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FACTORS AFFECTING THE BILATERAL TRADE OF PAKISTAN WITH MAJOR TRADING PARTNERS

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HIGHLIGHTS

- The product of GDPs, per capita income, trade to GDP ratio and population of Pakistan have a significant and positive impact on bilateral trade of Pakistan with its major trading partners.
- Distance of Pakistan with trading partners and population of trading partners have negative and insignificant impact on Pakistan`s bilateral trade.
- Membership in Trade organizations have negative and insignificant impact on Pakistan`s bilateral trade. The gravity theory seems to be ineffective with negative relationship for Pakistan`s bilateral trade.

ABSTRACT

The current study under hand was aimed to estimate the impact of different factors affecting bilateral trade of Pakistan with its major trading partners. Panel data set about different variables including GDP, per capita income, population and membership of different international organizations were taken from the different sources for the time period of 1995-2016. For this purpose the augmented gravity model of trade has been used by following the fixed and random effects methods. According to the results the product of GDPs, trade to GDP ratio and population of Pakistan have a significant and positive impact on bilateral trade of Pakistan with its major trading partners. Per capita GDPs has positive while distance between trading countries and population of trading partners have negative and insignificant impact on Pakistan`s bilateral trade. Trade organizations also have negative and insignificant impact on Pakistan`s bilateral trade. The gravity theory seems to be ineffective with negative relationship for Pakistan`s bilateral trade.

Keywords: Gravity model; dynamic panel; bilateral trade; Pakistan
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Introduction

The major trading partners of Pakistan are United States of America, China, United Kingdom, Afghanistan, Germany, United Arab Emirates, Spain, Bangladesh, Italy and France. About 61% of Pakistan`s total exports goes to these markets while 39% to the rest of the world. Pakistan mainly imports from China, United Arab Emirates, Saudi Arabia, Indonesia, India, United States of America, Japan, Kuwait, Germany and Malaysia. About 68% value of total Pakistan's imports is with these markets and about 32 % from the rest of the world (GOP, 2017). Pakistan joined the membership of different trading organizations to promote its trade to the rest of the world. These organizations are World Trade Organization (WTO), Economic Cooperation Organization (ECO), South Asian Association for Regional Cooperation (SAARC), The South Asian Free Trade Area (SAFTA), Shanghai Cooperation Organization (SCO), Asian Infrastructure Investment Bank (AIIB), International Monetary Fund (IMF), Organization of the Islamic Conference (OIC), World Bank and Commonwealth of Nations. The trade situation of Pakistan is shown in the table 1 from 2009 to 2016. Pakistan export agricultural products and import crude oil, machinery, petroleum products and manufacturing instruments (ITC, 2017).

Graphical presentation of trade of Pakistan is shown in figure 1. The value of total trade of Pakistan was US$ 19861.41 million in 1995. Trade value in 2002 was US$ 21002.188 million. After 2005 trade increasing rate declined and in 2008 it rises rapidly. In 2009 trade decreases to US$ 49138.416 million and then rises. From 2011 to 2013 trade value remains the same. In 2015 it regularly declines to the value US$ 66078.663 million and again rises to the value of US$ 67532.062 million in 2016 (ITC, 2017). The decline in trade value was due to the loss of competitiveness Pakistani products in international market.

International trade plays vital role in economic development of a country. The economy of Pakistan has faced number of challenges for last fifteen years. Responsible reasons are quantifiable and non-quantifiable. The quantifiable factors are low GDP growth, high interest rate, foreign direct investment, high budget deficit, high rate of inflation and average applied tariff rate. The unquantifiable factors are war on terror, energy crisis, poor market access, narrow industrial base, lack of education and unskilled labor. The government of Pakistan worked hard to improve its trade by providing raw material at world price (at zero tariffs), exemption from duties and

taxes to exporters and market access through FTAs (Free Trade Agreements), GSP (Generalized System of Preferences), PTAs (Preferential Trade Agreements) and providing long term trade policy (GOP, 2015).

The microeconomic foundation for gravity model (Bergstrand, 1985) was extended to explore the factor endowment (H-O) and taste variables (Bergstrand, 1989). This study explicitly provided the theoretical foundations for per capita income and importer and exporter incomes consistent with trade theories. Eichengreen and Irwin (1998) analyzed the historical impact on trade. They used the gravity model by using the data on interwar and postwar trade flows from 1949-1964. Fitzsimons et al. (1999) analyzed the bilateral manufacturing volume of North-South trade in Ireland with 28 developing countries for the time period of 1970-92 through gravity equation of trade.

Table 1: Pakistan`s Trade Balance (US$ Billions)

	2010	2011	2012	2013	2014	2015	2016
EXPORTS	21.41	25.34	24.61	25.12	24.72	22.09	20.53
IMPORTS	37.54	43.58	43.81	43.77	47.54	43.98	46.99
BOT	-16.12	-18.23	-19.2	-18.65	-22.82	-21.9	-26.46

Source: UNCTAD (2017) and ITC (2017).

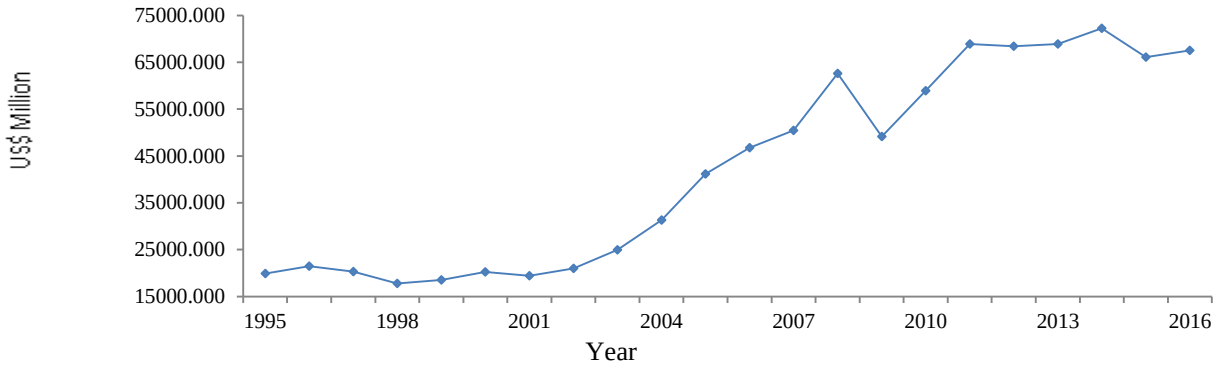

Figure 1: Trade of Pakistan

The preferential trade agreements do not provide the same benefits to all countries (Linnemann, 1966). Sohn (2001) analyzed the Korea`s trade flows through gravity trade model by using the cross-section data of 30 countries. Whether they suggested that Korea`s economy face the Product Differentiated Model and H-O theory of trade and want to estimate the impact of trade bloc on bilateral trade of Korea. Rahman (2003) used the generalized gravity model to analyze the bilateral trade of Bangladesh with major trading partners by using panel data estimation technique. He estimated three models (i) Gravity model of trade. (ii) Gravity model of exports. (iii) Gravity model of imports. The results of the study indicated positive and effective relationship between income of a country and bilateral trade. Positive effect of per capita income indicated the domination of H-O effect i.e. factor endowment difference on Linder effect in case of Bangladesh trade. The trading partner`s membership of SAARC, EEC, NAFTA, ASEN and Middle East had negative effect on exports and imports of Bangladesh.

Lubinga (2009) studied through gravity model to analyze the factors affecting Uganda`s trade with consistent trading partners over past ten years. GDP of Uganda as well as trading Partner put positive and significant effect on Uganda`s trade. Uganda`s trade negatively affected by Uganda`s population, distance, real exchange rate and real exchange rate misalignment. Trade agreements, colonial ties positively affect Uganda`s trade flow. Arabi and Ibrahim (2012) explained Sudan`s bilateral trade pattern with 16 Arab states through augmented gravity model of trade using panel data from 1990-2000. Inter-industry trade explained through Heckscher-Ohlin and highlighting competitiveness rather than intra-industry trade and complementarities between Sudan and Arab states. Mohmand and Wang (2014) analyzed the role of Islamic Cooperation Organization in promoting the trade of her member country. In this way, panel data set for 56 countries from 1962-2011.

Waheed and Abbas (2015) examined the exports potential markets of Bahrain with the help of augmented gravity model of trade by using panel data set of 31 countries from 1994-2013. The findings specified that domestic and trading partner`s income, real exchange rate, foreign currency reserves, population of trading partners, free trade agreements and Gulf Cooperation Council statistically significant and positive affiliation with the export potential of Bahrain. Distance, language had significant but negative effect on export potential of Bahrain. Du et al. (2017) estimated the impact of political relations on trade by using gravity model estimation

technique. The low frequency data of political relations indicated the aggregate bias because political shocks were too much shorter. In that study, political relations` model concluded that the political shocks were short lived. A VAR technique indicated that the political shocks influenced China`s exports, but largely finish within two months. A comparison of annual-monthly frequency gravity model explained the impact of temporal aggregation.

Gul and Yasin (2011) examined the Pakistan`s trade potential by using the panel data from 1981-2005 through gravity model of trade for 42 countries. The results predict the trade potential in specific trading area as well as for country worldwide. There was more trade potential with the countries of European Union (EU), North America, Asia-Pacific Region (ASEAN) and the Middle East. Malik and Chaudhary (2012) explained the import`s behavior of Pakistan towards some selected Countries of Asia. By using panel data set with the help of gravity trade model. Khan et al. (2013) investigated the bilateral trade flow of Pakistan to her major trading partners through gravity model by using panel data for the time period of 1990-2010.

Javed et al. (2016) analyzed the effect of trade affecting factors between Pakistan and UAE by applying gravity model on panel data to determine the variables effect. In this study, agricultural trade between Pakistan and UAE analyzed. Hussain (2017) investigated the exports situation of Pakistan to 15 trading Partners for the time period of 1993-2013 by using Pseudo Poisson Maximum Likelihood (PPML) technique for gravity model.

Several factors which could have negative or positive effects on trade of any country includes prices (domestic and international) of traded commodity, GDP, per capita income, population, inflation, distance between trading partners, exchange rates, and regional trade organizations. Due to rising globalization and dependency, during the current study an estimation of the impact of GDP, population, per capita income, geographical differences, factor intensity and membership of some regional organizations on bilateral trade of Pakistan with trading partners.

Methodology

The aim of the study was to identify the factors of Pakistan`s bilateral trade with its trading partners by using panel data. Furthermore the study analyzed the extent of SCO, ECO, OIC and SAARC integration into the world economy and Pakistan in Particular. The countries included in the study are China, United States of America, India, Iran, Saudi Arabia, United Kingdom, Japan, Malaysia, United Arab Emirates, Kuwait, Russia, Australia, Bangladesh, Afghanistan, Turkey, Sri Lanka, Germany and France.

Theoretical Framework

The idea of gravity trade model was basically originated through Newton`s Law of Gravity in physics. He stated that the attraction forces between two bodies are directly proportional to the mass of those bodies and inversely proportional to the distance exists between them. Tinbergen (1962) first used the gravity equation for bilateral trade analysis and without any theoretical justification, empirical study was provided. The general from of the gravity equation is as follows,

$$T_{ij} = A.(\frac{Y_i Y_j}{D_{ij}})$$

Here, T_{ij} represented bilateral trade flow, A indicated proportionality constant, Y_i point to GDP of Country i (country which`s trade is measured), Y_j showed GDP of Country j (trading partner) and D_{ij} specified distance between trading countries. After Tinbergen (1962), Linnemann (1966) used the gravity equation to estimate the partial equilibrium model of trade. In 1980, when geographical factors got importance in international trade, gravity model was again interested. Anderson (1979) and Helpman and Krugman (1985) provided strong theoretical justification of gravity model as gravity trade model with the help of differentiated product model and modern theory of trade (H-O Model) respectively. Anderson (1979) postulated the gravity model to constant elasticity of substitution or Cobb-Douglas approach. According to Helpman and Krugman (1985), Under Imperfect Substitute Model where less differentiated goods were available. Consumer had a variety of choice. When the economy size increased, consumer increased their utility with the help of greater variety. In this way international trade help them out. When products were perfect substitute for each other in consumer preferences and transported without cost of transportation between countries, the variable of exchange rate and price could be omitted. Such situation corresponds to the H-O theory of international trade (Jakab et al., 2001).

Several studies were conducted by using other factors which affect the trade of any nation with the help of augmented gravity model. Lubinga (2009), Gul and Yasin (2011), Arabi and Ibrahim (2012) and Waheed and Abbas (2015) also used the augmented gravity model to find out the factors affecting bilateral trade between countries. Thus in the current study augmented gravity model was used to analyze Pakistan`s bilateral trade situation with its trading Partners.

Collection of Data

Panel data estimation technique was used for the period of 22 years from 1995-2016 to find out the causal factor of bilateral trade of Pakistan with its trading Partners. The data was taken from Pakistan Economic Survey, Federal Bureau of Statistics, Islamabad, Pakistan, ITC calculation based on UN COMTRADE Statistics, UNCTAD (United Nations Conference on Trade and Development), World Bank, World development Indicator and International Monetary Fund (IMF).

To determine the trade potential of Pakistan, the Pakistan`s trade with its trading partner was taken as dependent variable. Independent variables of the studies includes per capita income of Pakistan, per capita income of trading partner, population of Pakistan, population of trading partner, trade openness, distance with trading partner, culture, joint border and membership in different trade integrated organizations like SAARC, ECO, SCO and WTO.

Testing for Panel Data

To check the presence of stationarity issue in panel data, panel unit root tests will applied. The panel unit root tests include Levin, Lin and Chut* (LLC), I P, Shin W-stat, ADF–Fisher Chi–square and PP–Fisher Chi-square. If null hypothesis of unit root or non stationarity is not rejected at level, the data was transferred to first difference and this practice continued until the stationarity hypothesis is accept.

Gravity Model for Trade

Gravity trade model is based on Newton`s Law of gravity in physics (Kristjánsdóttir, 2005). The gravity model of international trade helps to identify the driving forces of foreign trade. Universal Law of Gravity was firstly designed for foreign trade by Tinbergen (1962). The empirical framework of gravity trade model was used to predict about the performance of the economies in foreign trade (Eichengreen and Irwin, 1998; Rauch, 1999). The gravity model about the trade was first used by Tinbergen (1962). The basic model for trade between two countries (i and j) takes the form of:

$$T_{ij} = f\left(\frac{G_i^{\beta 1} G_j^{\beta 2}}{D_{ij}^{\beta 3}}\right)$$

Here T is the trade flow which is directly related to G i.e. the economic mass of each country and inversely related to D i.e. the distance while f is gravitational constant depending on the unit of measurement for mass and force. β_1, β_2 and β_3 are the econometric constant of the gravity model. Thus the augmented gravity trade model in this study is as:

$$\text{Log } (T_{ijt}) = \beta_0 + \beta_1 \log (GDP_{ijt}) + \beta_2 \log (PCGDP_{ijt}) + \beta_3 \log (T_{ijt}/GDP_{it}) + \beta_4 \log (POP_{it}) + \beta_5 \log (POP_{jt}) + \beta_6 \log (DIST_{ijt}) + \beta_7 (CULT_{ijt}) + \beta_8 (JB_{ijt}) + \beta_9 (SAARC) + \beta 10 (ECO) + \beta_{11} (SCO) + \beta_{12} (WTO) + U_{ijt}$$

Where

i = Pakistan
j = Trading partners of Pakistan
T_{ijt}= Total trade between Pakistan (i) and partner (j)
GDP_{ijt} = Product of Gross Domestic Product of Pakistan and trading partner.
$PCGDP_{ijt}$ = Per Capita GDP (PPP) of Pakistan and trading partner.
POP_{it} = Population of Pakistan,
POP_{jt} = Population of trading Partners
T_{ijt}/GDP_{it} = Trade openness (bilateral trade GDP ratio of Pakistan)
$DIST_{ijt}$ = Distance between country i and country j,
$CULT_{ijt}$ = Similar religion is taken as culture similarity between Pakistan and partner (dummy variable)
JB_{ijt} = Land border between country i and j (dummy variable)
SAARC = Partner country having membership of SAARC (dummy variable)
WTO = Partner country having membership of WTO (dummy variable)
ECO = Partner country having membership of ECO (dummy variable)
SCO = Partner country having membership of SCO (dummy variable)
U_{ij} = Error term; t = time period; βs = parameter

Results and Discussion

Panel data provides the additional advantage through observing individual impact between trading partners and capturing the relationship over variables in time (Antonucci and Manzocchi 2006; Kepaptsoglou et al., 2010). The summary statistics of the data set which is used for the gravity model analysis is shown in table 2.

Mean value of bilateral trade of Pakistan with major trading partners is US$ 1610.585 million. Mean value of Pakistan`s population is 156.5139 million and 201.79 million is the mean value of trading partner`s population. Mean value of distance variable is 4250.611 km and the minimum distance between Pakistan and trading partners is 371 km. In this study variable of GDP is used as the product of GDP of Pakistan with her trading partners rather than it is separately used and the per capita GDP (PPP) of bilateral trading nations is also used in this case. Mean value of Pakistan`s trade openness is 11.71 million.

Table 2: Summary Statistics of Panel Data Used in Gravity Model

Variables	N	Max.	Min.	Mean	Median	Std. Dev
T_{ijt}	396	1.5E+4	33.8	1610.58	921.58	2023.36
GDP_{ijt}	396	3.2E+17	178.02	3.8E+15	7.5E+4	2.5E+16
$PCGDP_{ijt}$	396	1.12E+8	1.1E+8	5.6E+6	4.05E+8	9.1E+7
POP_{it} (M)	396	193.20	122.82	156.51	155.50	21.033
POP_{jt} (M)	396	1378.66	1.96	201.79	64.49	370.88
T_{ijt}/GDP_{it}	396	53.83	0.402	11.71	8.44	11.60
$DIST_{ijt}$ (Km)	396	11396	371	4250.61	3639	2E+3

Source: Author`s calculations

Unit Root Tests

Different tests for Unit root i.e. Levin, Lin & Chut*, I P Shin W-stat, ADF-Fisher Chi-square and PP -Fisher Chi-square were used. The variable of $Trade_{ijt}$ becomes stationary at first difference as shown in table 3.

These test statistics were used for the GDP_{ijt} (Product of the Gross Domestic Product of Trading Country) and data becomes stationary at first difference. The data of the PC_{ijt} (per capita GDP on bases of purchasing power parity) was not stationary at level, when data transfer to the first difference it became stationary.

Table 3: Results of Panel Unit Root Methods

Variables	Data Type	Test Stat./ Prob.	Levin, Lin & Chut*	IP& Shin W-stat	ADF–Fisher Chi-square	PP– Fisher Chi-square
	At Level	Test Stat.	1.16197	1.52484	25.1546	27.5246
$Trade_{ijt}$		Prob.	0.8774	0.9364	0.9122	0.8437
	1st difference	Test Stat.	-11.6954	-12.0871	207.449	301.862
		Prob.	0.0000	0.0000	0.0000	0.0000
	At Level	Test Stat.	8.4227	8.34738	17.9704	15.5707
GDP_{ijt}		Prob.	1.0000	1.0000	0.9948	0.9988
	1st difference	Test Stat.	-9.07557	-7.08695	141.064	372.270
		Prob.	0.0000	0.0000	0.0000	0.0000
	At Level	Test Stat.	9.36754	11.3784	4.46246	2.70689
$PCGDP_{ijt}$		Prob.	1.0000	1.0000	1.0000	1.0000
	1st difference	Test Stat.	-5.79614	-5.55072	103.185	102.860
		Prob.	0.0000	0.0000	0.0000	0.0000
	At Level	Test Stat.	11.2415	16.0490	0.00941	1.3E-06
POP_{it}		Prob.	1.0000	1.0000	1.0000	1.000
	1st difference	Test Stat.	-10.5864	-5.95623	96.9911	1.20606
		Prob.	0.0000	0.0000	0.0000	1.0000
	At Level	Test Stat.	-0.58547	3.95951	40.0100	89.0972
POP_{jt}		Prob.	0.2791	1.0000	0.2966	0.0000
	1st difference	Test Stat.	-12.8265	-6.96737	343.452	28.5689
		Prob.	0.0000	0.0000	0.0000	0.8063
	At Level	Test Stat.	0.3951	0.3359	34.4173	47.0181
T_{ijt}/GDP_{it}		Prob.	0.6536	0.6316	0.5439	0.1034
	1st difference	Test Stat.	-8.6183	-9.5867	158.229	322.362
		Prob.	0.0000	0.0000	0.0000	0.0000

Source: Author`s calculations

When these four test statistics of unit root were applied on the data of POP_{it} (population of Pakistan) the results indicate that data was not significant at level, means that data was not stationary at level, although data turned to first difference it indicated the significance and stationarity, while the data in the test PP-Fisher Chi-square is also not significant. Whereas the three tests out four indicate that data is stationary at first difference, than we conclude the data is stationary. When test statistics of unit root used for POP_{jt} (population of Partner country), it suggests that data is insignificant at level i.e. the data is not stationary. Whereas PP-Fisher Chi-square indicate data of POP_{jt} is significant and stationary at level. Although we conclude that more test show non-stationarity of data, so we turned the data to first difference form and get the results. Three tests except PP-Fisher Chi-square show that partner`s population data is significant and stationary at first difference. Thus we conclude that data is stationary at first difference. Ratio of bilateral trade with Pakistan`s GDP is not stationary at level, when data transfer to the first difference it became stationary.

Selection of Appropriate Model

Panel data capture the relationship of variables over time and individual impact between trading partners (Antonucci and Manzocchi 2006; Kepaptsoglou et al., 2010). REM (Random-effects model) would be more appropriate to estimate trade flows for a randomly selected sample for time invariant variables. While, FEM (Fixed-effects model) is also a test for the trade flows of predetermined selected sample. This model is considered better than REM. But there is an issue with fixed- effects model of estimation that this model cannot estimate the time invariant variables like distance, as distance cannot change with respect of time. Thus this type of variables wipe out from the analysis (Zarzoso, 2003). The current analysis of gravity trade model was carried out by following Rahman (2003), Zarzoso (2003), Gul and Yasin (2011), Arabi and Ibrahim (2012), Suvankulov and Ali (2012) and Javed et al. (2016).

F-test (Pooled OLS or FEM)

Appropriate model was selected by using F-test under null hypothesis i.e. Pooled OLS is appropriate for data analysis while alternate hypothesis indicates the appropriateness of fixed effects model. The value of F-test is 171.18 which is highly significant. It goes against the null hypothesis and concluded that pooled OLS regression is not appropriate test than the fixed effects model.

Breusch-Pagan LM Test (Pooled OLS or REM)

As the time invariant variables are in the model and the both pooled and random effects model are able to estimate the time invariant variables. So, which is the more appropriate between these two? Breusch-Pagan LM test (Breusch and Pagan, 1980) was used to find out the appropriate model by testing the null hypothesis. The null hypothesis states that pooled OLS is appropriate for data analysis. The results of Breusch-Pagan LM test indicated the appropriateness of random effect model by rejecting the null hypothesis.

Hausman Specification Test (REM or FEM)

Hausman test is used to check the appropriateness of random effect model or fixed effect model for analysis under null: random effects model is appropriate; alternate: Fixed effects model is appropriate.

Chi-Sq. Statistics = 37.278

Chi-Sq. d.f. = 7

P-value = 0.0000

P-value was being the cause of accepting the alternate hypothesis that indicates the appropriateness of fixed effects model for gravity model

Estimation of Gravity Model by Fixed Effects Model

As F-test and Hausman test select the fixed effects test for the estimation of gravity model. Thus gravity model having only time variant variables and its estimated results are shown in the table 4, because the time invariant variables are not estimated by fixed effect model. Zarzoso (2003) estimated the gravity model because he found that as compared to random effect model, fixed effect model was more appropriate model for estimation of gravity model.

HAC standard error test or Newey-West standard error test is used to solve the problem of hetroskedasity. Neway-West Standard error test is mostly valid for large sample even though it is used in many researches. In large sample this test is used to handle the situation of heteroskedasticity and autocorrelation as well. HAC test can handle both problems, Unlike White test, which is specially designed to overcome the problem of heteroskedasticity. After applying HAC test, fixed effect estimates are free from heteroskedasticity problem.

According to results, the product of GDPs is putting positive and significant effect on the bilateral trade between Pakistan and trading partners. The result is according to expected result. The coefficient of GDP of both countries was 0.0546. One percent increase in GDPs cause 0.0546 percent increase in trade between Pakistan and trading partners. According to Sohn (2001), there was a highly significant and positive relationship between bilateral trade and GDPs in gravity model. Rahman (2003) found the positive and significant results of national income with bilateral trade. There was also positive and significant effect of size (GDPs) of bilateral trading partners on trade (Bussière et al., 2005). Dilanchiev (2012) concluded that bilateral trade and GDPs were having positive and highly significant relation to each other. Khan et al. (2013) also concluded that contribution of GDPs to trade was positive and significant. Hussain (2017) found positive and significant impact of Gross Domestic Products of trading countries on bilateral trade.

The result of per capita GDP was according to expectations which is positive. The product of per capita GDP has positive and significant impact on bilateral trade of Pakistan with its trading partners. The coefficient value is 0.1933; it concludes that one percent increase in per capita GDPs cause 0.1933% rise in trade. Rahman (2009) found positive and significant relationship between per capita GDPs on trade. In livestock, Bovine cattle and in non-agricultural product trade coefficients of per capita GDP of both exporting and importing countries were positive and highly significant (Grant and Lambert, 2005). A positive and significant impact of per capita GDPs on trade is also found through the analysis (Hussain, 2017).

Table 4: Estimation of Gravity Model by Fixed Effects Model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
C	-12.825	1.2079	-10.618	0.0000
$LGDP_{ijt}$	0.0546	0.0314	1.7383	0.083*
$LPCGDP_{ijt}$	0.1933	0.0729	2.649	0.0084***
$[LT_{ijt}/GDP_{it}](-1)$	0.72144	0.0427	16.8925	0.0000***
$LPOP_{it}$	2.8922	0.3513	8.2318	0.0000***
$LPOP_{jt}$	-0.1284	0.1934	-0.6639	0.5072^{NS}
R-square	F-statistic	Prob.	Adjusted R2	DW-stat
0.8943	136.5828	0.0000	0.8877	2.08

*Note: * and *** indicate significance at 10% and 1% respectively. NS indicate non-significant*

The variable ratio of trade over GDP (trade openness) of Pakistan`s shows the positive and highly significant relationship on bilateral trade of Pakistan, which is same to expected results. The coefficient`s value was 0.721 indicated that one percent rise in trade over GDP ratio, cause rise the bilateral trade to 0.721 percent. Rahman (2003) found positive and significant relationship between trade openness to the bilateral trade of Bangladesh. Malik and Chaudhary (2012) concluded that lag of bilateral imports flow of Pakistan had a positive and significant impact on bilateral imports flow of Pakistan.

The result of population of exporting country is also according to expected result i.e. positive. Population of exporting country (Pakistan), in the analysis, concludes the

positive and significant results. The coefficient value is 2.8922 indicates that one percent increase in Pakistan`s population cause 2.89 percent increase in bilateral trade of Pakistan. Fitzsimons et al. (1999) found that exporting nation`s population had positive and significant impact on exports of trading country. Kucera and Sarna (2006) also concluded the positive and significant relationship between exporters and population of exporter country. Arabi and Ibrahim (2012) found that population of exporting country significantly and positively influence the exports of that country.

According to results, the population of importing country negatively affects the bilateral trade of Pakistan. The result of population of partner country is also according to expected result i.e. negative. One percent rise in importing Nation`s population may decrease the bilateral trade by -0.1284 percent. Importer`s population also have a negative and insignificant impact on exports of a nation (Endoh, 1999). Multicollinearity is a situation shows the dependency (correlation) among regressors is strong. Here is a statistic (Tolerance) which measures the degree of collinearity. Variance Inflation Factor is reciprocal of this statistics. Higher value of VIF makes her estimate unstable and indicates the presence of multicollinearity. The value of VIF which is less than 10 for each regressor. All the variables have the VIF value less than 5. It indicates that the inter dependency ratio among regressors is very low and might not be considered. It means that there is the absence of multicollinearity problem as shown in table 5.

Table 5: Multicollinearity among Variables of Fixed Effect Model

Variable	VIF
$LGDP_{ijt}$	2.9433
$LPCGDP_{ijt}$	2.6200
$[LT_{ijt}/GDP_{it}](-1)$	1.1135
$LPOP_{it}$	4.9552
$LPOP_{jt}$	2.082

Source: Author`s Calculations.

Gravity Model by Random Effects Model

As there is time invariant variables are included in the augmented trade model in the estimated random effect model. The data under consideration has no problem of multicollinearity because the values of VIF are less than 10. According to the value of Durbin-Watson for the estimated random effects model, problem of autocorrelation is also absent in the data set because the Durbin-Watson Value was near to 2, as shown in the table 6.

Table 6: Estimation of Gravity Model by Random Effects Model

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	-12.0457	1.1923	-10.1027	0.0000^{*}
LGDPijt	0.0555	0.0286	1.9391	0.0532^{*}
LPCGDPijt	0.0198	0.0395	0.5027	0.6154^{NS}
[LTijt/GDPit](-1)	0.8942	0.0271	32.9433	0.0000^{***}
LPOPit	3.2811	0.248	13.2297	0.0000^{***}
LPOPjt	-0.0208	0.03544	-0.5875	0.5571^{NS}
LDIST.ijt	-0.0563	0.0575	-0.9802	0.3276^{NS}
CULTijt	0.0541	0.0751	0.7205	0.0971^{*}
Jbijt	0.1552	0.101	1.5368	0.0412^{**}
SAARC	-0.0091	0.1199	-0.0758	0.9396^{NS}
SCO	0.0069	0.1005	0.0687	0.9452^{NS}
ECO	-0.1197	0.1027	-1.1651	0.2447^{NS}
WTO	-0.0014	0.0772	-0.0175	0.9860^{NS}
R-square	Adjusted R2	F-statistics	Durbin-Wat.stat	Prob.(F-stat)
0.8835	0.8797	230.78	2.22	0.0000

Note: *, ** and *** indicate significance at 10%, 5%, 1% respectively; NS: non-significant

According to results, the product of GDPs is putting positive and significant effect on the bilateral trade between Pakistan and trading partners i.e. according to expected result. The coefficient of GDP of both countries is 0.0555, which results 0.0555 percent rise in bilateral trade of Pakistan when product of both countries GDP rise one percent. After 2002-03 GDP of Pakistan rose gradually and trade also. There was a slight decline in GDP which caused a sharp decline in trade in 2009. Trade decreased in 2014 while GDP increased. This decline in trade is due to the sharp decrease in exports and imports as well. In 2016 imports again increased. According to Sohn (2001), there was highly significant and positive relationship between bilateral trade and GDPs in gravity model. Rahman (2003) found positive and significant results of national income with bilateral trade. There was also positive and significant effect of size (GDPs) of bilateral trading partners on trade (Bussière et al., 2005). Dilanchiev (2012) concluded that bilateral trade and GDPs were having positive and highly significant relation to each other. Hussain (2017) found the positive and significant impact of the product of Gross Domestic Products on the bilateral trade of Pakistan and trading countries.

The result is totally according to expected result. The product of per capita GDP on the bases of purchasing power parity put positive and insignificant impact on

bilateral trade of Pakistan and trading partners. The coefficient value was 0.0198 indicates that one percent increase in per capita GDPs increased the Pakistan`s bilateral trade by one percent. Thus, the increase in per capita GDP is also in favor of Pakistan`s bilateral trade but results indicate /insignificant impact of GDP per capita with bilateral trade of Pakistan. As Sohn (2001) showed positive and insignificant results between per capita GDPs and trade. Dilanchiev (2012) analysis showed the positive and non-significant relationship between per capita GDPs and trade.

Trade openness also affect Pakistan`s bilateral trade as expected. The variable trade openness (ratio of trade over GDP of Pakistan) showed the highly significant and positive relationship on bilateral trade of Pakistan. The coefficient`s value was 0.8942 indicates that one percent rise in trade openness cause rise the bilateral trade to 0.8942 percent. Rahman (2003) found positive and significant relationship between trade over GDP ratio in case of the bilateral trade of Bangladesh. Malik and Chaudhary (2012) concluded that lag of bilateral imports flow of Pakistan had a positive and significant impact on bilateral imports flow of Pakistan.

Population of exporting country (Pakistan), in the analysis, conclude the positive and significant results i.e. according to expected result. The coefficient value is 3.28 indicated that one percent increase in Pakistan`s population cause the 3.28 percent in bilateral trade of Pakistan. Fitzsimons et al. (1999) found that exporting nation`s population had positive and significant impact on exports of trading country. Walsh (2006) also found positive and highly significant relationship between population of exporting nation and bilateral trade of that nation. Kucera and Sarna (2006) also concluded positive and significant relationship between exporters and population of exporter country. Arabi and Ibrahim (2012) found that population of exporting country significantly and positively influence the exports of that country.

Population of importing country negatively affected the bilateral trade of Pakistan. One percent rise in importing Nation`s population may decrease the bilateral trade by -0.02 percent. Importer`s population also have a negative and insignificant impact on exports of a nation (Endoh, 1999).

The results of distance variable in the model shows a negative sign indicating negative effect on bilateral trade of Pakistan which is not significant. The coefficient of distance was -0.056 which indicated that one percent increase in distance decreases the bilateral trade to 0.05 percent. Thus increase in distance between trading countries cause a decline in trade. Rahman (2003) found negative and insignificant impact of distance on bilateral trade of Bangladesh. There was negative and insignificant effect of distance (Khan et al., 2013; Malik and Chuhdary, 2012). Distance has a negative and significant impact on trade of Pakistan with United Arab Emirates (Javed et al., 2016).

Culture dummy variable put positive and significant impact on bilateral trade of Pakistan as expected. Bilateral trade of Pakistan will increase to 0.0541%, if the trading countries have the same culture (religion). Culture is also a positively and highly significant trade determining factor (Javed et al., 2016). As expected result border dummy positively and significantly influence the bilateral trade of Pakistan. The value of coefficient was 0.1552 showed that bilateral trade raised by 0.1552% if there is joint border between Pakistan and trading country. This result had positive and significant impact (Kucera and Sarna, 2006; Gul and Yasin, 2011; Mohmand and Wang, 2014; Javed et al., 2016; Hussain, 2017).

SAARC (South Asian Association of Regional Corporation) dummy puts negative and insignificant effect on the bilateral trade of Pakistan. This result is contrary to expected result. Negative value of SAARC dummy indicated that if Pakistan and trading partner of Pakistan is the member of SAARC association than trade between Pakistan and member country decreased by -0.0091%. Gul and Yasin (2011), Ekanayake et al. (2010) also found negative and insignificant effect of SAARC membership on trade. The result of SCO (Shanghai Corporation Organization) dummy shows that bilateral trade of Pakistan is negatively and insignificantly associated with Pakistan`s bilateral trade. This result is according to expected result. If Pakistan and partner country are the member of SCO than bilateral trade of Pakistan with that country rises by 0.0069 %.

The result of dummy variable of membership of ECO (Economic Cooperation Organization) shows that it has negative and insignificant impact on Pakistan`s bilateral trade. The results of ECO and WTO are contrary to expected result. If both countries are the member of ECO, the bilateral trade of Pakistan declines by 0.1197%. Ekanayake et al. (2010) also found negative and insignificant effect of ECO membership on trade between partner countries. Value of WTO dummy variable indicates decline of 0.0014 % of bilateral trade of Pakistan with its trading partners. Kolesnikov and Podkorytova (2011) found that WTO negatively and insignificantly influenced the trade between Russia and her trading partners.

Table 7: Multicollinearity of Variables in Random Effect Model

Variable	VIF
$LGDP_{ijt}$	8.6633
$LPCGDP_{ijt}$	6.1491
$[LT_{ijt}/GDP_{it}](-1)$	2.0344
$LPOP_{it}$	2.4745
$LPOP_{jt}$	7.3849
$LDIST._{ijt}$	5.6169
$CULT_{ijt}$	3.4204
JB_{ijt}	4.3364
SAARC	5.5100
SCO	3.6026
ECO	2.4542
WTO	1.9060

Source: Author`s calculations.

If there is an undesirable condition of independent variables, in which these independent variables are collinear to each other, the situation is known as multicollinearity. Tolerance statistic is used to determine the rate of collinearity (multicollinearity) among independent variables. The reciprocal of tolerance is Variance inflation factor (VIF). As the value of VIF rises, variance of estimated coefficients makes unstable estimates. Higher VIF value indicates the presence of multicollinearity. VIF value less than 10 indicated the absence of multicollinearity among independent variables. The results of this study showed the VIF value less than 10, indicating absence of multicollinearity. The table 7 below showed the VIF results.

Conclusion

Estimated results showed that the product of GDPs, population of Pakistan and trade openness are Pakistan`s major deriving factors of bilateral trade. Dummy variables like culture and border sharing also effective determinant of Pakistan`s bilateral trade. So it will be helpful if Pakistan concentrate more in improving trade relations with those countries which have cultural similarities and sharing border with Pakistan. Pakistan`s exports mainly depends on agricultural production, whereas Pakistan`s imports consists of petroleum products, crude oil, edible oil, machinery, tea, iron and steel, fertilizers and chemicals which with more than 70 percent import share. As a result, Pakistan faces trade. Positive and significant relation between trade and GDP suggested that Pakistan need to explore large economies for trade. Trade GDP ratio has a positive and significant impact on trade. So Pakistan should take measures to increase GDP as well as Trade. Pakistan`s exports mainly depends on agriculture and imports consists of machinery, chemicals and energy resources. Government should take measures to promote its production along with value addition to increase exports. As Pakistan`s bilateral trade positively and

significantly influenced by Pakistan`s population. Thus Pakistan should try to import those commodities which could be used in production of value added goods to increase exports with the help of skilled labor. As distance play insignificant role in determining Pakistan`s trade but it is important factor for trade. Thus it is necessary to explore the nearest markets. Improvements of transportation infrastructure are more useful to improve the significance of distance factor in determining Pakistan`s trade. As bilateral trade of Pakistan positively and significantly influenced by the variable joint border. Thus it is necessary for Pakistan to promote its trade with China, India, Afghanistan and Iran. Although Pakistan has many political and social issues with India but if these issues are settled down, both countries can get more advantage of trade with each other by making its production with respect to comparative advantage. It will make an efficient use available resources. In case of regional agreements like SAARC and ECO there are many issues due political tensions between Pakistan and India which are the major players among SAARC countries. So, it is necessary for Pakistan to sort out all issues to enhance trade with major economies which are the members of these trade organizations.

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