 percent per annum in real terms. Hence, the period from 1950 to 1973 is known as "golden age". Moreover, during the period 1950 to 2007 world's merchandize growth rose by 6.2 percent. Table-1 provides the percentage share of world export of world GDP over the period of 1870 to 1998 which indicates that integrated world economy increased the world's trade massively.

Table 1 Share of world export in world GDP 1870-1998 (Percentage)

1870	4.6
1913	7.9
1950	5.5
1973	10.5
1998	17.2

Source: OECD (2001)

The globalization phenomenon contains the seeds of free trade which brings mutually beneficial gains from trade for all societies of the world. According to WTO, (2013) during the last three decades; the world merchandize trade has been increased from US$ 2.03 trillion in1980 to US$ 18.26 in 2011 which is four-fold increase in the world merchandize and is 7.2 percent growth per year on average in current dollar terms. This upturn in world's trade is mainly attributed to the reduction in trade barriers (tariff and non-tariff) through preferences trade agreements (PTA) under the umbrella of WTO.

According to the WTO's world trade report, 2008, Globalization brought considerable changes in economic growth, international trade and development and has reduced poverty around the world. As it is clear from (Table-2 and Figure-2) that the current wave of globalization emerging economies like BRICS i.e. Brazil, Russia, India China and South Africa have experienced massive increase in their growth rate and trade than developed and less developed nations. However, the world trade is distributed unevenly among the nations of the world.

During the period of 1980 to 2011 the "Gini coefficient" has not been improved which implies that inequality is increasing among the nations and societies WTO, (2013). In such a perspective, there are countries especially less developed who have lagged behind in the race of globalization and their trade performance is poor in the international arena. Pakistan is among one of those countries whose exports percentage to GDP is declining persistently more

prominently from 2003. Since 2003, the percentage to GDP is suffering from downturn because of energy crises and war against terrorism in Pakistan. On the other hand, since from same point of time the percentage of exports to GDP of its two neighboring countries, India and Bangladesh who share fairly similar socioeconomic, cultural and historical linkage; India and Bangladesh is improving extensively which is depicted in Figure-3.

World's merchandize trade and real GD

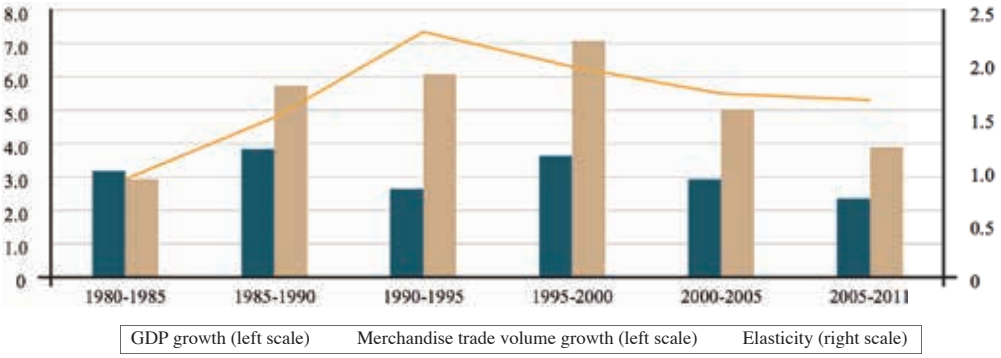


Figure 1*. WTO Secretariat.*

P, 1980-2011(annual percentage change)

TABLE-2 *Trade to GDP Ratio*

Economies	1995	2000	2005
World	43.3	50.3	56.4
Developed Economies	38.3	44.5	49.4
Emerging Economies	43.3	50.3	56.4
(LDCs)	46.7	53.1	63.8

Source: WTO,(2013)

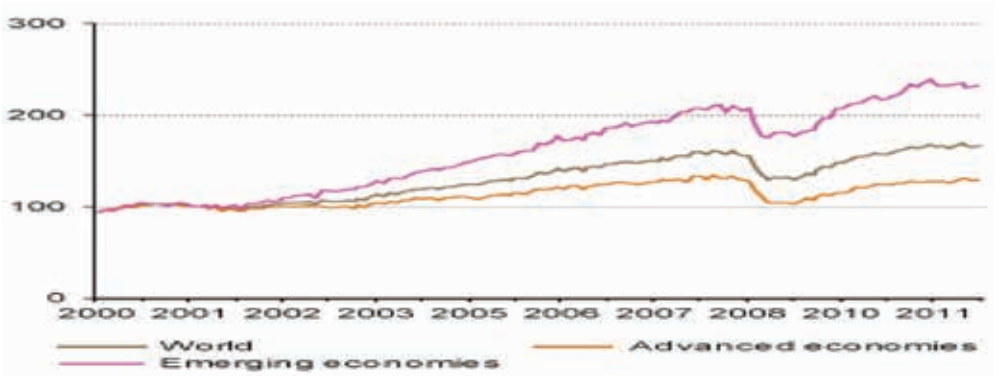
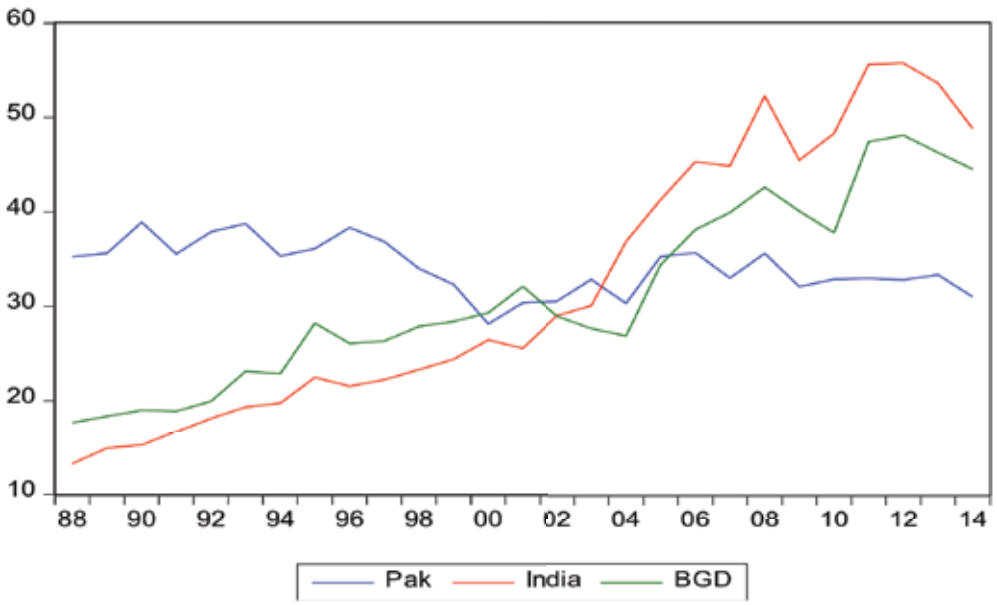


Figure-2 *Source: World Trade Report, 2013 (WTO)*

According to World Trade Report WTO, (2013), the China was a largest merchandize exporter in the world in 2011 with its export's value US$ 18,255.2 billion and India's export value was US$ 304.6 billion. Furthermore, during last one and half decade Bangladesh's trade performance been improved and has emerged as one of the top exporter of textile goods.

Figure-3 *Exports percentage to GDP (1988-2016) for Pakistan, India and Bangladesh.*



Source: Generated by authors using WDI, 2016 data

Objective of the Study

This study aims to investigate the determining factors of exports of China, India, Pakistan and Bangladesh (which are located in vicinity of one another). Separate econometric models have been regressed for comparison among these countries. For this purpose structural gravity model of trade has been employed using relatively an advanced panel data technique "PPML-Estimator" developed by Santos and Silvana, (2011). Pakistan, China and India share connecting border countries with one another and Bangladesh has common border with India. So this research study focuses on comparative analysis among these four countries due to their significant socio-economic role in the world. Furthermore, to arrest the impact of globalization on their exports flow directed toward their 15 major trading partners, this study uses overall globalization index (GI) and its proxies like Political Globalization Index (PGI), Social Globalization Index (SGI), Economic Globalization Index (EGI) and Information Flow Index (IFI) as it was first used by Husain, (2017) in gravity model analysis. The detail and computation of these indices is provided in Appendex-1

LITRATURE REVIEW

Theoretical Framework of Gravity Model

The analogy and idea of gravity model of trade has been derived from the Newton's "Universal law of Gravitational Force" which states that everybody in this universe attracts with a force to another body in a way that this force of attraction is directly proportional to the product of their masses and inversely related to the square distance between them. This relationship in equation form is as under:

$$F = \alpha\left(m_1 \times m_2\right) / \mathrm{r}^2 \quad (1)$$

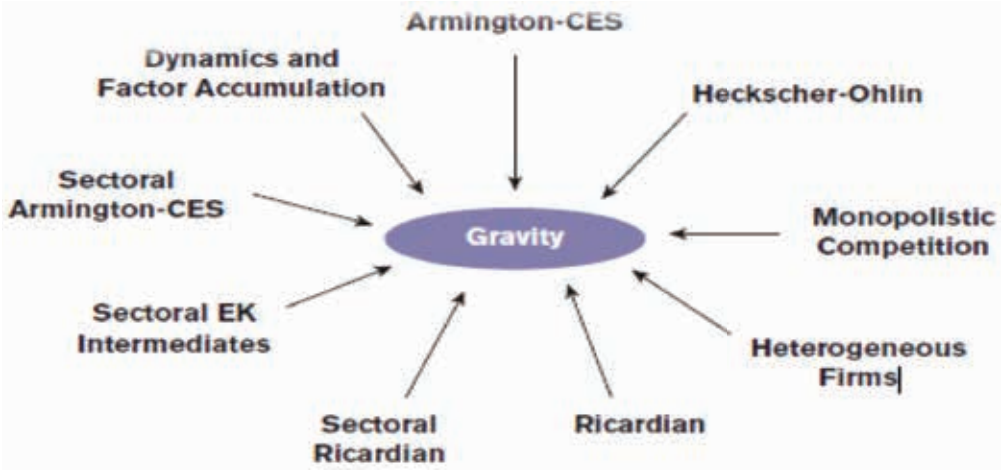
Tinbergen, (1962) and Ravenstein, (1885), were the pioneer to use gravity equation in international trade. The gravity model of trade in log linear form is written as:

$$log\ \left(Trade_{ijt}\right)\ =\ \beta_0 + \beta_1 log\left(\ GDP_{it}.\ GDP_{jt}\right)\ +\ log\ \left(Distance_{ijt}\right)\ +\ \mu_t \quad (2)$$

Equation (2) represents that economic size (GDPs) of trading partners which have positive and geographical distance between them has negative impact on bilateral trade flows of trading partners.

At this initial stage gravity model lacked appropriate theoretical foundations but afterwards economist began to work on it and applied several theories from the literature of international trade in gravity model of trade. The remarkable contribution of economist provided the strong many theoretical foundations to the literature of gravity model. In this journey Anderson, (1979) was first who tried to provide theoretical foundations to gravity model on the basis of product differentiation by the place of origin so called "Armington Assumption" in the context of constant elasticity substitution (CES). Armington, (1969), pointed to consider the goods for their different kinds e.g. merchandise goods, chemical goods, petroleum and wooden products etc. but also differentiated homogeneous goods on the basis of different place of production. As the same kind of goods produced at two different places makes them imperfect substitute due to different cost of production and cost of trade.

Another contribution by Helpman and Krugman, (1989), on the basis of monopolistic competition and differentiated products in accordance with increasing returns to scale. Deardorff, (1998) explained gravity model on the grounds of "Heckchier-Ohlin Theorem" of internati onal trade theory on the assuptions of "frictionless trade and trade with impediments", Sarah, (2012). Eaton and Kortum, (2002), proved gravity model envelopes the Recardian theory of "Comperative Advantage". This theory states that in two commodity two nations assumption even if a country is less efficient (having absolute disadvantage) in production in both commodities than other tarde partner, there are still basis for mutual beneficial trade. The theory in opportunity cost terms states that "the cost of a commodity is the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of first commodity", Salvatore, (1998). Therfore, Eaton and Kortum, (2002) provided that heterogenirty of production between trade partners are the basis of "Comperative Advantage". This theory states that in two commodity two nations assumption even if a country is less efficient (having absolute disadvantage) in production of both commodities than other country there are still basis for mutual beneficial trade.



Review of Structural Gravity Model

Exporting countries (i) produce differentiated goods which they trade with their partners. The supply of each good is fixed at Qi, and factory gate price is represented for each commodity is pi, hence the total nominal GDP is stated as $Y_i = p_i Q_i$. On the other hand, Expenditures of country i may be expressed in nominal income terms Ei. It is represents $Ei = \varphi i Yi$, where $\varphi i > 1$ indicates deficit in balance of trade, whereas, while $1 > \varphi i > 0$, implies a trade surplus in an economy. Next we derive the structural gravity model like Dekle et al. (2007; 2008), from demand side.

On the demand side, consumer preferences are assumed to be homothetic, identical across countries, is and given by a CES-utility function for country j:

$$\left\{ \sum_{0i} a_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{\frac{1-\sigma}{\sigma}} \right\}^{\frac{1-\sigma}{\sigma}} \tag{3}$$

Teachers Where $\sigma > 1$ is the elasticity of substitution among different varieties, i.e. goods from different countries, $\alpha_i > 0$ is the CES preference parameter, which will remain treated as an exogenous taste parameter and c_{ij} denotes consumption of varieties from country i in country j. Consumers maximize equation (3) subject to the following standard budget constraint:

$$\sum_i p_{ij} c_{ij} = E_j \tag{4}$$

Equation (4), show that expenditures Ej in country j are equal to total spending on varieties of goods from which it imports the goods at delivered prices $p_{ij} = p_i . t_{ij}$ which are defined conveniently as a function of factory-gate prices in the country of origin, pi, marked up by bilateral trade costs, $t_{ij} \geq 1$, between trading partners i and j.

Solving the consumer's optimization problem yields the expenditures on goods shipped from origin i to destination j as:

$$X_{ij} = \left(\frac{a_i p_i t_{ij}}{p_j} \right)^{1-\sigma} E_j \tag{5}$$

Where X_{ij} denotes trade flows from exporter i to destination j and, for now, Pi can be interpreted as a CES consumer price index:

$$p_j = \left[\sum_i \left(a_i p_i t_{ij} \right)^{1-\sigma} \right]^{\frac{1-\sigma}{\sigma}} \tag{6}$$

Given that the elasticity of substitution is greater than one, σ >1, equation (6) captures several intuitive relationships. In particular, expenditure in country j on goods from source i, X_{ij}, is Proportional to total expenditure, E_j, in destination j. The simple intuition is that, all else equal, larger/richer markets consume more of all varieties, including goods from i.

It is Inversely related to the (delivered) prices of varieties from origin i to destination j, $p_{ij} = p_i t_{ij}$. This is a direct reflection of the law of demand, which depends not only on factory-gate price pi but also on bilateral trade cost t_{ij} between partners i and j. The ideal combination that favors bilateral trade is an efficient producer, characterized by low factory-gate price, and low bilateral trade cost between countries "Directly related to the CES price aggregator P_j ". This relationship reflects the substitution effects across varieties from different countries. All else equal, the relatively more expensive the rest of the varieties in the world are, the more consumers in country j will substitute away from them and toward the goods from country i. contingent on the elasticity of substitution σ_i when factory-gate prices or the aggregate CES prices (Or in the combination of those as a relative price) change. All else equal, a higher elasticity of substitution will magnify the trade diversion effects from the more expensive commodities to the cheaper ones.

The final step in the derivation of the structural gravity model is to impose market clearance for goods from each origin:

$$Y_i = \sum_j \left(\frac{a_i p_i t_{ij}}{P_j} \right)^{1-\sigma} E_j \tag{7}$$

Equation (7) states that, at delivered prices (because part of the shipments melt "en route"), the value of output in country i, Y_i , should be equal to the total expenditure of this country's variety in all countries in the world, including i itself. To see this intuition more clearly, note that the right-hand side expression in equation (7) can be replaced with the sum of all bilateral shipments from i as defined in equation (5), so that $Y_i \equiv \Sigma_j X_{ij} \forall_j$.
Defining $Y \equiv \Sigma_i Y_i$ and dividing equation (7) by Y, the terms can be rearranged to obtain:

$$\left(a_i p_i \right)^{1-\sigma} = \frac{\frac{Y_i}{Y}}{\sum \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} \frac{E_j}{Y}} \tag{8}$$

Following (Anderson and van Wincoop, 2003), the term in the denominator of equation (8) can be defined as: $\prod_j^{1-\sigma} = \sum\left(t_{ij}/P_j\right)^{1-\sigma} E_j/Y$, and be substituted into equation (8):

$$\left(a_i p_i\right)^{1-\sigma} = \frac{Y_i/Y}{\prod_i^{1-\sigma}} \tag{9}$$

Recent developments in gravity model are inspired by the work of (McCallum, 1995), who provided empirical findings that "Canadian provinces trade more than 20 times as much among each other than Canadian provinces and U.S. states do". This outcome is referred as "trade puzzle". (Anderson and van Wincoop, 2003), based on his earlier work (Anderson, 1979) having assumptions that goods are differenciated from the place of origin, consumers preferences are homothetic, identical across countries, and approximated by a CES utility function provided the following systm of structural gravity model:

$$X_{ij} = \frac{Y_{i,t}E_{j,t}}{Y_t}\left(\frac{t_{ij,t}}{P_{j,t}\prod i,t}\right)^{1-\sigma} \tag{10}$$

$$\prod^{1-\sigma} = \sum_j\left(\frac{t_{ij,\mathrm{t}}}{P_{j,t}}\right)^{1-\sigma}\frac{E_{j,t}}{Y_t} \tag{11}$$

$$P^{1-\sigma}{}_{j,t} = \sum_i\left(\frac{t_{ij,t}}{\prod_{i,t}}\right)^{1-\sigma}\frac{Y_{i,t}}{Y_t} \tag{12}$$

$X_{ij,t}$, denotes trade flows from exporter i to importer j

$E_{j,t}$, is the total expenditure in importer j

$Y_{i,t}$, is the value of total production in exporter i

Y_t , is the value of world output;

$t_{ij,t}$, denotes bilateral trade frictions between partners i and j;

σ>1 is the elasticity of substitution among goods from different countries;

Finally, the more important the terms coined by (Anderson and Van Wincoop, 2003) $P_{j,t}$ and $\Pi_{i,t}$ as the inward and the outward multilateral resistances, respectively.

"The multilateral resistances are the vehicles that translate the initial, partial equilibrium effects of trade policy at the bilateral level to country-specific effects on consumer and producer prices", (Piermartini and Yotov, 2016).

Log-linear Equation (1) and expanding it with an additive error term, μ_{ij}, t obtains the following estimating gravity equation:

$$\ln X_{ij} = \ln \mathrm{E}_{\mathrm{j,\,t}} + \ln \mathrm{Y}_{\mathrm{i,\,t}} - \ln \mathrm{Y}_{\mathrm{t}} + (1-\sigma)\ln \mathrm{t}_{\mathrm{ijt}} - (1-\sigma)\mathrm{P}_{\mathrm{j,\,t}} - (1-\sigma)\ln\prod_{\mathrm{i,\,t}} + \mu_{\mathrm{ij,\,t}} \tag{13}$$

Specification (1-11) is the most popular version of the empirical gravity equation, and it has been used routinely in the trade literature to study the effects of various determinants of bilateral trade. Hundreds of papers have used the gravity equation to study the effects of geography, demographics, RTAs, tariffs, exports subsidies, embargoes, trade sanctions, the

World Trade Organization membership, currency unions, foreign aid, immigration, foreign direct investment, cultural ties, trust, reputation, mega sporting events (Olympic Games and World Cup), melting ice caps, etc. on international trade.

Empirical Literature Review

Batra,(2004), using data for the year of 2000 and applying OLS technique of estimation. Estimation results reveal that the gravity equation fits the data and prices, income and geographical, cultural and historical variables are consistent with theory and are significant.

Panda, etal. (2016),With the obective of coparision of trade flow determinants between India and China used the data from 2004 to 2013 for penal data anaylysis and found that both country's trade flows more with neigboring countires. In the case of China common language and high per capita income are determining factor of its trade and geographical distance is having negative and significant impact as theory suggests. Whereas in the case of India higher GDP level and low per capita income. Moreover when analyzing for pre and post financial crisis of 2007-08, common colony beacame a determining factor of India.

Caporale and Sova, (2015), analayze the trade flow of China with its major trading partners in Asia. North America and Europe. The annual data from 1992 to 2012 was used for analysis empolying a recent econometric technique "the fixed effect vector decomposition" (FEVD) proposed by Plumper and Troeger, (2007). The econometric outcome suggest that economic size and geographical distance are consistent with theory and FDI and WTO have positive impact on its trade. Whereas, the dummy variable for finanacial crises for the years 2007-008 is impacting negatively on its bilateral trade.

Wang, (2016) using data ranging from 2000 to 2013 analyzed balance panel on PPML estimation method through the gravity model covering 80 countries for the trade vegetable oil and empirical findings reveal that incomes of importer countries have statistically positive impact on trade of vegetable oil and geographical distance having statistically negative coefficient.

Rehman, (2003), investigated for determining factors trade for Bangladesh with 35 trading partners through panel data analysis found that economic size, PCI differential and openness have positive and significant impact on its trade and multilateral resistance factors also influence Bangladesh's trade positively.

Tripathi, S and Leitao, N. C. (2013), using data ranging from 1998 to 2012 applied Tobit and GMM panel data technique for analysis of gravity model in the case of India and its main trading partners. The econometric results suggest that higher GDPs have positive impact and noteably geographical distance has also positive impact on bilateral trade of India. The positive coefficient of distance is not consistent with basic gravity model. Moreover, cultural proximity and political globalization have positive and significant impact on indian trade.

Rasoulinezhad, (2017) to investigate the specification of china's external trade with its 13 major trading partners from OPEC member countries, used the annual data ranging from 1998 to 2014 and employed three panel data estimations with fixed effects, random effects and fully modified ordinary least squares (FMOLS). The findings of the study reveal that gravity model

fits the data well and GDP, GDP difference, exchange rate, the trade openness, geographical distance and WTO membership are trade determining factors of China with OPEC members. Furthermore, he concluded that China's trade patteren with OPEC is consistent with Heckscer-Ohlin.

Hussain, (2017), used Pakistan and its 15 major trading partners' data for the period 2003 to 2013 to augmented gravity model and estimated it with PPML-Estimator technique of panel data. Empirical findings provide that GDP and PCI have positive significant impact on Pakistan's export flow and geographical distance is statistically negative impact. Furthermore, the contiguity is statistically positive but the common official language is negative against the expected sign. More significantly, the study first time introduces information flow index (IFI) in the gravity model which is used as a proxy for overall globalization index to capture the impact of globalization on exports flow and finding reveal that IFI has statistically positive impact on exports and is reduces negative value of distance.

Hypothesis for Model (1)

H1: Economic size, geographical distance, contiguity, common official language and common colony are determining factors of exports flow of China, India, Pakistan and Bangladesh.

Hypothesis for Model (2)

H1: Overall globalization index and its proxies (Cultural, Social, Economic, Social and Information Flow index (IFI) don't have impact on export of China, India, Pakistan and Bangladesh.

METHODOLOGY

Model Specification: Model (1) to determine the variables that explain export

Considering literature review of gravity model and taking into account the socio-economic conditions of four countries which are understudy. The following models have been selected for empirical estimation:

Model for PPML estimation with multilateral resistance term: as proposed by Piermartini and Yotov, (2016).

$$lnX_{ijt} = \beta_{0+}\beta_1 \ln\left(DIST_{ij}\right) + \beta_2 ln(Y_i) + \beta_3 ln\left(E_j\right) + \beta_4\left(CNTG\right) + \beta_5\left(LANG\right) + \beta_6\left(CLNY\right) + \beta_7\left(RTA\right) + u_{ij} + \eta_t + \varepsilon_{ijt} \quad (1)$$

Variables used in the models (1) are discussed as under:

Xijt, is export flow of countries i (exporters), China, India, Pakistan and Bangladesh directed to their 15 major trade partners j (importers) for the time t. The data of exports of these countries has been taken from UNCOMTRADE database.

DISTij, is geographical distance from capitals the capital of an exporting nation i to the capitals of its export destination j in kilometers. This data has been taken from the CEPII gravity dataset.

Yi, is income, is Gross Domestic Product (GDP) in current US dollar of the exporting country i which has been imported from World Development Indicator (WDI, 2016) of World Bank. The GDP size represents the economic size and supply capacity of exporting nation.

Ej, is the expenditure (GDP in current US dollar) of importing countries j which represents the economic size and demand capacity of an importing nation. The data is also taken from (WDI, 2016).

CNTG, is a dummy variable for contiguity implies border connections between trade partners i and j. Its value is 1 if trade partners share common borders and 0 otherwise.

LANG is a dummy variable for common official language used in trading partners in i and j. Its value is 1 if trade partners share common official language and 0 otherwise.

RTA, is a dummy variable if the trade partners i and j are co-signatory of regional trade agreements and its value is 1 if trade partners share common borders and 0 otherwise.

CLNY, is a dummy variable for being a common colony. Its value is 1 if trade partners share common characteristic of being common colony, and 0 otherwise.

The data for dummy variables in the model of this study i.e. contiguity, common official language that is spoken in trade partners, common colony and RTAs has been taken from the CEPII gravity dataset.

μ_{ij}, is country-pair fixed effects.

η_t , is exporter and importer time fixed effects.

Model Specification: Model (2) to capture the impact of globalization

To show the impact of globalization the following model has been estimated as used by (Hussain, 2017).

$$lnX_{ijt} = \beta_{0+}\beta_1 ln\left(DIST_{ij}\right) + \beta_2 ln(Y_i) + \beta_3 ln\left(E_j\right) + \beta_4\left(EGI\right) + \beta_5\left(PGI\right) + \beta_6\left(SGI\right) + \beta_7\left(IFI\right) + \beta_8\left(GI\right) + \varepsilon_{ijt} \quad (2)$$

Variables used in the models (1) are discussed as under:
Xijt, is export flow of countries i (exporters), China, India, Pakistan and Bangladesh directed to their 15 major trade partners j (importers) for the time t. The data of exports of these countries has been taken from UNCOMTRADE database.

DISTij, is geographical distance in kilometers between exporter nation's capital to the capital of their trading partners.

Ej, is the expenditure (GDP in current US dollar) of importing countries j which represents the economic size and demand capacity of an importing nation. The data is also taken from (WDI, 2016).

The detail of computation and explanation of globalization indices and variables **EGIi, SGIi, PGIi, GIi, IFIi** is provided in (Appendics-1) which has been used in the model (2). These variables and indices are maintained by KOF Index of Globalization (2016).

The Data Set

This study uses data for the period of 1992-2013 for four countries namely China, India, Pakistan and Bangladesh. The data for geographical distance, common official language, sharing common colony, RTAs of each country has been taken from the (CEPII) gravity dataset.The bilateral export data of four countries and their 15 major partners has been taken from UNCOMTRADE database. The data for overall globalization index and its sub-categories i.e. economic, social and political globalization is taken from KOF Index

Globalization, 2016 and finally the data for gross domestic products (GDP) of four exporting countries understudy and their 15 major trading partners has taken from the World Development Index (WDI), of World Bank database.

Estimation Technique

This study employs relatively advance econometric estimation technique PPML-Estimator for panel data analysis of the model which has developed by Santos and Silvana, (2006, 2011b.). This technique is having estimation superirity over traditional approaches of panel data techniques like OLS etc. First it mangaes usefully large number of zeros which is a problem in trade data and addresses the issue of heteroskedasity appropriatly.

Baldwin and Taglioni, (2006) explained the importance of multilateral resistence terms (MRs) which are theoritical construct and if not contolling the MRs in the estimation; they referred as to commit as "Gold Medal Mistake". Therefore, to control multilateral resistance terms ($P_{j,t} and \Pi_{i,t}$) properly, this study uses exporter time and importer time fixed effects Feenstra, (2004). Furthermore, the trade policy variables like RTA and tariff are endogenous which may cause the estimates unreliable, in this regard as proposed by Agnosteva, etal. (2014) a variable of pair-fixed effects has been used in the estimation of gravity model.

Cheng and Wall (2005), noted that "fixed-effects estimation applied to data pooled over consecutive years, is sometimes criticized on the grounds that dependent and independent variables cannot fully adjust in a single year's time". In this connection researchers have proposed to use the data with 3-years to 5-years interval rather taking the data with consecutive years. Therefore, this study takes the data for three year interval in order to capture the adjustment in policy changes in trade regimes.

RESULTS AND DISCUSSION

The table-3 provides the estimated results of four models for four countries. In all four cases, the coefficients of variables of basic gravity model; like income, expenditures and geographical distance are consistent with the theory. These results are in accordance with empirical results of the study of Batra, (2006) Hussain, (2017) Panda atel, (2016). The coefficients of income and expenditure represent demand and supply capacity of trade partners. These are positive and significant at 1% level in all four models of China, India, Pakistan and Bangladesh. This result implies that larger is the size of economies of trade

partners more they trade. The coefficients of bilateral geographical distance is having negative and is significant at 5% level in the case of China, India and Pakistan and is significant at 1% level in the case of Bangladesh. This empirical outcome reveal that with distant destinations when they trade incur more cost and consequently attract less export. The coefficients for expenditure are all positive and significant which provides the insight that more the per capita income of the people of importer country they spend more on foreign goods. Common official language is significant and has positive impact on exports in the case of China and Pakistan and Bangladesh which is consistent with the finding of Shujaat, (2015) and Mohmand and Wang, (2013). Furthermore, the dummy variables border are all insignificant and in the case of Pakistan and India the RTAs have negative and significant impact which suggest that the disputes of these countries with their neighboring nations are hurdles to get benefit from Regional Trade Agreements. Being the common colony in the case of India the dummy has positive and significant impact on its trade, because the small economies of SAARC who share common colony characteristic with India rely more on India. Whereas it is having negative and significant in the case of Pakistan insignificant in the case of Bangladesh and China does not share common colony with their trading partners.

TABLE-3 *Four Gravity models estimated PPML-Estimator*

Names of Variables *Names of countries above their respective models*				
Dependent variable (Export)	*India*	*China*	*Bangladesh*	*Pakistan*
Distance	-1.618 (0.012)**	-0.359 (0.040)**	-1.612 (0.002)**	-0.571 (0.048)**
Income	1.038 (0.0023)***	0.774 (0.0042)***	1.502 (0.007)***	.723 (0.001)***
Expenditure	0.845 (0.001)***	.784 (0.001)***	0.439 (0.005)***	-0.244 (0.003)***
Border	-0.606 (0.205)	0.918 (0.021)**	-0.522 (0.346)	(0.157) (0.319)
Language	0.691 (0.071)*	1.817 (0.007)***	----------	1.577 (0.008)***
RTA	-0.432 (0.045)**	0.333 (0.050)	0.940 (0.108)	-1.424 (0.015)**
Colony	0.966 (0.024)**	----------	-0.276 (0.535)	-0.593 (0.002)***
R^2	0.861	0.876	.816	0.594

The values in parenthesis represent with three steric*** that it is significant at 1% level, with two steric** significant at 5% level of significant and one steric* indicate that it is significant at 10% level of significant.

Table-4 provides the results regarding the impact of overall globalization (GI) and its proxies i.e. economic (EGI), social (SGI), cultural (CGI), political (PGI) and information flow (IFI) indices on exports of four countries. These models have been estimated with basic gravity variables i.e. income, expenditure and geographical distance, however, have been excluded from the table-4 because of brevity purpose. The results suggest that economic globalization has positive impact and significant impact on the exports of China, Bangladesh and Pakistan and cultural globalization is an explaining variable in the case of India which has positive and significant impact. Social globalization has negative and significant impact on Pakistan's export and has positive and significant impact in the case of Bangladesh. Political globalization is having negative and highly significant impact on China's trade. However, it has positive and highly significant impact in the case of Pakistan and Bangladesh.

The variable information flow index (IFI) has negative and high significant impact in the case of India and Bangladesh. Whereas, in the case of China and Pakistan information flow (through internet, print and electronic media) is highly positive and significant similar results were found by Hussain, (2017).

TABLE-4 *Four models to capture the impact of globalization using PPML*

Names of Variables *Names of countries above their respective models*				
Dependent variable (Export)	*India*	*China*	*Bangladesh*	*Pakistan*
Economics Globalization	_____	.0322 (0.002)***	0.026 (0.035)**	1.616 (0.025)**
Cultural Globalization	0.019 (0.008)***	0.0001 (0.717)	_____	0.004 (0.378)
Social Globalization	_____	_____	0.261 (0.000)	-0.026 (0.031)
Political Globalization	-0.040 (0.572)	-0.001 (0.004)***	0.015 (0.036)**	0.025 (0.0025)***
Information flow index	-0.079 (0.001)***	0.005 (0.001)***	-0.088 (0.001)***	0.214 (0.001)***
Globalization index	0.317 (0.001)	0.013 (0.001)***	0.184 (0.001)***	0.040 (0.001)***

The values in parenthesis represent with three steric*** that it is significant at 1% level, with two steric** significant at 5% level of significant and one steric* indicate that it is significant at 10% level of significant.

Overall globalization index is positive and significant in the case of India, China, Bangladesh and Pakistan. Which implies that globalization process overall is an export determining factor for all these four countries.

CONCLUSION AND POLICY RECOMMENDATIONS

This study using data from 1992 to 2011 employed PPML-Estimator technique and analyzed the structural gravity model. On the basis of empirical outcomes it is concludes the variables of basic gravity model of trade like income, expenditures and distance are consistent with the theory and the hypothesis of the study. The political disputes among these four neighboring countries are not only main hurdle in boosting their mutual beneficial trade but also hampering the capability to trade with rest of the world. Resolving the political dispute they can gain from mutual trade because of natural close geographical location and due to low trade cost. In this regard, consequently they can also reap the fruits of RTAs signed among them like Global System of trade Preferences among Developing Countries (GSTP) came into force from 19th April, 1989, South Asian Preferential Trade Agreement (SAPTA) effective from 07th December, 1995 and South Asian Free Trade Agreement (SAFTA) which was put into practice 1st January, 2006, because the RTAs have negative and significant impact on exports of Pakistan, India and Bangladesh in this study. However, process of globalization, overall is very much supporting phenomenon. Pakistan's socio-economic set up is responsive with globalization, however, the energy crises, high cost of production, weak trade policy implementation and low value addition in its exports is undermining its trade performance than its neighboring countries India and Bangladesh.

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Appendex-1

2017 KOF Index of Globalization

Indices and Variables Weights

A. Economic Globalization [36%]

i) **Actual Flows (50%)** Trade (percent of GDP) (21%) Foreign Direct Investment, stocks (percent of GDP) (28%) Portfolio Investment (percent of GDP) (24%) Income Payments to Foreign Nationals (percent of GDP) (27%)

ii) **Restrictions (50%)** Hidden Import Barriers (22%) Mean Tariff Rate (28%) Taxes on International Trade (percent of current revenue) (26%) Capital Account Restrictions (24%)

B. Social Globalization [37%]

i) **Data on Personal Contact (33%)** Telephone Traffic (25%) Transfers (percent of GDP) (2%) International Tourism (26%) Foreign Population (percent of total population) (21%) International letters (per capita) (25%)

ii) **Data on Information Flows (36%)** Internet Users (per 1000 people) (37%) Television (per 1000 people) (39%) Trade in Newspapers (percent of GDP) (25%)

iii) Data on Cultural Proximity (32%) Number of McDonald's Restaurants (per capita) (47%) Number of Ikea (per capita) (47%) Trade in books (percent of GDP) (6%)

C. Political Globalization [27%] Embassies in Country (25%) Membership in International Organizations (27%) Participation in U.N. Security Council Missions (22%) International Treaties (26%).