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Pakistan's Trade Flows with Shanghai Cooperation Organization: A Gravity Approach

Zakia Bano[1] and Hira Mujahid[2]

Abstract

Pakistan has a growing economy and always seeks to integrate with different regional or free trade agreements. The study has the objective is to determine the empirical evidence of Pakistan's Trade flow with (SCO) Shanghai Cooperation Organization. The study applied the gravity model with augmenting some variables by panel data from 1993 through 2020 into two segmentations: pre-inclusion 1993-2016 & post-inclusion 2017-2020 of Pakistan with SCO. The key contribution of this study is to use an indicator of "corruption" to measure a country's internal governance condition. The estimated results show that Pakistan had the strongest trade potential with Kazakhstan, Tajikistan, India, Russia & China. The policy implication of current research is Pakistan needs to enhance the effectiveness of its exports to increase market share in dynamic regions and improvements of the smooth transportation system are of utmost need for a successful trade.

Key Words: Trade potential, Gravity Model, Panel data, regional integration, corruption, SCO
JEL Codes: F12, F14, F15, F17, E19, O11

1 Introduction

Trade is an essential component in raising the influence of Pakistan's economic growth. (Mohammad.et.al 2010). International trade is mostly considered as the crucial factor of growth, [(Boldrin and Schinekman 1988), (Young 1991) and (Wong (1995]. All those countries who witnessed the rapid growth so decided to open their economies because it stimulates

[1]Department of Economics, College of Economics and social Development, Institute of Business Management (IoBM), Karachi, Pakistan. Email: zakiabb18@gmail.com
[2] Department of Economics, College of Economics and social Development, Institute of Business Management (IoBM), Karachi, Pakistan. Email: hira.mujahid@iobm.edu.pk

to bring countries together and make global or regional blocs by some joint attempt in order to attain the trade markets.

Pakistan is located in southern Asia. It does have a shoreline of about 1,047 kilometers (650 miles) besides its southern Arab Sea and the Gulf of Oman as well as Pakistan's neighbors to the east lies India, to the west is Afghanistan, to the southwest is Iran, and to the northeast is China. Pakistan has become one of Southeast Asia's rapidly growing markets, and the area in which it is located can become a gateway for markets as it has traditionally been. The nation is accompanied by resource-rich countries; so a possible driver of Pakistan's economic growth may be regional trade. The Pakistani government has always welcomed the quick decision to join competition through foreign direct investment, portfolio investments, or through the tangible and intangible trade goods to enter into regional and global markets, to restructure its economy by lifting some barriers to foreign investment and trade to improve the economy.

Regional trade integrated the different economics that significantly increased international competition and it demanded small specialized economies to put their efforts to increase their domestic production to compete for international requirements otherwise they may suffer from economic and trade distortion. Pakistan always shows its interest to join its association in different RATs or bilateral trade to increase its substantial economic growth and development. Pakistan exports cause its output growth (NS, Shirazi 2004). Pakistan is seeking to diversify its exports and quest new and easily accessible markets for its products in this era of competition. Pakistan views itself being a significant contributor to regional growth (Khetran 2019).

The (SCO) Shanghai Cooperation Organization is in all directions of Asian regional organization just another image of regional Eurasian economic union countries, where political, economic, cultural, and security issues are discussed. On 15 June 2001 in Shanghai, the official development was declared, then China, Russia, Tajikistan, Kazakhstan, Kyrgyzstan, and Uzbekistan were members and now Pakistan & India also become member states. From 9 June 2017, Pakistan and India became full

members at a summit in Astana. Pakistan after being a full-fledged member of SCO is expecting to meet his essential requirement. In terms of current economic integration, Pakistan has a massive chance to effectively increase its regional trade with Central Asia, East Asia, South Asia, and West Asia. In addition, there is an extensive landmass with seaports in SCO which provides opportunities to Pakistan to create new linkages with the world economy. In near future, Afghanistan and Iran, and possibly Turkey would also join the organization that would surely increase the relation of Pakistan with these trading partners. The SCO also contributed to Pakistan with the opportunity to build up its relation to increasing trade with the European countries, and also provides new strengthened economic and political relation to every member, particularly; with Russia China, and the Central Asian states, Table-1 shows the Pakistan Trade with SCO members.

Table 1

Pakistan Trade with Shanghai Cooperation Organization (1993-2018) in Million US$

County	1993	1999	2005	2011	2016	2017	2018
Russia	1.25	0.42	2.80	4.73	4.06	5.43	7.31
China	8.49	9.71	42.56	105.61	196.00	201.62	191.51
Kazakhstan	1.11	0.36	0.93	3.31	2.56	2.84	2.94
Kyrgyzstan	0.03	0.05	0.13	0.41	0.36	0.45	0.50
Tajikistan	0.31	0.03	0.20	3.54	7.46	2.41	2.12
India	1.05	2.01	8.06	20.39	21.08	22.28	29.05
Uzbekistan	1.50	7.38	2.20	5.93	3.44	3.22	9.30

Source: World Bank Data

Table: 1 Pakistan trade volumes were highest with SCO in 2016 before it became a permanent member of this organization. In 1993, the trade volume of Kyrgyzstan was only 0.03 million US$, and the trade volume of Kyrgyzstan and Tajikistan were identical in 1999 because it was the initial period of central Asian economies after independence from the Soviet Union States. However, the trade volume of China and India was stabilized when the study was taken into consideration. From 2017 Pakistan trade volume reflects the increasing trend among all countries. Moreover, China shows the highest trade with Pakistan among other SCO countries. SCO framework provides the opportunity to

the South Asian countries to start new energy projects that provide energy and promote economic integration. Similarly, some of the SCO members enjoy a comparative advantage in the energy sector and infrastructure sector that can bring huge investment toward Pakistan.

The development of regional trade contributes to improved resource distribution, the creation of economies of scale, and output efficiency by encouraging exchangeable technology growth, the accumulation of capital, and the creation of job opportunities. There are several kinds of research on this relationship of [(Gul & Yasin 2011), (Roy & Rayhan 2011), (Voicu & Horsewood 2006), (Boughanmi 2008), (Achakzai 2006), (Rehman et al. 2006), (Clarete et al. 2002)], they all give the evidence on integration of economics, creates trading blocs and emerged as regional trading partners. While some studies of [(Derakhshideh et al. 2015), (Shahnoza 2014), (Taghavi et al. 2012), (Xuegang et al. 2008)], show evidence to become a regional trading partner with SCO significantly great evolvement, bring improvement in trade policies and economic integration is justifiable.

This research aims to determine the direction and the diversification of Pakistan's trade with its regional trading partner SCO that improve its economic growth. The present study estimated the Trade flow of Pakistan with SCO by augmenting the gravity model with the product of annual GDP and some other variables; to understand the living standards of such countries that provide the trading and market structure of potential economies. In Pakistan, association with different regional trade organizations shows positive and significant trade evidence with greater scope for regional integration. (Achakzai 2006). There is no such detailed study was found that shows empirical work on Pakistan trade potential with SCO, while some studies showed qualitative work of [(Alimov, R 2018), (Siddiqa A 2016), (Norling N et, al 2007)], they all discuss only improve relations of Pakistan on regional understanding. To explore the quantitative work on Trade flow and potential markets of Pakistan with SCO, this study plans to fill the gap that provides the foundation of further analysis to contribute in different ways.

This study has comprised six sections. Section 1 presents the study Introduction; section 2 discusses the literature reviews of SCO and gravity model. In addition, Section-3 considered model specification while section 4 undertakes Data sources and econometric Methodology, section 5 interpreted Results and Discussion and at last, section 6 presents the Conclusion, policy recommendations, and study limitation.

2 Literature Review

This study captures empirical evidence of Pakistan trade with SCO countries making use of augmented Gravity Model. For empirical evidence of bilateral trade between countries, initially, the gravity model of trade was used by Beckerman (1956), Tinbergen (1962), Pöyhönen (1963), and Linnemann (1966). Similarly, Aitken (1973), econometrically had employed gravity model to describe the trade flows between countries by other explanatory variables by using the transportation cost, income levels between trading countries, and institutional factors i.e., regional trade diversion and creation. From then, the gravity model became an extensive instrument for empirical analysis of international trade.

2.1 Theoretical Foundation of Gravity Model

The real bilateral trade model between countries is fundamentally obtained from Newton's law of gravity, which specifies the 2-bodies attracted one another in accordance to the outcomes of their mass & negatively correlated to geographical distance. The gravity model becomes an instrument that has been effectively and successfully used in analytical and empirical research to support the international or bilateral trade flows between geographical entities. In 1954, Walter Isard had the first economist to introduce this model in the area of trade. The basic gravity trade model between two countries (i and j) is

$$F = G \frac{m^1 - m^2}{r^2} \tag{1}$$

$$Trade\ ijt = \alpha . \frac{GDPi.GDPj}{Distance\ ij} \tag{2}$$

Where "F" force transformed by "T" trade, "m1" mass1 and "m2" mass2 are transformed by "GDPi and GDPj" (i and j

show home country and a foreign country) and "r2" transformed by "Dij" Distance. In international trade, whenever the gravity model applies, variables of international trade are known to be the gravity force between economies masses. For empirical analysis of gravity model, international trade model equilibrium equation derived according to as inter-industry trade of Heckscher-Ohlin model while intra-industry trade of Helpman-Krugman-Markusen models.

The gravity model of international trade has a logically justified historical and theoretical background as an analytical instrument. It should be acknowledged that, when evaluating the bilateral trade between two countries, the gravity model doesn't affect the third party (country. In applied work, the model is often used as an augmented gravity model to broaden by adding several other variables to measure the categorical results, it might be expected to change the outcomes.

The Gravity trade model is widely applied in both National and foreign empirical studies after its strong theoretical and high explanatory power. In fact; it determines the trade determinants and forecasts the possible potential that expands the country's trade. The gravity model now becomes an essential tool to estimate bilateral trade. This section discusses some studies on gravity models to understand the initial concept.

Abbas & Waheed (2018), Javed et al. (2016), Sultan & Munir (2015), Malik & Chaudhari (2012), Aljebrin & Ibrahim (2012), Roy & Rayhan (2011), Gul and Yasin (2011), Rahman (2009), Alam, et al. (2009), Butt (2008), Achakzai (2006), Voicu & Horsewood (2006), Hapsari & Mangunsong (2006), Batra (2004), Clarete et al. (2002), Soloaga & Winters (2001) have investigated the bilateral or regional trade integration between the countries by augmented gravity model with many other different explanatory variables & dummies and all revealed their findings that GDP, population, real exchange rate, and trade openness of Pakistan & partner country have significant positive effects while distance, border, language puts a negative effect on trade if official language English were not exist there. In addition, some studies reported the result of dummy variable of trade integration shows

an insignificant effect on regional trade flow of Gul & Yasin (2011), Abbas & Waheed (2015).

Similarly, some studies of Derakhshideh et al. (2015), Shahnoza (2014), Taghavi et al. (2012), Xuegang et al. (2008) investigated the bilateral trade with SCO member countries, explained by the augmented gravity model. Findings reveal that the variables of GDP, trade Conformity Index TCI, trade liberalization Index, and a dummy of SCO puts positive impact while pcGDP, and distance puts negative impact, but they have significant effects. Moreover, it shows that the trade between the SCO member countries has strong economic ties, so economic integration is acceptable.

During my best research, I didn't find any such detailed study that shows empirical work on Pakistan trade potential with SCO. Considerable numbers of theoretical research work have been given on Pakistan's perspective of integration in the SCO regional organization. Khetran, (2019), Rauf (2019), Alimov (2018), Siddiqa (2016), and Norling et, al (2007), they all highlighted, that being a full member of Pakistan in the SCO has improved its relations with all the member states and in particular, with the CARs, it provides opportunities to Pakistan to address its border, energy, and economic challenges. The strategic proximity of Pakistan makes it a center for connectivity and trade ties between Central Asia, South Asia, and Russia-China. Among all the regions of Asia, the location of Pakistan is advantageous and can provide the landlocked countries with the shortest sea path. SCO could also provide Pakistan with opportunities to improve its trade links with Eurasian countries, it must give leverage to its business community. In addition, to ensure regional peace and stability, the constructive role of the SCO in Afghanistan is important, so the relation between all actors for trade and development can be improved by this crucial role of Pakistan.

So, in order to fill the gap of empirical results on Pakistan trade with SCO countries, current research contributed to investigating the trade flows and potential for further analysis through an augmented gravity model by panel data.

3 Empirical Methodology

There are several different kinds of research conducted in determining the gravity model of trade flow of Batra A (2004), Roy & Rayhan (2011), Sultan & Munir (2015), Javed et al. (2016). This research study is investigating Pakistan's bilateral trade with its seven SCO regional countries, by using panel data for the 1993 to 2020 period of augmented gravity model. The study is capturing the pre-inclusion and post-inclusion effects of Pakistan trade with the said organization; to attain the proposed effects, the duration of time divided into 2-segments, one period has 1993-2016 (when Pakistan did not become a member of SCO) while other have post-inclusion period 2017-2020 (Pakistan became a full member of SCO). For all these reasons, during estimation of the panel data gravity model, further, select the appropriate technique either use FEM or REM by different tests like the Hausman specification test.

The traditional gravity model expresses that the structure of the country's economy has significantly positively determined while negative by geographical distance between countries. The following is the basic gravity model of trade:

$$LnTijt = \alpha 0 + \alpha 1 Ln(Yi * Yj)t + \alpha 2 Ln(Dist)ij + \mu t \qquad (3)$$

Where Tijt is the Trade flow between countries, $(Yi * Yj)$ t is product of the size of reporting and partner countries' economies (GDPs), and (Dist) ij is the bilateral geographical distance in Km.

The following is an augmented version of the gravity model of Pakistan's trade flow.

$$Ln(P.Trade)ijt = \alpha 0 + \alpha 1 Ln(Yi * Yj)t + \alpha 2 Ln(popi)t + \alpha 3 Ln(popj)t + \alpha 4 Ln\left(\frac{t}{yi}\right) t + \alpha 5 Ln\left(\frac{t}{yj}\right) t + \alpha 6 Ln(corruption\ i)t + \alpha 7 Ln(corruption\ \ j)t + \alpha 8 Ln(RER\ ij)t + \alpha 9 Ln(Dist\ ij) + \alpha 10(SCO\ ij) + \alpha 11(CLang\ ij) + \alpha 12(Boarder\ ij) + \mu ijt \qquad (4)$$

In equation (4) (P.Trade)ijt is Pakistan's trade flow from the Pakistan$_i$ to SCO trading partner country$j$ that is using as a dependent variable, (YiYj)t is the product of GDPij whereas (t/yit) & (t/yjt) is the trade to GDP ratios of Pakistan$_i$ to trading partner country$j$, popit & popjt are the populations similarly RERijt is the real exchange rate of Pakistan$_i$ to trading partner country$j$ which is determined for this study, (corruption)it & (corruption)jt are measured the country's governance that would affect the bilateral trade mechanism, $Disijt$ is the bilateral countries distance in Km Pakistan$_i$ to trading partner country$j$, all these variables are transformed into natural logarithms and use as explanatory variables. While $Borderij$, c$Lanij$, SCO are taken as dummy variables for the common geographical border, as official language English and common regional trade organization (SCO) to check the other factors that affect the model without transformation of the log.

As for purpose of this research, the real exchange rate is determined by applying country's official exchange rate to GDP deflator ratio of partner j and country i

$$\text{RER}ij\text{t} = \text{ERij} \times \frac{\text{Pj}}{\text{P}i} \quad (5)$$

Where,

ERij = bilateral Official exchange rate of Pakistan with partner countries

Pj= GDP deflator ratio of partner country (j) trading partners

Pi=GDP deflator ratio of the country (i) Pakistan

The RER coefficient should have a significant impact on Pakistan trade.

After estimation, Pakistan's Trade flows with SCO countries by augmented gravity model from 1993 through 2020, the study further computes the average trade potential to forecast the future direction of Pakistan's trade by using the estimated coefficients. For this, there are two effective ways to compute the potential by predicted coefficient values of the gravity model; (Helmers et al. 2005):

Ratio of (Predicted value/ Actual value) P/A
Difference between (predicted value- actual value) P-A

In this study, the potential would measure through (ratio of Predicted value/ Actual value) P/A;

$$(P.Trade)ijt = \frac{\sum(P.\bar{T}rade)ijt}{\sum(P.Trade)ijt} \quad (6)$$

The predicted values are derived by the coefficient of the estimated gravity model while the actual value has the actual levels of trade among Pakistan and SCO members. If average trade potential values are positive and greater than one that indicates there exists a future possibility of expanding of the trade while values come negative or less than one reveal that country has (exhausted) meaning no possibility exists in bilateral trade at a certain time. (Batra, 2004).

4 Data Sources and Methodology

The current research study captures the trade flows of Pakistan with SCO members that are comprised of seven-member (Russia, China, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and India) for 1993 to 2020, augmented Gravity model will employ in this study with panel data. The variables included in this study comprise Pakistan's trade with seven SCO in thousand U.S. dollars as a dependent/response variable. Product of GDP, Population, and Trade to GDP ratio, Real Exchange Rate (RER) and corruption, of Pakistan and partner countries are taken in thousand US dollars while the distance between Pakistan and the seven SCO countries in kilometers are taken as independent/ explanatory variables. The variables sources are composed of different secondary data sources i.e., the annual data of Pakistan's Trade is sourced at (DOTS) Direction of Trade Statistics issued in International Monetary Fund IMF 2020. Data of GDP, Population, and Trade to GDP ratio, Exchange rate, GDP Deflator, and corruption between countries are taken from World Bank Data, 2020. Moreover, some variables used in this study are time-variant nominal series and transformed into natural logarithms while some variables are time-invariant series. The data of bilateral geographical distance in Km are taken from an internet

website i.e., indo-distance and it also transformed into natural logarithms. The data of dummy variables for SCO countries are generated valuing 1 (if the country is a member of SCO) and 0 otherwise. Similarly, the data on CLANGij are generated valuing 1 if trading partners have the same language and 0 otherwise, while for Border dummy generates valuing 1 if trading partners have shared the same geographical border and 0 otherwise. To draw the empirical relationship among dependent and explanatory variables, the current research employs an augmented Gravity model by Panel data.

4.1 Panel Data Models

Panel data is one of the best models to increase the efficiency of econometric estimation. It combines time series and cross-section data and is also called longitudinal data to measure the multi-dimensional estimation of a model over a period of time. Time-series technique can only measure a single equation in time order in gravity model while cross-section data technique can only measure the trade relation among pair of countries in a specific time which both makes some biases for actual result and makes data heterogeneity (Chang & Wall, 2005). For these reasons panel data is progressively used in many studies and popular day by day. Panel data controlled the problem of individual heterogeneity rather than cross-section or time-series data, allowing more degree of freedom to their use to reduce the problem of collinearity among the explanatory variables. Panel data also have been worked with some other estimation techniques like with FEM and REM (Gujrati, 2003). Both of these techniques have been effectively applied to panel data analysis.

The expression fixed effects model (FEM) (also defined as inside estimator) is often used to relate to an assessor for the regression model coefficients. In FEM, the intercept has varied across individuals or over time due to different intercepts of individual perspective although each individual has constant intercept and constant slope coefficient, its error variances are constant. The FEM is ideal if particular intercepts can associate to one or even other independent variables (Gujrati, 2003). Similarly, the random-effects model (REM) implies that regressor

or independent variables are not associated with individual outcomes, intercept is a constant mean that is brought from large population data (Gujrati, 2003). Although the intercept of every cross-section has a random variable while individual intercept shows deviation from the constant mean. Error variances are randomly distributed across individuals or time.

The model is more appropriate when explanatory variables are uncorrelated with a random intercept of each cross-section unit. In this situation, the REM is more acceptable because the model uses simultaneously time-variant & time-invariant variables and the regressor does not associate with every cross-sectional random intercept.

Researchers are mostly confused about whether they select FEM or REM for model estimation, to reduce the issues, there are some tests and one of them mostly employs a Hausman (1978) test (Wooldridge, 2002 and Baltagi, 2005). In this study, Hausman tests consider checking the non-observed specific dependency effects that are associated with the independent variable.

In the Hausman test, if null hypotheses (H0), the vi has not correlated with Xit then REM is acceptable, while the alternative (H1), the vi has correlated with Xit then FEM is acceptable. Therefore, current research confirmed after the test, that accepts the REM and rejects the FEM (Ozdeser & Ertao, 2010). When the quantity of cross-sections is larger than the time duration, REM is indeed preferable (Gujrati, 2003).

5 Results

The estimated findings of the basic and augmented gravity models with panel data of Pakistan's trade flow by its SCO partner are described in this section. In panel models, the dependent and independent variables have been changed into a log-linear form, that eliminates issues like serial correlation and heteroscedasticity. The study first estimated the basic and then augmented gravity model. Secondly, it determines the Potential by estimated coefficient of augmented gravity models This study capture the period of 1993-2020, further, it divides into two segments, one period covers the time of 1993-2016 data and the other covers the

time of 2017-2020 on panel data that are determined by countries gross domestic product Yi*Yj, SCO partner countries distance with Pakistan and some more explanatory and dummy variables.

The augmented gravity model of Pakistan trade flow during the period of 1993-2016 is estimated through the Random Effect Model (REM) after the Hausman Test that selects the appropriate model. The chi2=0.4135 value of the Hausman test refers to accepting the null hypothesis i.e. REM is appropriate. The dependent variable of Pakistan Trade (P.Trade) was estimated by including several explanatory variables, mainly trade openness, corruption of both Pakistan & partner countries, real exchange rate, with some dummies to acquire the influence of some significant aspects on international trade. Incorporating such variables into the model would provide a review for its response and stability. For trade openness, researchers have employed two alternative measures, such as the customs-to-total tax revenues and the trade-GDP ratio, but the second measure has always been preferred. For reference, Rahman (2003) employed the trade-GDP ratio in gravity model to determine the trade flow of Bangladesh with its trading partners. Hence, in current research, this variable is employed for trade openness, countries' data also being easily available for estimation. The result of the basic and augmented gravity model of Pakistan Trade Flow is presented at given below in Table (2) with a brief discussion.

Table: 2

Estimation of Pakistan Trade Flow with SCO Countries 1993-2016

Dependent Variable Pakistan Trade						
	Basic Gravity Model			Augmented Gravity Model		
Explanatory Variables	Coefficient	Standard Error	t-stat(p-value)	Coefficient	Standard Error	t-stat (p-value)
Cons	-6.7890	0.6586	-10.31 (0.000)	-42.9256	10.1196	-4.24 (0.000)
lnYiYj	0.6530*	0.0361	18.07 (0.000)	0.4878*	0.1163	4.19 (0.000)
lnDistance	-0.4079*	0.1516	-2.69(0.008)	-1.9043*	0.3447	-5.56 (0.000)
lnPoPi				4.5622*	1.2834	3.55 (0.001)

lnPoPj	0.5062	0.2710	1.87 (0.064)
lnTYi	2.9691*	0.8254	3.60 (0.000)
lnTYj	-0.6192*	0.2086	-2.97 (0.003)
Corruption i	-0.3772	0.2451	-1.54 (0.126)
Corruption j	0.1508	0.1670	0.90 (0.368)
lnRER	-0.0462*	0.0206	-2.24 (0.027)
SCO	-0.3305*	0.0900	-3.67 (0.000)
Clang	-2.2073*	0.2976	-7.42 (0.000)
Border	0.4767	0.2821	1.69 (0.093)
No. of Observation: 168	The chi2=0.4135 value of the Hausman test		
R-Squared: 0.8963			
F-Statistic: 0.0000			

Source: Author estimation, Note p-values significant at level 5%*

In table 2 the diagnostic test values of overall R2 gives 89% variation in trade flow model is described by twelve augmented independent variables. F-statistic value gives the regression model has the goodness of fit. The estimated coefficients of explanatory variables show elasticity between corresponding variables. The above finding shows, the dependent variable of (P.Trade) flows is significantly positive decisive by the coefficient of the product of GDP i.e. Yi*Yj that is used to capture the market size between domestic and its partner country's demand potential as a proxy, whereas negatively but significantly determined by the geographical distance that measures the transportation cast as a proxy. The variables are of appropriate proportions between them and mostly they have the expected signs. The entire variable extended gravity model for Pakistan Trade Flow is transformed into the log. The one percent increases in the product of Yi*Yj results show an increase in trade by 0.48 percent, while an increase in PoPi and PoPj by one percent response in an increase in trade by 4.56 and 0.50 % because population put a positive significant effect on Pakistan Trade, especially Pakistan's population puts an amazing high effect on trade model.

This study is particularly interesting to measure the trade openness between the countries separately. The TYi trade to GDP ratio of Pakistan is used for trade openness that shows positive significant impact on trade that means if Pakistan opens their trade to countries by one percent result in increased the Pakistan trade by 2.96% that would highly consider variables to measure the trade and improvement in domestic productivity. Similarly, TYj puts the negative but significant impact that means other countries' trade openness would not put the desirable impact. Trade openness provides evidence to demand their partners to open their markets for Pakistani products and improve the trade liberalization policy by removing some trade barriers. This variable is exceedingly considered to measure openness as it enables demand to trade partners to open their borders of Pakistan's trade.

The study also uses "corruption" as a proxy to measure the country's internal aggregate and individual governance condition that highly affected the trade. The indicator "corruption" of Pakistan shows the negative impact on trade while "corruption" of other countries shows positive impact but both countries have insignificant results that show to decrease the Pakistan trade simultaneously. The real Exchange rate RER gives a significant but negative impact. If a 1 % rise in RER is related to a decrease in trade by 0.046 %. The findings of CLANGij reveal a significant negative result; it implies that when Pakistan trades to those countries that do not have the common language i.e., official English, that makes the communication hurdles in trade dealing. While the common border shows a positive but insignificant impact and the only reason is Indian political and law & order disputes, even other countries have friendly relations with Pakistan. The result of regional Shanghai cooperation organization SCO shows the negative but significant impact, indicating the unimpressive impact meaning that there is no high trade scope of a regional organization on Pakistan's trade.

A further significant feature of gravity model is to predict the trade potential. The results acquired from the gravity models, as discussed above are reasonably accurate, bearing in mind the data constraints and issues concerns from the amount of informal

trade within territorial boundaries. To forecast the potential, estimated coefficient values of the gravity model would be used to generate the predicted values that further divided the actual values.

Table 3

Pakistan Trade Potential with SCO countries 1993-2016

Countries	1993-2004	2005-2016
Russia	1.010897*	0.99781
China	1.007705*	0.993582
Kazakhstan*	1.004798	1.00418
Kyrgyzstan**	0.993022	0.993776
Tajikistan*	1.047894	1.003759
India	1.013495*	0.988762
Uzbekistan	0.952744	1.025827*

Source: Authors' estimation. Note: 1> is maximum trade potential and 1< is exhausted trade potential

Pakistan trade potential with SCO countries of the pre-inclusion period (1993-2016), findings are determined by the values of estimated coefficients of the aggregate trade flow model. Potential is determined by dividing the predicted value (as measured by the estimated coefficients of gravity model) by the actual trade. For convenience's purposes, table: (3) the entire period (1993-2016) is breaking into two sub-period for calculating average trade potential values. Results explain maximum average potential (P/A), which shows Pakistan had expanded its trade with Kazakhstan and Tajikistan from 1993 through 2016 was highest. While during this time Pakistan had exhausted trade potential with Kyrgyzstan, this indicates the actual trade volume of Pakistan had more than its predicted trade (P/A <1). Similarly, during 1993-2004, Russia, China, and India had high trade potential while during the period 2005-2016 Pakistan had sufficient trade potential with Uzbekistan.

Similarly, the estimated results of the Pakistan Trade Flow model during the period of 2017-2020 are shown in Table (4), along with concise analysis. The coefficients have more significant p-values with REM after confirming the test Hausman Test, the chi2=0.2223 value of the Hausman test refers to accepting the null hypothesis i.e., REM is appropriate.

Table: 4
Estimation of Pakistan Trade Flow with SCO Countries 2017-2020

Dependent Variable Pakistan Trade

	Basic Gravity Model			Augmented Gravity Model		
Explanatory Variables	Coefficient	Std. Error	t-stat(p-value)	Coefficient	Std. Error	t-stat (p-value)
Cons	-6.3168	1.4284	-4.42 (0.000)	-2.6714	2.771	-0.96 (0.350)
lnYiYj	0.6399	0.0802	7.97 (0.000)*	0.3323*	0.1914	1.99 (0.052)
lnDistance	-0.4738	0.3167	-1.50 (0.147)	-2.2486*	0.4863	-4.56 (0.000)
lnPoPi				-0.0776*	0.4434	-1.15 (0.033)
lnPoPj				1.0776*	0.3618	2.98 (0.009)
lnTYi				0.2237*	0.8288	1.05 (0.059)
lnTYj				0.0790	0.2571	0.31 (0.763)
Corruption i				-0.08714	0.3713	-0.23 (0.818)
Corruption j				-0.1056	0.2418	-0.44 (0.668)
lnRER				-0.0025	0.0185	-0.19 (0.848)
SCO				0.1372	0.1693	0.81 (0.430)
Clang				-2.2326*	0.4381	-5.10 (0.000)
Border				0.2828	0.2991	0.95 (0.359)
No. of Observation: 28				The chi2=0.2223 value of the Hausman test		
R-Squared: 0.9823						
F-Statistic: 0.0000						

Source: Author estimation, Note p-values significant at level 5%*

As above table (4), the diagnostic test values of the overall R^2 of REM give 98% percent variation in the augmented trade flow model which is described by twelve independent variables. F-statistic value shows the regression model has the goodness of fit. The results do not show any unit root and autocorrelation problems. The calculated coefficients of the independent variable indicate the elasticity among variables. The post inclusion estimation results reveal that the dependent variable of Pakistan's Trade flows (P.Trade) has positive significant determined through

the coefficient of the product of the Gross domestic product of both countries i.e. Yi*Yj, while negatively but significantly determined by the geographical distance that measures the transportation cast. The one percent increases in a product of Yi*Yj results in an increase in trade by 0.33 percent, whereas a 2.24 percent trade decrease is due to long-distance routes. After inclusion in the organization, Pakistani population has negatively insignificant effect on Pakistan trade meaning that if 1% rise in PoPi that down the Pakistan trade by 0.077%, while PoPj shows positive significant impacts that mean by one percent increase in other country's population rise Pakistan's trade by 0.60%.

The TYi trade to GDP ratio of Pakistan has a positive significant effect to trade that means if Pakistan opens their trade to countries by one percent result in increased in the Pakistan trade by 0.22% that would be considered significant variables that provide the evidence for improvement in domestic productivity. Similarly, TYj puts the positive but insignificant impact which means other countries' trade openness would not put the desirable impact. Trade openness of other countries TYj suggests to Pakistan to make some trade agreements with their partners to open their markets for Pakistani products and remove some barriers. The indicator "corruption" of Pakistan and partner countries shows the negative and insignificant impact that shows they could decrease the smooth flow of Pakistan trade simultaneously. The Pakistan government should take some corrective measures of regulatory accountability and negotiate with their partners to improve their governance. The real Exchange rate RER shows negative insignificant effects. 1% rise in the RER is related to a decrease in trade by only 0.002%. The finding of CLANG gives significant negative effects; it explains that Pakistan trade to those countries who do not have the common language i.e. official English, which makes the communication hurdles in trade dealing, while common border shows positive but insignificant impact. After inclusion in this organization, the variable of regional Shanghai cooperation organization SCO shows the positive but insignificant impact, displaying the disruptive effect of regional organizations on Pakistan's imports. Pakistan's post-inclusion trade potential to members of the SCO

(2017-2020), findings calculated through the estimated coefficient value of aggregate trade flow model.

Table: 5

Pakistan Trade Potential with SCO Countries 2017-2020

Countries	2017-2020
Russia	0.998207
China	0.999993
Kazakhstan*	1.001931
Kyrgyzstan*	1.005369
Tajikistan	0.994285
India*	1.000089
Uzbekistan*	1.001822

Source: Authors' estimation. Note: 1> is maximum trade potential and 1< is exhausted trade potential

According to the above table: (5), calculate the potential of Pakistan trade flow with SCO countries, the average trade potential (P/A) was the maximum of Kazakhstan, some other by Kyrgyzstan, India, and Uzbekistan in during 2017-2020, so Pakistan needs to expand the quality of trade with product specialization to achieve the competitive market share. While Russia, China, and Tajikistan show the exhausted Trade potential with Pakistan, it means the actual trade volume of Pakistan had more than its expected levels (P/A <1).

6 Conclusion

The study investigated Pakistan's trade potential with regional organization SCO of 7-trading partners. The research also specified Pakistan's overall trade flow determinants with a special focus to quantify the empirical effects of the period is taken from 1993-2020 yearly that is divided into two segments; one analysis has pre-inclusion empirical effects from 1993-2016 and other segments have post-inclusion effects which are taken from 2017-2020. The gravity model of trade still has its advantages, as well as all models and methods for estimation, are generated and suffer from certain limitations.

The standard gravity model has been augmented to incorporate the corruption, population, real exchange rate, and trade openness along with dummy variables of regional trade organization SCO, common language, and border. The findings

reveal that the coefficient of the product of GDP i.e., Yi*Yj and population (PoPi) & (PoPj) that they all use to capture the market size of domestic and traded countries as proxy that has a positively significant effect on Pakistan Trade flows whereas negatively but significant determined by the geographical distance that measures as proxy the transportation cast. The RER real exchange rate shows a significant but less elastic impact.

This study is particularly interested in measuring the trade openness between the countries separately. The (TYi) trade to GDP ratio of Pakistan has been used to consider the trade openness that puts the positive significant impact on trade that would be highly considered variables to measure the trade and improvement in domestic productivity. Similarly, TYj has a negative but significant impact that means other countries' trade openness would not have the desired impact, this would be exceedingly considered variable for the country's economy.

The study also uses "corruption" as a proxy to measure the country's internal aggregate and individual governance conditions that highly affect trade. The indicator "corruption" of all regional partner countries and Pakistan puts an insignificant impact that shows to decrease in the Pakistan trade. Similarly, the dummy variables of common language show a significant negative impact, while the border has positive and insignificant effects on Pakistan Trade flow. The result of regional SCO shows a negative but significant impact, indicating the ruinous effects that show no huge opportunities for Pakistan's Trade-in regional organization. Other studies have also reported an insignificant and negative effect on regional trade flow of [(Gul & Yasin 2011), (Abbas & Waheed 2015)].

The results illustrate the fact that Pakistan had the strongest trade potential with Kazakhstan, Tajikistan, India, Russia & China from 1993 through 2004. Similarly, from 2005 to 2016 countries had the maximum trade potential of Kazakhstan and Tajikistan while during 1993-2016, Kyrgyzstan had been exhausted in trade. From 2017-2020, Pakistan has a tremendous change in their trade potential with the high scope after post inclusion period have maximum expanded potential with

Kazakhstan, India, Kyrgyzstan, and Uzbekistan. However, Russia and China have exhausted trade potential with Pakistan.

The current study recommends some policy implications measures that trade with central Asian countries is quite difficult due to long routes with inadequate infrastructure and the region's transport network. Improvements in an adequate level of the transportation system and smooth infrastructure are the utmost need for successful trade flows within the region. In addition, Trade within the region would increase the competition, especially with China and Russia, they both have a big amount of regional market shares. So, Pakistan has had to raise the quality of its exports products to achieve a competitive region market share, cost efficiency and quality control are necessary with trade promotion.

Furthermore, the current contagious coronavirus disease in all the countries and the existing political tensions of India, both would make barriers. All these factors should be addressed and take some corrective measures to save from the threats that limit the trade of Pakistan within the region.

6.1 Limitation of Study

Previous research studies provide the evidence for further research work. The study faced the problem of the unavailability of quantitative research on Pakistan's trade with SCO countries. As a result, the current study aims to bridge the connection by providing empirical evidence for future research.

During the collection of "corruption" data of some countries for statistical measurement, the study faced inconsistency in finding smooth data, so the data was interpolated at only the beginning period of the study.

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Appendix

Table: A1

Bilateral Regional Trading Partners of Pakistan with SCO

Russia	China
Kazakhstan	Kyrgyzstan
Uzbekistan	Tajikistan
India	

Hausman Test to Confirmed REM Is Acceptable

Pakistan trade flow with SCO 1993-2016

```
. hausman fe re
                ---- Coefficients ----
          |      (b)        (B)          (b-B)     sqrt(diag(V_b-V_B))
          |       fe         re       Difference        S.E.
----------+------------------------------------------------------------
     lnYiYj |    .7574104    .4878933       .2695171       .1782605
      lnTYi |    2.067654    2.969156      -.9015017       .5047321
      lnTYj |   -.2523537   -.6192628       .366909        .1227775
     lnPOPi |    1.286995    4.562224      -3.275229       2.141856
     lnPOPj |    1.053783    .5062229       .5475604       1.059269
corruptioni |    -.375376   -.3772891       .0019131       .0284042
corruptionj |    .1394002    .1508954      -.0114953       .0589213
      lnRER |    .0087146   -.0462132       .0549279       .0184415
        SCO |   -.2900066   -.3305322       .0405256        .032004
------------------------------------------------------------------------------
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg
  Test:  Ho:  difference in coefficients not systematic
              chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =        9.26
            Prob>chi2 =      0.4135
            (V_b-V_B is not positive definite)
```

Pakistan Trade Flow with SCO 2017-2020

```
. hausman fe re
                ---- Coefficients ----
          |      (b)        (B)          (b-B)     sqrt(diag(V_b-V_B))
          |       fe         re       Difference        S.E.
----------+------------------------------------------------------------
     lnYiYj |   -.2943492    .3366443      -.6309935       .8952534
      lnTYi |    .9369268    .2228857       .714041        .0444512
      lnTYj |    .1920319    .0649833       .1270486             .
     lnPOPi |    .1320274   -.0778549       .2098823       .4053911
     lnPOPj |   -.2053371    1.133921      -1.339258       .4594898
corruptioni |   -.2465683   -.1643908      -.0821775       .4077157
corruptionj |    .2531158   -.0735362       .326652        .2235868
      lnRER |    .0543362   -.0027717       .0571078       .1070076
------------------------------------------------------------------------------
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg
  Test:  Ho:  difference in coefficients not systematic
              chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       10.65
            Prob>chi2 =      0.2223
            (V_b-V_B is not positive definite)
```