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FOREIGN TRADE PATTERN OF PAKISTAN

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Abstract

Using the gravity model approach, this study investigates the overall trade pattern of Pakistan. The study has applied the panel dataset for 10 major trading partners of Pakistan for the period 2005-2015. The analysis of this study is based on Panel data for which the Pooled OLS, FEM and REM are estimated while taking different assumptions. The empirical results are found to be consistent with basics of gravity model as the study indicates positive relationship between the economic size, level of development and, trade and negative relationship between the distance and trade. The overall results indicate that Pakistan needs diversification, both in the existing markets and products. It also needs to enter into new trade agreements with an aim to explore new markets, so that it could be able to reap the full benefits of trade.

Key Words: Trade GDP, Gravity.
JEL Classification: F19.

I. Introduction

International trade plays a significant role in economic growth and development process of a country. Pakistan is cognizant of the fact that nature and patterns of foreign trade sets the direction of economic development of the country. It has been proved that a major force in progress can move the potential growth trajectory on the basis of trade volumes of a country. Historically, Pakistan's economic performance remained below its potential level, particularly during 2007-08 to 2012-13, when the growth rate averaged to less than 4 per cent, on account of various factors emanated from internal and external factors. At the same time, due to an international financial and economic meltdown, the external sector was deteriorated and witnessed substantial increase in the current account deficit which was recorded at 8.8 per cent of GDP in the fiscal year 2008. However, a significant improvement has been witnessed in the overall economic performance, since the economic growth averaged above 4 per cent since 2013-14 and onwards.

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Trade can help to boost development and reduce poverty by generating growth through increased commercial opportunities and investment, as well as it can broaden the productive base through private sector development. As far as external sector of Pakistan is concerned, historical review highlights that the economy has witnessed a widening trade gap as import growth surpasses the export expansion. Despite an increase in absolute term, exports have declined both in terms of growth and GDP. The growth in export declined by 3.9 per cent in the fiscal year 2015 against the growth of 16.2 per cent recorded in the fiscal year 2005. In terms of GDP, it stood at 8.9 per cent in the fiscal year 2015 as compared to 13.2 percent in the fiscal year 2005. Contrary to it, the growth in imports registered a sharp decline from 37.8 per cent in 2004-05 to 0.9 per cent in 2014-15. However, the imports witnessed a steady decline in terms of GDP as it reduced to 15.2 per cent in 2014-15 from 17.1 per cent in 2004-05. Accordingly, the trade balance widened to 6.3 per cent of GDP in 2014-15, against 4 per cent of GDP registered in the fiscal year 2005.

The slowdown in export's growth during the past few years was attributed to various factors such as weak external demand due to sluggish global economic activity; the fall in international commodity prices resulted in lower unit receipts for exporters, high cost of production and continuing competitiveness issues. Additionally, narrow product and market bases lead to stagnant exports and sensitive conditions to demand and supply. Pakistan's exports are highly concentrated in few items which is evident from the fact that share of cotton and cotton manufactures, leather, rice, and few more items remained significant in total exports between FY2004-05 and FY2014-15. During FY2014-15, these three items accounted for 67.8per cent of total exports against the share of 69.7 per cent during FY2004-05.[1] However, all these items are relatively low value added products. High export concentration in few products means that Pakistan has not made significant progress in increasing the number of products. Similarly, the exports are highly concentrated in few countries as more than half of Pakistan's exports go to ten countries; namely, USA, China, UAE, Afghanistan, UK, Germany, France, Bangladesh, Italy and Spain.[2]

Like exports, Pakistan's imports are also concentrated in few items and few markets. Almost one-third of the Pakistan's import bill constituted by petroleum products including crude oil, while principal imports are from China, Saudi Arabia, the United Arab Emirates, Indonesia and Kuwait. In 2014-15, Pakistan's imports were the U.S$ 41.3 billion, which largely constituted the petroleum, petroleum products, machinery, plastic, transportation equipments, edible oils, paper, iron, steel and tea. Realizing the need to enhance, export competitiveness through product diversification, value addition, trade facilitation and enhanced market access, a three year medium term framework known as Strategic Trade Policy Framework (STPF) was developed in 2009. Till now two medium term frameworks have been completed, i.e., STPF 2009-12 and

[1] Pakistan Economic Survey. Trade and Payments (2008-09 and 2015-16).

[2] Pakistan Economic Survey. Trade and Payments (2014-15).

STPF 2013-15. Currently STPF 2015-18 is in progress with a plan to enhance the annual exports to US$ 35 billion to improve Export Competitiveness, transition from 'factor-driven' economy to 'efficiency-driven' and 'innovation-driven' economy; to increase the share in regional trade.

Over the past few years, Pakistan has stringently focused on developing its trade and economic ties with different countries of the world. Particularly, it has focused on enhancing its trade relations at regional level with an aim to improve the living standard of people of the region. This is evident from the fact that Pakistan is an active member of various organizations that aims to promote economic and trade ties between nations of the region, such as the Economic Cooperation Organization (ECO), a founding member of the South Asian Association for Regional Cooperation (SAARC) and the Developing-8 (D-8). Moreover, Pakistan has entered into several trading arrangements with countries of the region, such as the SAFTA Agreement, the Pakistan-Sri Lanka Free Trade Agreement, the China-Pakistan Free Trade Agreement, the Comprehensive Free Trade Agreement between Pakistan and Malaysia, and a Preferential Trade Agreement with Islamic Republic of Iran (subject to applicable sanctions compliance). All agreements aims to give boost to trade particularly exports.

One of the major development which Pakistan has witnessed (in December 2013) when the EU Parliament granted Pakistan, the GSP + scheme. Under GSP+, Pakistan will benefit from the duty-free access to the EU markets about 90 per cent of its exports, provided the government implements legislation to improve the human rights, labor standards, sustainable development and good governance, all of them are part of the government's program. Pakistan's exports to EU member states increased from US$ 4.25 billion in 2005 to US$ 6.73 billion in 2015. The Compound Annual Growth Rate (CAGR) of exports to EU has been 4.85 per cent only. Pakistan's exports to EU during the year 2014 amounted to US$ 7.54 billion, but however, decline in 2015 was realized largely on account of financial crisis in EU countries and the depreciation of EURO against Dollar (and the Pak Rupee).[3] However, despite all its efforts, Pakistan's trade has shown a mix-trend when compared to 2005 trade pattern of different countries at regional and international level. Pakistan's trade within the region, especially with China, India, Saudi Arab and Kuwait is on the rise. Normalization of trade relations with India is also a major initiative; and these developments present both the challenges and opportunities for Pakistani exporters. In order to up-scale our market development activities in neighboring markets, including China, India, Afghanistan and Iran, Pakistan is undertaking different promotional initiatives including market research, support to non-traditional exports, marketing efforts of private sector, etc.

The main objective of this study is to find factors which effect the trade pattern of Pakistan with 10 major trading partners (Appendix-I). The analysis will help to know whether trade relations with these economies have improved on account of various

[3] Pakistan Economic Survey. Trade and Payments (2015-16).

trade agreements with these countries. In this regard a gravity model has been estimated with panel data and pooled, fixed and random effect estimations covering the period from 2005 to 2015.The analysis would be helpful to know the current trade patterns with these countries, along with useful insights about the trade potential.

The study is organized as follows. First, after introduction the review of some important studies on bilateral trade flows and its determinants based on gravity model of trade (Section II) is reviewed. As the analysis of this study is based on the gravity model of trade, therefore in Section III the theoretical foundations of the gravity model briefly discussed; later in Section IV the model and its methodology is defined. Then the data used in the estimation is addressed, and finally the results of gravity model followed by conclusion and policy implications are presented in Section V.

II. Literature Review

There are various studies which have estimated the gravity model, using cross-section and panel data approaches to observe the bilateral trade patterns. In these studies the gravity model is used, both for aggregate bilateral trade and for product level trade. Besides, there are some studies which have examined the trade potential, trade determinants, trade direction and trade enhancing impacts.Prasai (2014) examined the overall trade patterns of Nepal by using pooled ordinary least square along with one year lag gross domestic product (GDP). He used the basic and augmented forms of gravity model from 1981 to 2009. The study found negative signs for per capital GDP in augmented model for both the imports and exports. The negative signs implies that Nepal exports labour-intensive goods and imports the necessity goods.

Khan et al. (2013) analyzed the bilateral trade flow of Pakistan with major trading partners using panel data for the period covering 1990 to 2010 with a frequency of two years for analysis. According to the result, the traditional variables of gravity model, i.e., GDP, distance and GDP per capita have shown their significant impact on bilateral trade with expected signs. However, the variable of cultural similarities is negatively related to trade volume. Rayhan and Roy (2012) analyzed the influencing factors of import flows of Bangladesh based on different methodologies related to the gravity model panel data approach, such as pooled OLS model and the fixed effect model within the group estimator.

Additionally, the study examines the impact of time invariant variable under random effect model and the cross section country effects. The results indicate that import model is consistent with the gravity model as GDP is positive and distance is negative. Akhter and Ghani (2010) analysed the trade potential and benefits of regional integration under SAARC for member and non-member countries. Their analysis is based on both the cross sectional and pool data in order to capture individual, as well as the overall trade effects, respectively. The study shows that this regional trade agreement can divert the trade for member countries, as well as for the non-member countries.

However, trade volume will increase only if major partners (Pakistan, India, and Sri Lanka) sign the regional trade agreements. Rahman (2009) has estimated the trade potential for Australia using the augmented gravity models and the cross section data of 50 countries. Results revealed that there is a positive impact of economic size, per capita GDP, openness and common language, and the negative impact of distance between trading partners on Australia's bilateral trade. The results also show that Australia has significant potential for trade expansion with Argentina, Austria, Bangladesh, Brazil, Chile, Canada, Greece, Israel, New Zealand, Norway, Pakistan, the Philippines, Portugal, the Russian Federation, Singapore and Turkey. Batra (2004) estimated the trade potential for India using gravity model approach. The estimates of India's global trade potential reflect that scale of India's trade potential is high in the Asia-pacific region followed by Western Europe and North America. With regard to specific country or trade arrangements, the results indicate that India has the maximum trade potential with Pakistan in SAARC, with Philippines and Cambodia in the ASEAN region, and with Oman, Qatar and Kuwait in the GCC.

III. Theoretical Foundation of Gravity Model

The emergence of gravity model is linked with Newton's Law of universal gravitation, which describes gravitational force between the two masses in relation to distance that lies between these two masses. The gravity model of trade is defined as volume of trade between the two countries, like gravitational force between the two masses depends directly on their respective 'masses' (where GDP is often used as a proxy for mass) and inversely on the distance that lies between these two masses. The gravity equation is defined as follows:

$$F = G\ \frac{m1.m2}{r^2} \tag{1}$$

Equation (1) implies that

$$Trade_{ij} = \alpha\ .\frac{GDP_i\ GDP_j}{Distance_{ij}} \tag{2}$$

Where, $Trade_{ij}$ is the value of bilateral trade between home country (i) and foreign country (j), Product of *GDPi* and *GDPj* are the national income of home and foreign country, respectively, $Distance_{ij}$ is the bilateral distance between country (i) and country (j). Lastly, α is a constant of proportionality.[4] Equation (3) describes the most simplified version of gravity equation of international trade. According to mccallum (1995), this simple model fits the data well due to high explanatory power. To make Equation (2) into linear form, logarithms of gravity model is taken. Hence, the linear form of equation which is also known to be an estimable equation can be written as:

[4] Batra (2004).

$$log(Trade_{ij}) = \alpha + \beta_1 log(GDP_i\ GDP_j) + \beta_2 log(Distance_{ij}) + \upsilon_{ij} \quad (3)$$

In Equation (3), α, β_1 and β_2 Are the coefficients will be estimated, while the error term υ_{ij} (independent and normally distributed) which is the unknown zone, captures the impact of other events. This could affect the bilateral trade between the two countries but it is not explained here. Equation (3) is the main gravity model equation which can be defined as bilateral trade as positive function of product of GDP of the host and foreign country, and a negative function of distance between the two countries. Tinbergen (1962) and Poyhonen (1963) were the pioneers who used this concept in the area of international trade. However, theoretical foundation of the model is relatively new. In this regard, [Linnemann's (1966) application of model to international trade] was of more classic and recent. The author also used an analogy with Newton's universal law of gravitation to explain the patterns of bilateral aggregate trade flows between country *i* and country *j* as positively related to the size of those countries and negatively related to distance between them. The economic size implies the production capacity of each country along with the market potential for sale of goods to each country. On basis of this property, the economic size is an essential or fundamental force which determines the trade flow between the home country and foreign country. The product of GDP is used as a proxy for the two countries economic size, both in terms of production capacity and market size.

Distance is another variable which has been defined in standard gravity model and is used as a proxy for transportation cost. In literature, it is defined either as geographical distance between the two countries involved in trade with each other or a distance between capital cities measured in nautical or land miles. The impact of distance representing transportation costs is to tax on international trade. Consequently, it results in decline of trade flows. Tinbergen (1962) refers the variable of trade as an index of information about export markets. This definition implies that distance is a proxy, not only for transportation costs but it is also an indicator of time elapsed during shipment, synchronization costs, transaction costs or cultural distance [Head (2000)]. Since measuring all these costs is very hard and complex, therefore geographical distance is commonly used as an approximation to all these costs. Similarly, other than the above traditional gravity model variables, a number of other factors; such as, the same cultural heritage or similar political systems which can significantly impact the bilateral trade flows, have also been introduced.

IV. Methodology

1. Model Specification

a) The Model

The basic form of model can be explained in Equation (3), which shows that bilateral trade ($Trade_{ij}$) is proportional to the product of GDP_i and, GDP_j is inversely related to distance between them.

$$log(Trade_{ij}) = \alpha + \beta_1 log(GDP_i\ GDP_j) + \beta_2 log(Distance_{ij}) + \upsilon_{ij} \quad (3)$$

With per capita GDP the basic model will be presented as follows:

$$log(Trade_{ij}) = \alpha + \beta_1 log(GDP_i\ \ GDP_j) + \beta_2 log(PCGDP_i\ PCGDP_j) + \beta_3 log(Distance_{ij}) + \upsilon_{ij} \quad (4)$$

b) Augmented Gravity Model

In order to incorporate the effect of other factors which may change the bilateral trade flows between the countries; dummy variables have been included to the basic model. This would be helpful to account for individual country effects. Hence, the augmented form of the model would be:

$$\begin{aligned} log(Trade_{ij}) = \alpha + \beta_1 log(GDP_i\ GDP_j) + \beta_2 log(PCGDP_i\ PCGDP_j) + \\ \beta_3 log(Distance_{ij}) + \beta_4 log(|PCGDPD_{ij}) + \beta_5 (Border_{ij}) + \beta_6 (Lang_{ij}) + \\ \beta_7 (RTA) + \beta_8 (WTO) + \beta_9 (ECO) + \beta_{10} (SAARC) + \upsilon_{ij} \end{aligned} \quad (5)$$

The specification of models (4) and (5) is useful for the cross sectional analysis. However, in this study the intent is to use the basic model and the augmented gravity model in order to determine foreign trade patterns of Pakistan; using panel data for 10 countries covering the period between 2005-2015. Hence, specification of both models would be:

$$log(Trade_{ijt}) = \alpha + \beta_1 log(GDP_{it}\ GDP_{jt}) + \beta_2 log(Distance_{ijt}) + \upsilon_{ijt} \quad (6)$$

$$\begin{aligned} log(Trade_{ijt}) = \alpha + \beta_1 log(GDP_{it}\ GDP_{jt}) + \beta_2 log(PCGDP_{it}\ PCGDP_{jt}) + \\ \beta_3 log(Distance_{ijt}) + \upsilon_{ijt} \end{aligned} \quad (7)$$

$$\begin{aligned} log(Trade_{ijt}) = \alpha + \beta_1 log(GDP_{it}\ GDP_{jt}) + \beta_2 log(PCGDP_{it}\ PCGDP_{jt}) + \\ \beta_3\ log(Distance_{ijt}) + \beta_4 log(|PCGDPD_{ijt}) + \beta_5 (Border_{ijt}) + \\ \beta_6 (Lang_{ijt}) + \beta_7 (RTA_{ijt}) + \beta_8 (WTO_{ijt}) + \beta_9 (ECO_{ijt}) + \\ \beta_{10} (SAARC_{ijt}) + \upsilon_{ijt} \end{aligned} \quad (8)$$

2. Description of Variables

a) $Trade_{ijt}$

The dependent variable is Bilateral Trade, which is the sum of exports and imports between the two partners (in value terms). $Trade_{ijt}$ represents the Pakistan's trade with its major trading partners in year *t*. Data has been taken from the Direction of Trade Statistics (DOT) 2016.

b) GDP_{ijt} (Product of Gross Domestic Product Constant 2005 US$)

The product of GDP between Pakistan and its trading partners have been used in year *t* as a proxy for economic size and productive capacities between the two trading partners, as a standard practice in gravity model of trade. Here, the GDP at constant price have been used to account the impact of inflation. Data has been taken from the World development Indicators [WDI (2016)].

c) $PCGDP_{ijt}$ (Per capita GDP in Constant US$)

This variable is used as an independent variable to measure the level of development between the two countries (country *i* and country *j*). There are many studies in which the explanatory variables have been used, either as GDP or population, separately or as GDP per capita to account for two in one. However, GDP per capita has been used most often in the gravity model estimations as a proxy to measure the level of development. There is a positive link between the trade and per capital GDP. Data on per capita GDP has been taken from the WDI 2016.

d) $Distance_{ijt}$

It is a geographical distance between the home country and foreign country. The literature on gravity model used this variable as a proxy for transportation cost and also the other cost which have already been discussed. There are many datasets on distance proposed in the literature and provide geographical and distance data. However in analysis, the data developed by Jon Haveman[5] have been used. It is expected that a negative sign for this variable, implies that shorter distances leads to lower transportation costs; hence there is an increase in trade between the countries.

e) ($|PCGDP_{ijt}|$) Absolute Difference in per capita GDP

The standard gravity model predicts that countries with similar level of GDP per capita will trade more than the countries with dissimilar levels. Linder (1961) hypothesis calculated absolute difference between per capita income of the host country (*i*) and foreign country (*j*). According to the hypothesis, presence of increasing return in production causes production of each good to be located in either of the countries, but not in both of them. It is also suggested that demand structure will be similar for similarities of per capita income. So, more similar the countries are in per capita income, larger would be their bilateral trade. It means that absolute value of difference of per capita income in any two countries will have a negative effect on their bilateral trade.

[5] Jon Haveman's International Trade data. Retrieved from www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/Data/Gravity/dist.txt

Here, this variable is used to test the strength of Linder hypothesis against H-O hypotheses.[6] A negative sign on coefficient will bolster the Linder hypothesis, and positive sign will be in favor of the H-O hypothesis.

In order to account for individual country's effects on bilateral trade, the dummy variables have been included:

(i) Border

In addition to distance variable, dummy variable is included to recognize the impact of common border on bilateral trade. It is the land border between the host country (Pakistan) and its trading partner (*j*) in year *t*. It has been observed that sharing common borders induce trade, owing to strong social and economic relations. Border dummy takes the value 1 if country *i* and *j* are adjacent to each other, and 0 otherwise.

(ii) Language (Official)

Two countries sharing common language tends to involve more in trade as transaction cost is expected to reduce on account of those fact that it facilitates the trade negotiations [Batra (2004)]. It takes 1 if two countries share a common language (official), and 0 otherwise.

(iii) RTA

It is a dummy for regional trading arrangements; and is equal to 1 if both countries (*i* and *j*) are members of the same regional group, and 0 if they are not. The estimated result with regard to RTA will explain the contribution of trading agreement in stimulating the trade between country *i* and *j*.

To account for the impact of regional and international trading arrangements the study also introduce separate dummies, which are as follows:

(i) WTO (World Trade Organization)

It is equal to 1 if both countries are members of the World Trade organization (WTO) in year t,and 0 otherwise.

(ii) ECO (Economic Corporation Organization)

It is equal to 1 if the host country and its trading partner countries (*j*) are members of ECO in year *t*, and 0 otherwise.

[6] The Hecksher-Ohlin theory however, stands in stark contrast to this opinion and holds that countries with dissimilar levels of output will trade more than countries with similar levels.

(iii) SAARC (South Asian Association for Regional Corporation)

It is equal to 1 if country *i* and *j* are members of SAARC, and 0 otherwise. Positive signs for all types of trading arrangements are expected.

3. Panel Data Framework

Conventionally, the standard gravity models have been estimated on cross section data in order to analyze trade patterns for a given year (one year). However, panel data framework provides additional insights, capturing relevant relationship over time. Arvas (2008) is of the view that using panel data may avoid risk of choosing an unrepresentative year. It is also explained that panel data allows monitoring unobservable individual effects between trading partners. It is further added that, it is important because proper econometric specification of gravity model should control for heterogeneous trading relationship; and because of this the panel data is taken in order to examine trade patterns of Pakistan, over the years with its major trading partners.

There are three estimation techniques to estimate the linear panel data models, Pooled OLS method, the fixed effects model (FEM) and the random effects model (REM).

a) Pooled OLS Method

This method assumes that there is no heterogeneity; and this assumption implies that all countries are same. Therefore, it ignores time and country effect. The pooled OLS estimator ignores the panel structure of data and simply estimate α and β. Thus, in order to examine an overall behavior, irrespective of country effect pooled OLS technique is used to calculate general β. However, to account hetero, there are some other methods discussed below.

i) Fixed Effect model

The constant under fixed effect model is taken as group specific, which implies that the model allows for different constants for each group. It can be represented as:

$$Y_{it} = \alpha + \beta X_{it} + u_{it} \tag{9}$$

There are three methods to estimate FE model based on the assumptions that whether one want to remove heterogeneity or observe heterogeneity. There are 3 equivalent approaches: First Difference Method, Within Estimator and Least Square Dummy Variable (LSDV).

To remove heterogeneity there are two estimation techniques: First difference method is appropriate in case the analysis is for two years. For more than two years of data, this

method is not applicable. Presently, the large number of dataset for panel estimation are used, and therefore, to remove heterogeneity instead of using the first difference method, the estimator technique is used. Under this technique, the mean of every variable is taken and subtracted from the actual number so that it eliminates the heterogeneity. This methodology is known as within estimator, and can be explained as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \lambda_i + U_{it}, \tag{10}$$

where λ_i cross sectional heterogeneity.

$$\bar{Y}_i = \beta_0 + \beta_1 \bar{X}_i + \lambda_i + \bar{U}_{it} \tag{11}$$

Subtracting equation (3) from (2) we get:

$$Y_{it} - \bar{Y}_i = (\beta_0 - \beta_0) + (\beta_1 X_{it} - \beta_0 \bar{X}_i) + (\lambda_i - \lambda_i) + (U_{it} - \bar{U}_{it}) \tag{12}$$

$$\Delta Y_{it} = \beta_1 \Delta X_{it} + \Delta U_{it} \tag{13}$$

Equation (13) shows that there is no cross sectional heterogeneity. On the other hand to observe heterogeneity theLeast Square Dummy variable (LSDV) is used. The FEM allows for different constants for each group. The fixed effect estimator is also known as the least square dummy variables (LSDV) estimator because in order to allow for different constants for each group, it includes a dummy variable for each group.

In order to allow intercept to vary between individual countries, the dummy variable is introduced and thus can be written as model:

$$Y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 D_{4i} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} \tag{14}$$

In the above model, dummy variable can capture the heterogeneity across different cross sections. The model will be solved through OLS technique.

(ii) *Random Effect*

It is constant for each group under Random effect model (REM) and is considered as random parameters [Asteriou (2006)]. The variability of constant for each section comes from the fact that:

$$\alpha_i = \alpha + v_i \tag{15}$$

where v_i is a zero mean standard random variable.

$$Y_{it} = (\alpha + v_i) + \beta_1 X_{1it} + \beta_2 X_{2it} + \quad \ldots\ldots\ldots \quad + \beta_k X_{kit} + u_{it} \tag{16}$$

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \quad \ldots\ldots\ldots \quad + \beta_k X_{kit} + (v_i + u_{it}) \tag{17}$$

Comparison of both the FEM and REM indicates that FEM does not take into account the time invariant variables. This implies that FEM does not allow to use the dummy variables which are not good, particularly when there are reasons to consider such dummies [Asteriou (2006)]. On the other hand the problem with the REM is that it requires making specific assumptions about distribution of random component. Similarly, if the unobserved group specific effects are correlated with explanatory variables, the estimates will be biased and inconsistent. However, it also has advantages, as it has fewer parameters to estimate as compared with the FEM. Additionally, it allows using dummy variables.

4. Data Sample

This study would analyze a comprehensive panel dataset for 10 years (2005-2015) covering Pakistan's 10 major trading partners. The panel data is analyzed through pooled OLS, Fixed Effect and Random Effect, which have already been discussed in the previous section. Keeping in view the importance of their trading relationship with Pakistan, the selection and availability of data of its 10 major trading partners are from and within different regional groups. These include Afghanistan, Australia, Bangladesh, China, India, Kuwait, Saudi Arabia, Turkey, United Kingdom and the United States.

5. Estimation of Gravity Model and Results

a) Pooled OLS

First, the pooled OLS is estimated for basic and augmented gravity model as shown in Table 1. To estimate gravity model, it is assumed that all countries are same.

The results for basic gravity model are theoretically consistent and with expected signs. It also shows that overall bilateral trade is positively related to the national income of host and foreign country; which is negatively related to distance between the two. Basic gravity model has been estimated, first without per capita GDP and then with percapita GDP. As the analysis is for Pakistan, therefore it can be interpreted that results of basic gravity model are as follows:

i) Basic Gravity Model

According to the results R-squared for Models 1 and 2 are 0.306 and 0.407, respectively; which indicates that 31 per cent variation in bilateral trade in model I is being explained by the product of GDP and distance between Pakistan and its trading partners; while 41 per cent variation in bilateral trade is being explained by the product of GDP

(per capita GDP and distance in model 2). Low explained variation implies that there are other factors which jointly determine the bilateral trade between the two countries. However, the overall model is significantly good as F-stat is 0.000, which suggests that bilateral trade flows of Pakistan is better explained by gravity model. Moreover, it can be seen that Model 2 is better than Model 1 due to the fact that RMSE is 0.788 which is lower than RMSE (0.847) of Model 1, while R-squared in Model I is better than R-squared in Model 2. It is pertinent to mention that R-squared and RMSE measures the strength of any model. Therefore, it is better to include per capita GDP, along with GDP to estimate the basic gravity model. The estimated coefficients of basic gravity model are significantly consistent, as predicted by the economic theory. It shows that in Model I, if product of GDP increases by one per cent, while keeping all other variables constant, then Pakistan's bilateral trade volume will rise significantly by 0.39 per cent, on an average; while distance variable (proxy for transportation cost) with negative sign is significant at 5 per cent level of significance. It shows that a one per cent increase in distance between Pakistan and its trading partner, keeping all other variables constant, will result of decline in trade volume by 0.48 per cent on an average.

TABLE 1

Pooled OLS

Basic Gravity Model				Augmented Gravity Model	
Model-1 $lnTrade_{ij}$		Model-2 $lnTrade_{ij}$		Model-3 $lnTrade_{ij}$	
$lnGDP_{ij}$	0.386***	$LnGDP_{ij}$	0.399***	$lnGDP_{ij}$	0.741***
$lnPCGDP_{ij}$		$lnPCGDP_{ij}$	0.318***	$lnPCGDP_{ij}$	0.348**
$lnDistance_{ij}$	-0.478***	$lnDistance_{ij}$	-0.950***	$lnDistance_{ij}$	-0.296**
$lnABSPCGDP_{ij}$		$lnABSPCGDP_{ij}$		$lnABSPCGDP_{ij}$	0.006
$Border_{ij}$		$Border_{ij}$		$Border_{ij}$	1.764***
$Comlang_{ij}$		$Comlang_{ij}$		$Comlang_{ij}$	-2.54***
RTA_{ij}		RTA_{ij}		RTA_{ij}	-2.216***
WTO_{ij}		WTO_{ij}		WTO_{ij}	-0.862*
ECO_{ij}		ECO_{ij}		ECO_{ij}	0.244
$SAARC_{ij}$		$SAARC_{ij}$		$SAARC_{ij}$	1.825***
_cons	-8.982	_cons	-10.751	_cons	-32.676
F(2,96)	21.21	F(3,95)	21.7	F(10,88)	240.22
Prob>F	0	Prob>F	0	Prob>F	0
R-squared	0.306	R-squared	0.407	R-squared	0.965
Root MSE	0.847	Root MSE	0.788	Root MSE	0.2

*, **, *** indicates significance at 90%, 95% and 99% level, respectively.
Source: Authors' calculations.

Model 2 is not much different with regard to the signs and significance of coefficients; the only difference is in magnitude of impact on dependent variables.

ii) Augmented Gravity Model

According to the results of augmented gravity model (Table 1, Model 3), R-squared is 0.96 which suggests that 96 per cent variation in bilateral trade flows is being explained by the explanatory variables. If Model 3 is compared with Models 1 and 2, it is clear that with addition of other important variables, the model strength has increased. Also RMSE is the lowest, i.e., 0.200. Thus, it explains that Pakistan's bilateral trade, flows in a better way. Overall the model is highly significant as F-stat is 0.000. The results suggest that while keeping all other variable constant, one per cent increase in product of GDP will lead to raise the bilateral trade volume significantly by 0.74 per cent on an average. Similarly, coefficient of per-capita GDP is positive and significant, and indicates an increase in per-capita GDP by one per cent; while other variables remain constant, Pakistan's trade volume will increase by 0.35 per cent on an average. The absolute difference in GDP per capita is also included in order to test for relative strength of Linder hypothesis against the Heckscher-Ohlin (HO) hypothesis. The coefficient of variable is positive but insignificant.

Now, the impact of different qualitative variables will be discussed on bilateral trade of Pakistan. According to the results, the coefficient of border dummy is positive and highly significant. In order to interpret the coefficient of dummy variable the study proceeds as follows. Taking the antilog of border dummy (1.764) and subtracting 1 from it, and multiplying by 100 the results obtained is 483.57 per cent, which suggest that Pakistan's trade will increase by more than 400 per cent, if it shares a common border with its trading partners as against those trading partners with whom Pakistan do not have a common border. The result is highly significant and theoretically consistent. It is pertinent to mention that an impact of language has been found significant in gravity model while assessing goods trade flows, nevertheless this impact is expected to be strong in services, because common language significantly simplifies many transactions. Common official language variable may also capture other effects, such as cultural or institutional similarities between countries. However, in this study the coefficient of common official language dummy, shows that Pakistan's trade with those countries with whom it shares a common language is expected to reduce by 92.1 per cent, as compared to those with whom Pakistan does not share a common language. The result is theoretically inconsistent, but however it is highly significant.

The coefficient of regional trading arrangement (RTA) is also found to be negative but it is highly significant. It shows that if Pakistan and its trading partners are members of the same trading arrangement then their trade is expected to reduce by 89 per cent, as compared to; if both are not the members of any trading arrangement. This result is inconsistent theoretically, however in case of Pakistan the result implies that various

contentious issues on account of political and military conflicts, posed threats to regional trade potential. In contrast, Pakistan's trade volume with countries which are not in the same RTA is high as compared to those countries with which Pakistan is sharing the same trading arrangement.

The segregation of regional dummy into SAARC and ECO provides some insight into trade creation and trade diversion effects. Both the trading arrangements indicate trade creation effect, however trade creation impact of SAARC is highly significant as compared to ECO which is insignificant. Interestingly, the WTO dummy was found to be negative but significant at 10 per cent. It shows that membership in WTO does not necessarily increase the bilateral trade flows. The negative sign on WTO dummy, suggests that after controlling the other factors in gravity model, Pakistan steadily inclined to trade more with those countries who are not members of WTO, as compared to WTO member countries.

b) Fixed Effect Method

Now, the gravity model is estimated with fixed effect and random effect. The results of FEM for all the three models of gravity are explained in Table 2.

The results of FEM for Basic Gravity Model (Model 1 and Model 2) are used. It is known that in the FEM, intercept terms are allowed to vary over individual units but are held constant over time. When FEM is estimated, there are two options, i.e., to remove heterogeneity and to observe it. In order to remove hetero estimator technique is used, while to observe hetero the LSDV technique is used. In this study both methods have been used. Similarly, due to presence of cross country heterogeneity, OLS is not good to estimate. Therefore, a choice had to be made between REM and FEM; and in order to choose an appropriate technique for the study on gravity model, both the FEM and REM were estimated. In model 1, model 2 and model 3, was applied within estimator technique which performs OLS on the mean differenced, because all observations of mean difference of a time invariant variable were zero, and the estimate coefficient on distance variable could not be estimated as it was a time invariant variable and therefore it was omitted.

Comparing our results of FEM with the one obtained in pooled estimation, the standard errors had roughly increased, only within the variation of data being used. Model 1 result show one per cent increase in product of GDP while other variables remain same. On an average, bilateral trade between Pakistan and its trading partners will rise significantly by 0.95 per cent. Again in model 2, the significant and positive relationship is found between bilateral trade and the product of GDP. One per cent would increase in GDP, while other remains constant and will significantly increase the trade volume of Pakistan by 0.99 per cent on an average. However, the coefficient of per capita GDP is found to be negative but also insignificant. In model 3, the other variables were augmented to account for individual effect which has also shown that

only the GDP of Pakistan and its trading partner are important determinant of bilateral trade. It reveals that one per cent increase in national income results in exactly the same rise as in the bilateral trade volume of Pakistan, i.e., 1.0 per cent on an average; while the coefficient of percapita GDP has found to be insignificant with negative sign. On the other hand, absolute per capita GDP differential is positive but it was not found significant for Pakistan's bilateral trade relations. The distance and all other dummy variables have been dropped as they are time invariant. This is unfortunate due to the fact that distance and these variables (border, common lang, RTA, WTO, ECO and SAARC) are important determinants of trade particularly.

TABLE 2

Fixed Effect Method

Basic Gravity Model				Augmented Gravity Model			
Within Estimator						Least Square Dummy Variable (LSDV)	
corr(u_i, Xb) = -0.8600		corr(u_i, Xb) = -0.8619		corr(u_i, Xb) = -0.8629			
Model-1 $lnTrade_{ij}$		Model-2 $lnTrade_{ij}$		Model-3 $lnTrade_{ij}$		Model-4 $lnTrade_{ij}$	
$lnGDP_{ij}$	0.952***	$lnGDP_{ij}$	0.990***	$lnGDP_{ij}$	0.996***	$lnGDP_{ij}$	0.996***
$lnPCGDP_{ij}$		$lnPCGDP_{ij}$	-0.066	$lnPCGDP_{ij}$	-0.086	$lnPCGDP_{ij}$	-0.086
$lnDistance_{ij}$	omitted	$lnDistance_{ij}$	omitted	$lnDistance_{ij}$	omitted	$lnDistance_{ij}$	-0.335
$lnABSPCGDP_{ij}$		$lnABSPCGDP_{ij}$		$lnABSPCGDP_{ij}$	0.015	$lnABSPCGDP_{ij}$	0.015
$Border_{ij}$		$Border_{ij}$		$Border_{ij}$	omitted	$Border_{ij}$	-0.353
$Comlang_{ij}$		$Comlang_{ij}$		$Comlang_{ij}$	omitted	$Comlang_{ij}$	-0.921
RTA_{ij}		RTA_{ij}		RTA_{ij}	omitted	RTA_{ij}	omitted
WTO_{ij}		WTO_{ij}		WTO_{ij}	omitted	WTO_{ij}	omitted
ECO_{ij}		ECO_{ij}		ECO_{ij}	omitted	ECO_{ij}	3.477
$SAARC_{ij}$		$SAARC_{ij}$		$SAARC_{ij}$	omitted	$SAARC_{ij}$	omitted
_cons	-42.549	_cons	-43.557	_cons	-43.684	_cons	-41.025
F(1,88)	134.79	F(2,87)	66.67	F(3.86)	43.96	F(12.86)	199.45
Prob>F	0	Prob>F	0	Prob>F	0	Prob>F	0
R-squared		R-squared		R-squared		R-squared	0.965
Within	0.605	Within	0.605	Within	0.605		
Between	0.174	Between	0.176	Between	0.177		
Overall	0.183	Overall	0.184	Overall	0.185		
F-test(u_i=0)		F-test (u_i=0)		F-test (u_i=0)			
F(9, 88)	220.48	F(9,87)	217.45	F(9,86)	177.89		
Prob>F	0	Prob>F	0	Prob>F	0		

*, **, *** indicates significance at 90%, 95% and 99% level, respectively.

Source: Authors' calculations.

c) Least Square Dummy Variable (LSDV)

Model 4 has been estimated while using LSDV approach in order to observe cross sectional heterogeneity which have included the dummy variables. If LSDV and within estimator technique are compared it shows that in both the techniques, slope coefficients are same for product of GDP, per capita GDP and per capita GDP differentials. However, the difference lie in a sense that LSDV is used to observe heterogeneity while within estimator is used to remove heterogeneity. LSDV dropped only three dummies, i.e., RTA, WTO and SAARC due to collinearity. To avoid dummy trap the regression with no constant can be estimated. As already mentioned the magnitude and significance level product of GDP, per capita GDP, and GDP differential are similar to Model 3. The difference is in dummy variables coefficients. Model 4 has dropped the dummy of RTA, WTO and SAARC, while for the remaining interpretation it is as follows.

The border dummy is negative and insignificant. This result is not only in conflict with the theory but is also opposite as estimated in the pooled OLS. Theoretically, inconsistent result suggests that analysis of this study included Afghanistan, China and India with whom Pakistan is sharing its common borders. Pakistan's trade particularly with India is limited due to conflict with each other. Additionally, large volume of border trade may be underground and unrecorded. Similarly, lower skills and similar products, low level of industrialization in the region, and more or less the same level of technical progress and development have also contributed to low level of trade between Pakistan and its neighboring countries.

Dummy of common official language is negative but significant at 5 per cent. It shows that if Pakistan and its trading partners have common official language their trade volume would be expected to reduce by 60 per cent. The result is theoretically inconsistent. Interestingly, ECO dummy has been found significantly positive. It indicates that if Pakistan's trading partner is also a member of ECO then the trade volume between them will increase by manifold.

d) Random Effect Model

According to the results in models 5 and 6, all coefficients are significant with expected signs. It shows that while keeping all other variables constant, one per cent increase in product of GDP will result in increase of trade volume of Pakistan with its trading partners by 0.88 per cent on an average. In model 6 the magnitude of an impact of GDP on bilateral trade is bit low, i.e., one per cent increase while other remains constant; the bilateral trade volume will increase by 0.69 per cent. The difference in magnitude may be due to inclusion of per capita GDP for which it may suspect multi-collinearity in model 6, as already discussed in detail. The distance variable in model 5 is negative and significant, suggesting that an increase in distance between Pakistan and its trading partners will reduce the trade volume between them by 1.15

per cent on an average, whereas in model 6 it shows that trade volume will reduce by 1.43 per cent on an average, if distance between Pakistan and its trading partner increase by one per cent while all other variables remain constant. Additionally, variable of per capita GDP which is a proxy to measure the level of development indicates that one per cent increase in per capita GDP will increase the trade volume of Pakistan with its trading partners by 0.37 per cent on an average.

The Wald test results for both the models show that Pakistan's bilateral trade flows are significantly determined by explanatory variables. With regard to correlation between cross sectional heterogeneity and explanatory variable, it can be seen that it is assumed to be zero in REM, but however it is -0.86 as seen in the FEM. With regard to Model 7 the results are similar to those estimated through pooled OLS technique. Overall, R-squared also implies the same results, i.e., 96 per cent variation in dependent variable is being explained by the explanatory variables.

TABLE 3

Random Effect Method

Basic Gravity Model				Augmented Gravity Model	
Model-5 $lnTrade_{ij}$		Model-6 $lnTrade_{ij}$		Model-7 $lnTrade_{ij}$	
corr(u_i, Xb) = 0(assumed)		corr(u_i, Xb) = 0(assumed)		corr(u_i, Xb) = 0(assumed)	
$lnGDP_{ij}$	0.877***	$lnGDP_{ij}$	0.691***	$lnGDP_{ij}$	0.741***
$lnPCGDP_{ij}$		$lnPCGDP_{ij}$	0.369*	$lnPCGDP_{ij}$	0.348***
$lnDistance_{ij}$	-1.152***	$lnDistance_{ij}$	-1.426***	$lnDistance_{ij}$	-0.296**
$lnABSPCGDP_{ij}$		$lnABSPCGDP_{ij}$		$lnABSPCGDP_{ij}$	0.006
$Border_{ij}$		$Border_{ij}$		$Border_{ij}$	1.764***
$Comlang_{ij}$		$Comlang_{ij}$		$Comlang_{ij}$	-2.54***
RTA_{ij}		RTA_{ij}		RTA_{ij}	-2.216***
WTO_{ij}		WTO_{ij}		WTO_{ij}	-0.862*
ECO_{ij}		ECO_{ij}		ECO_{ij}	0.244
$SAARC_{ij}$		$SAARC_{ij}$		$SAARC_{ij}$	1.825***
_cons	-29.424	_cons	-23.158	_cons	-32.676
Wald chi2(2)	123.95	Wald chi2(3)	130.74	Wald chi2(10)	2402.17
Prob>chi2	0	Prob>chi2	0	Prob>chi2	0
R-squared		R-squared		R-squared	
Within	0.605	Within	0.597	Within	0.599
Between	0.291	Between	0.385	Between	1
Overall	0.306	Overall	0.396	Overall	0.965

*, **, *** indicates significance at 90%, 95% and 99% level, respectively.

Source: Authors' calculations.

The result implies that it is much appropriate to estimate gravity model through pooled OLS technique. However, to choose between the REM and FEM, the Haussmann test has been applied. According to the results the P-value is 0.655 which indicate that the study accept H_0 suggesting that difference in coefficients are systematic or in other words REM is more appropriate than the FEM.

V. Conclusion and Policy Implication

Pakistan's foreign trade patterns have been empirically analyzed with ten of its major trading partners on the basis of basic and augmented gravity model for the period 2005 to 2015.The analysis is based on Panel data for which the Pooled OLS, FEM and REM have been estimated while taking different assumptions. However, it must be kept in mind that choice of an appropriate model depends on one's own judgment, i.e., if analyst is not interested in time invariant effects then the FEM is feasible. However, in the analysis it cannot disregard the time invariant variables as they are traditionally considered to be important determinants of bilateral trade between the countries. It also help in taking policy decision with regard to formulation of trading blocs, keeping in mind whether they should include the countries which share common border, common language or are in the same RTA, or it is important to explore new markets in order to create the trade. Therefore, on the basis of nature of this study, it is better to use the REM. Interestingly, the results for REM and pooled OLS on augmented gravity model are same.

For basic gravity (the model with and without per capita GDP), the results have proven to be consistent with the theory. According to it, Pakistan's trade patterns are strongly determined by GDP, per capita GDP and the Distance. Trade is positively related with the GDP and per capita GDP while it is negatively related to distance which is used as a proxy for transportation cost. The results also conformed empirically due to the fact that Pakistan's trade with its neighboring countries is constantly on rise.

The empirical results for augmented gravity model are largely consistent with predictions of the gravity model with some exceptions as it found negative signs for common language, RTA and WTO; while per capita GDP differential has found to be positive but insignificant for Pakistan. Therefore, no evidence was found to indicate that Pakistan benefits from the RTA and WTO for its trade; while SAARC dummy was significantly positive. This implies that Pakistan's trade within the region has a strong potential to reach new markets. Additionally, common language has also been found to be significantly negative, which implies that Pakistan's trade volume is positively related to countries with whom it does not share a common language.

Pakistan's trade within the region is on continuous rise; however, Pakistan is still in dire need of exploring new dimensions to expand its trade relations with other regions and countries with whom Pakistan's trade volume is currently low, e.g., countries in Latin America, Eastern Europe and East Asia. Besides, Pakistan also require to im-

prove the quality of its exports and minimize the cost of production in order to compete effectively in the international market. This can be taken as a policy implication that first Pakistan needs extensive efforts, both on economic and political fronts to maintain the existing markets through quality improvement in its exports but at the same time it should initiate stringent efforts to explore new markets. Thus, Pakistan can be able to broad the base of its products.

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APPENDIX –I

Countries included in the study are as follows:

1. Afghanistan.
2. Australia.
3. Bangladesh.
4. China.
5. India.
6. Kuwait.
7. Saudi Arab.
8. Turkey.
9. United Kingdom.
10. United States of America.

APPENDIX-II

This appendix gives the list of only those countries as member of WTO, SAARC and ECO which have been included in our study.

1. World Trade Organization (WTO) Member Countries

Afghanistan	29 July 2016
Australia	1 January 1995
Bangladesh	1 January 1995
China	11 December 2001
India	1 January 1995
Kuwait	1 January 1995
Pakistan	1 January 1995
Saudi Arabia	11 December 2005
Turkey	26 March 1995
United Kingdom	1 January 1995
United States	1 January 1995

2. SAARC Member Countries (Established in 1985)

- Afghanistan.
- Bangladesh.
- India.
- Pakistan.

3. ECO Member Countries (Established in 1985 by Iran, Turkey and Pakistan and in 1992 seven new members were included).

- Afghanistan.
- Pakistan.
- Turkey.