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FROM SAPTA TO SAFTA: The Trade Patterns within the SAARC Region

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Abstract

This study aims to highlight the impact of SAPTA and SAFTA on trade in the SSARC region. Fixed effects gravity model is estimated to cope with the unobserved heterogeneity that are country and time specific. The Poisson estimator is used to estimate the gravity model which deals with the inbuilt heteroskedasticity due to zeros in trade data. Results of the estimated elasticities show about 60 per cent, 50 per cent and 10 per cent increase in trade volume due to SAPTA, SAFTA and other trade agreements, respectively in the SAARC region.

I. Introduction

The formation of World Trade Organization (WTO) in 1994 added a new baby "The New Regionalism" to the global trading system. Since then there has been an explosion of economic integration agreements like common markets (CMs), customs unions (CUs), economic unions (EUs), free trade agreements (FTAs), and preferential trade agreements (PTAs). All these economic integration agreements aim to slash the barriers to trade flow. These integrations are bilateral, multilateral and regional trade agreements vary in scope from preferential to free trade agreement. However, according to Foster, et al. (2011) in the last two decades the World saw a proliferated wave of Regional Trade Agreements[1] (RTAs) that resulted in regional integration and removal of tariff barriers as evident from the following figure.[2]

Keeping pace with the rest of the world, the SAARC (South Asian Association for Regional Co-operation) countries[3] also part of the process and entered into the SAARC Preferential Trading Arrangement (SAPTA) and then South Asian Free Trade Area (SAFTA). According to Bandara and McGillivray (1998), in the past the region

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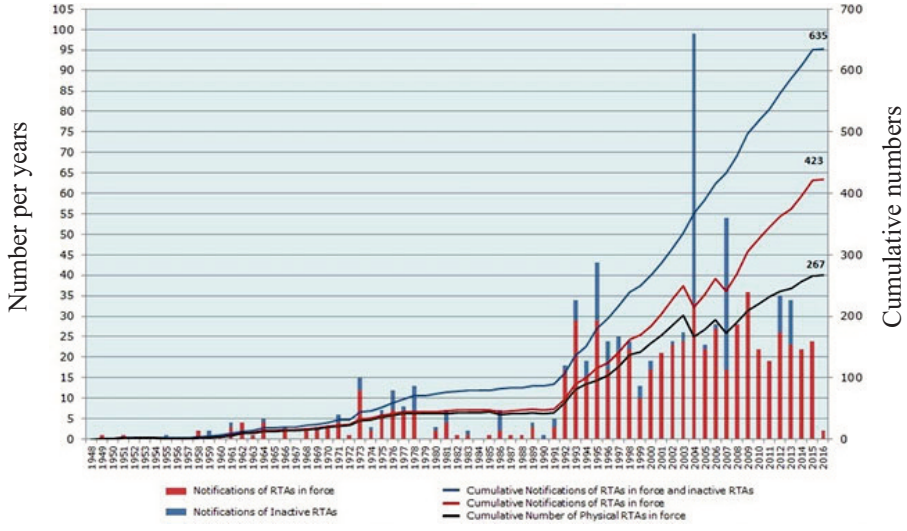
1 RTAs differ from the Most Favored Nation (MFN) principle of nondiscrimination as RTAs grant tariff concession to the member countries of that particular trade bloc.

2 https://www.wto.org/english/tratop_e/region_e/regfac_e.htm, accessed on August 15, 2016.

3 The SAARC countries include Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka.

adopted restrictive trade policies and therefore the output of the South Asian economies in the global trading system was minimal than their Eastern neighbors. However, in the 1990s the SAARC countries initiated and implemented trade liberalization policies including unilateral and preferential arrangements. This era is considered a period of trade reforms in the history of SAARC.



Note: Notifications of RTAs: goods, services & accessions to an RTA are counted separately. Physical RTAs: goods, services & accession to an RTA are counted together. The cumulative lines show the number of notifications/physical RTAs that were in force for a given year.
Source: WTO Secretariat.

FIGURE 1

Evolution of Regional Trade Agreements in the World, 1948-2016

Globally the rapid expansion in RTAs has received much attention in the growing trade literature. Tinbergen (1962) pioneered to show the impacts of trade agreements on trade. In his study, Tinbergen (1962) estimated trade divergence in the case of Benelux free trade agreement while trade creation effects for the members of the British Commonwealth. Following the work of Tinbergen (1962) researchers analyzed the impact of trade agreements on trade flows. Among others Aitken (1973) and Brada and Mendez (1983) studied the impact of agreements comprising the European Economic Community (EEC), European Free Trade Association (EFTA) and Latin America Free Trade Agreement (LAFTA). Later, Frankel, Stein and Wei (1995) and Frankel (1997) found trade creation effects of the MECOSUR,[4] the ASEAN Free

[4] MECOSUR is a sub-regional bloc of Argentina, Brazil, Paraguay, Uruguay and Venezuela to boost free trade and movement of currency, goods and people. The associate member countries of MECOSUR include Bolivia, Chile, Colombia, Ecuador, Peru, and Suriname while New Zealand and Mexico act as observers.

Trade Area (AFTA), and trade diversion effects of the European Union (EU) and the North American Free Trade Agreement (NAFTA). Soloaga and Winters (2001) estimated trade creation effects for LAFTA and trade diversion effects for the EFTA and the EU. Cernat (2001) empirically showed the trade diverting effects of MERCOSUR and Andean Community and trade creating effects of AFTA, EU, SADC, and COMESA. Baier and Bergstrand (2002) empirically proved that trade volume increased four times with free trade agreements. Carrere (2003) applying the model of Baier and Bergstrand (2002) found a substantial improvement in trade volume due to trade agreements. Later on Cheng and Tsai (2008) estimated the modified gravity equation and weighed their results against the earlier results. They concluded that the results differ across the free trade agreements and the magnitude depends on the prevailing condition and time period. Gilbert et al. (2004) studied the impact of trade agreement and argued that natural trading blocs in merchandise trade exist in East Asia. Endoh (2005) found trade creation effects of the Generalized System of Trade Preferences (GSTP) for developing countries. On the same lines, empirical studies regarding trade creation and diversion effects of SAPTA and SAFTA could not reach any consistent results. For example among others Coulibaly (2004), Hirantha (2004), Tumbarello (2006) estimated trade creation effects of SAPTA while trade diverting effects by Hassan (2001) and Rahman (2003) estimated insignificant effect of using dummy for SAARC in their studies.

Review of literature shows that trade creation and trade diversion effects of trade agreements in general and SAPTA in particular are inconsistent. Based on the behavior of trade agreement variable in various studies, Rahman, et al. (2006) alerted about the welfare effects obtain from using the gravity equation. They argued that welfare effects of trade agreements are based on the tradeoff between trade creation and trade diversion. Furthermore, review of literature shows that numbers of studies have been carried out by the trade economists concerning trade diversion and/or trade creation effects of trade agreements. However, only few economists have studied the effects of SAPTA and SAFTA on the regional trade and it is concluded that the SAARC region is an ignored one. Of these studies, no one has studied the impact of transformation of SAPTA into SAFTA on regional trade. Therefore, this study aims to show the impact of SAPTA and SAFTA on trade in the SAARC region to show the trade patterns using the gravity trade model. This study is carried out to contribute to the existing literature in number of ways. Firstly, this study covers the data period from 1980-2015. Secondly, unlike previous studies on SAPTA and SAFTA, this study estimates the gravity model using the Pseudo Poisson Maximum Likelihood (PPML) family to account for zeros in trade data and consequent problem of heteroskedasticity. Lastly, to account for the time varying and country specific factors, this study utilizes the fixed effects model. The findings of this work will be based on empirical research. Therefore, it is anticipated that the information will provide guidelines to policy makers and other stake holders for future research and development.

After the Intrduction (Section I) the first part of the study introduces the issue under discussion in the light of previous work with justification to show how this work is different from the previous studies. A brief extraction of SAPTA and SAFTA is followed in Section II. Data and its different sources are presented in Section III and theoretical and empirical models are given in Section IV. The estimation technique, results and discussion are provided in Sections V; while conclusion and findings (Section VI) are goven at the end of the paper.

II. SAPTA and SAFTA: A Brief Introduction[5]

During the Sixth Summit (held in Colomboon December 1991) of the SAARC the creation of an Inter-Governmental Expert Group (IGEG) was unanimously approved to plan "SAARC Preferential Trading Arrangement (SAPTA)", by 1997. The SAPTA was signed on April 11, 1993 and implemented on December 7, 1995 well before the scheduled time. The SAPTA aimed to encourage and continue reciprocal trade and economic cooperation through granting concessions within the SAARC region. It is believed that SAPTA was the very first move towards the transition to SAFTA and then directing towards a Customs Union, Common Market and Economic Union. During its Sixteenth session in New Delhi on December 18-19, 1995 the Council of Ministers agreed on the realization of the SAFTA. In this regard, an IGEG was constituted in 1996. The IGEG has the responsibility to ascertain the obligatory arrangements for moving ahead to a free trade area. The Tenth Summit [held in Colombo on July 29-31, (1998)] of SAARC countries wrap up with the decision to set up a Committee of Experts (COE) to plan a brief strategy for conceiving a free trade area within the SAARC region. The SAFTA Agreement was signed during the Twelfth Summit [held in Islamabad on January 6, (2004)] and came into force on January 1, 2006 while the Trade Liberalization Program started from July 1, 2006.

III. Data and Its Sources

This study aims to show the impact of SAPTA and SAFTA on trade in the SAARC region using the gravity trade model. For this purpose data on different variables of the gravity equation are obtained from different sources starting from 1980 to 2015. Trade data including both the imports and exports for the SAARC region are obtained at HS-2 digits from the Commodity Trade Statistics Database of the United Nations[6] (UN-Comtrade). Data on GDP Deflator, GDP, and population are acquired from the World Development Indicators[7] of the World Bank's while the

[5] This section is mainly based on the information from SAARC website: http://saarc-sec.org/areaofcooperation/catdetail.php?cat_id=45.

[6] http://comtrade.un.org/data/ (accessed on June 4, 2016).

[7] http://databank.worldbank.org/data/views/reports/tableview.aspx?isshared=true (accessed on June 4, 2016).

French Research Center in International Economics (CEPII)[8] are used to collect information on other gravity variables like common border, common colony, common language, distance, and landlocked countries etc.

IV. Theoretical and Empirical Models

This study estimates the gravity model known as the "work horse trade model" to meet the above mentioned objectives. Since long the gravity equation is used to estimate trade flows between the trading partners. Anderson (1979) derived the gravity equation using the Constant Elasticity of Substitution (CES) system. His was followed by others in different scenarios for example the monopolistic competition model by Bergstrand (1985) and Bergstrand (1989), the classical Heckscher-Ohlin model by Deardorff (1998), and the general equilibrium model by Anderson and Van Wincoop (2003) and Feenstra (2004). Later on, Bergstrand (1989) and Bergstrand (1990) developed and estimated the generalized gravity equation by justifying and adding up the per capita incomes of the trading partners. The structural inadequacies of the gravity equation were addressed by Anderson and Van Wincoop (2004), Baldwin and Taglioni (2006) and Helpman, et al. (2008). Anderson and Van Wincoop (2003) provided theoretical and empirical basis for derivation of gravity model. Anderson and Van Wincoop (2003) assumed that each country specialized in production of a commodity and commodities are differentiated by the country of origin.

Demand (q_{ij}) in importing country j for a commodity from country i is estimated by maximization of Constant Elasticity of Substitution (CES) utility function as given below.

$$\mathrm{e_j} = \sum_{i} p_{ij}\, q_{ij} \tag{1}$$

where e_j is the nominal income in country; and p_{ij} is the price of country $i's$ commodity for country $j's$ consumers. While p_{ij} is determined by the price of commodity in country i and the trade cost c_{ij} incurred in transporting commodity from country i to country, j i.e., $p_{ij} = c_{ij} p_i$. Maximizing the utility function subject to income constraint at market clearing conditions generates:

$$x_{ij} = \frac{y_i y_j}{y_w} \left(\frac{c_{ij}}{P_i P_j} \right)^{1-\sigma} \tag{2}$$

where x_{ij} is the trade flow from country ito country j, y_i, y_j and y_w are respectively the nominal income of country i, country j and the world, P_i is the price index in country i, P_j is theprice index in country j, c_{ij} is the trade cost incurred in transporting commodity from country i to country j and σ is the elasticity of substitution.

[8] http://www.cepii.fr/CEPII/en/bdd_modele/bdd.asp (accessed on June 4, 2016).

Furthermore, Anderson and Van Wincoop (2003) have categorized trade cost (c_{ij}) in bilateral trade resistance between country *i* and country *j*, country *i's* resistance to trade with all countries, and country *j's* resistance to trade with all countries. Mathematically P_i and P_j are presented as:

$$P_i = \left[\sum_j (\delta_j p_j c_{ji})^{1-\sigma}\right]^{(1/(1-\sigma)}$$

and

$$P_j = \left[\sum_i (\delta_j p_j c_{ij})^{1-\sigma}\right]^{(1/(1-\sigma)}$$

where δ_j is the share in consumption by country *j* in *i* and vice versa for δ_i, p_j and p_i are the respective prices in country *j* and *i*. It makes clear that any change in bilateral resistance term (c_{ij}) also affect the multilateral resistance term ($P_i P_j$). This validates that any trade friction depends on the ratio ($c_{ij} / P_i P_j$). r

Anderson and van Wincoop (2003) used technique to resolve the famous "border puzzle" of McCallum (1995). In their findings, they elaborated that the higher border effect is due to omitted variables bias (the multilateral resistance term) and the smaller size of Canadian economy. They also concluded that the economic distance between the trading partners is not only governed by a bilateral resistance term between the trading countries but also by the multilateral resistance term. Because of the endogenous P_i and P_j, Anderson and van Wincoop (2003) used the non-linear estimation technique and obtained efficient and consist estimates for border effects and other gravity variables.

Feenstra (2002) in his study reviewed three techniques to report price effects in the gravity equation namely (i) employing available data on price indexes; (ii) employing the techniques of Anderson and van Wincoop (2003); and iii.) employing country fixed effects to estimate the price indexes. Starting with the results of [McCallum (1995)] "border puzzle", with additional data of trade between the U.S. states. Feenstra (2002) added an indicator variable (one for trade between the two US states and zero otherwise) and got unexpectedly larger estimates (22 times) on Canadian interprovincial trade than trade between U.S. and Canada in 1988. Feenstra (2002) empirically showed the asymmetry of border effects across countries of different size by Anderson and van Wincoop (2003) and concluded that in the presence of border effects (transport costs or tariffs) the prices are not the same across the countries and therefore the trade model is more complicated than used by McCallum (1995). In his study, Feenstra (2002) compared the techniques of Anderson and van Wincoop and incorporated fixed effects for multilateral trade resistance term using trade data between and within Canada and the US. He obtained more consistent results using the fixed effect technique and therefore considered it a simple and preferred method to estimate the gravity equation.

In addition to the above, cross sectional gravity equation includes time invariant variables and also does not account for the time invariant country specific effects. Therefore, these models suffer from misspecification problem and consequently the results are misleading. The non-inclusions of time varying variables are captured by the disturbance term. This results in correlation between the disturbance term and the observed variables; violating the assumption of OLS. The non-inclusion of country specific effects results in homogeneity among the partner countries which lead to estimation bias.

In the recent past, economists have dealt these issues with the use of panel data. As panel frame work models the variables in time and space domain that account for heterogeneity among the trading partners and omitted variables bias. The panel data also considers the time invariant unobserved trade effects by including the country specific effects. There exist two commonly used estimation techniques the random-effects (RE) and the fixed-effects (FE) in case of panel data. The choice of use between RE and FE depends on priori assumptions. RE assumes that the unobserved heterogeneity is exogenous. While the FE assumes that the unobserved heterogeneity is not exogenous i.e., the individual effects (unobserved heterogeneity) and the independent variables are correlated. Under the condition of zero correlation between the individual country effects and the independent variables, both the RE and FE estimates are consistent while only the RE estimates are efficient. But when there is correlation between the individual country effects and the independent variables then only the FE estimates are consistent. Sometimes, in the FE models, the time invariant explanatory variables are dropped due to perfect collinearity. This eliminates the effects of theoretically relevant explanatory variables in the gravity framework.

According to Feenstra (2004) economists such as [Feenstra (2002), Harrigan (1996), Hummels (2001), Redding and Venables (2004), Rose and van Wincoop (2001)] among others have used fixed effects in the gravity equation.

Review of literature shows that different studies have used different cost items to determine bilateral trade. Hallak (2006) and Haq, et al. (2013) distinguished trade cost into three sets of variables. The first set includes variables on transportation costs; distance, landlocked countries, common border, etc. The second set includes variables on tariff structure; such as preferential trade agreements. The third set contains other variables like common language, colonial relationship, etc.

$$lnc_{ij} = \alpha_1 ln(Ds_{ij}) + \alpha_2(Br_{ij}) + \alpha_3(Ln_{ij}) + \alpha_4(LC_{ij}) + \alpha_5(Cl_{ij}) + \alpha_6(SAPTA_{ij}) + \alpha_7(SAFTA_{ij}) + \alpha_8(RTA_{ij}) + e_{ij} \quad (3)$$

where c_{ij} is the trade cost between two trading partners and assumed to be determined by the geographical distance (Ds_{ij}) between the trading partners, common border (Br_{ij}), common language (Ln_{ij}), landlocked countries (LC_{ij}), common colonial ties (Cl_{ij}), South Asian preferential trade agreement ($SAPTA_{ij}$), South Asian free trade area ($SAFTA_{ij}$), and regional trade agreements (PTA_{ij}).

Taking logarithm of Equation 2 and putting the values of c_{ij} in Equation 3, we get:

$$\begin{aligned} lnx_{ij} = {} & (1\text{-}\sigma)\gamma_1 \, lnP_i - (1\text{-}\sigma)\gamma_2 \, lnP_j + \gamma_3 \, lnY_i + \gamma_4 \, lnY_j + (1\text{-}\sigma)\alpha_1 \, ln(Ds_{ij}) \\ & + (1\text{-}\sigma_k)\, \alpha_2 \, (Br_{ij}) + (1\text{-}\sigma_k)\, \alpha_3 \, (Ln_{ij}) + (1\text{-}\sigma_k)\, \alpha_4 \, (LC_{ij}) + (1\text{-}\sigma_k)\, \alpha_5 \, (Cl_{ij}) \\ & + (1\text{-}\sigma_k)\, \alpha_6 \, (SAPTA_{ij}) + (1\text{-}\sigma_k)\, \alpha_7 \, (SAFTA_{ij}) + (1\text{-}\sigma_k)\, \alpha_8 \, (RTA_{ij}) + \varepsilon_{ij} \end{aligned} \quad (4)$$

Equation (4) also contains price terms which are unobserved in nature. To capture the unobserved country and product specific variables like trade policy, political system, etc., where it is estimated using the exporting (F_i), importing (F_j), and year (F_t) fixed effects. Many studies have estimated fixed effects gravity equation due to its coherence with economic theory and ease to implement [Head and Mayer (2014)]. Feenstra (2002) incorporated the FE to capture multilateral trade resistance for trade between and within Canada and the US and he obtained more consistent border effects. Haq and Meilke (2009)in their study used FE to account for unobserved variables like border-related hindrances (tariff etc.), technical and nontechnical barriers to trade, domestic and trade related policies, prices, commodity- and industry-specific characteristics, and non-measurable product quality characteristics. In our case FE are also incorporated to account for the unobserved factors specified by Haq and Meilke (2009).

V. Estimation Technique, Results and Discussion

1. Estimation Technique

Selection bias and heteroskesdasticity is common to the gravity equation due to the presence of zeros in trade flows between the partner countries. Heckman (1979) pointed out that the log-linear specifications omit zeros that lead to biasness. Zeros in trade data may be because of no trade between the countries; trade data is missing at particular time for the specific trading partners; and the trade volume is low and rounded to zero. Economists have used a number of techniques to deal with the issue of zeros in trade data. Ordinary Least Square (OLS) technique is used as a common method to ignore the zeros and estimate regression equation. This approached is criticized due to dropping out of zero observations which are infrequently identically and randomly distributed [Burger, et al. (2009)]. Hillberry (2002) used the dataset of McCallum (1995) and explained that how selection bias can lead to biased estimates in empirical analysis due to inclusion of zeros? According to Silva and Tenreyre (2006) in the presence of heteroskedasticity, the log linear transformation can bias the estimated results because of the Jensen's inequality ($E(\ln x) \neq \ln E(x)$) that violates the consistency of the estimates.

Trade economists also replace zeros in trade data with a small value and then estimate the equation using OLS. But no theoretical and empirical justification is present in using this approach and Linders and De Groot (2006) declared this approach a problematic one. Similarly, Flowerdew and Aitkin (1982) confirmed that replacing zeros with small values change the estimated results. Using the non-linear technique to estimates gravity equation in the presence of zeros in trade data is another method. Silva and Tenreyro (2006) argues that log-linearization of the gravity model is used to adjust the property of the disturbance term. In homoscedastic data, the variance and predicted disturbance term are considered constant otherwise the predicted disturbance term is a function of the regressors which is very common to trade data. In heteroskedasticity, the variance of the estimated parameters is biased and the t-values are misleading. According to Liu (2009) in the presence of heteroskedasticity both the traditional log-linear and the Tobit regression are questionable.

To deal with the issue, different researchers have opted for different techniques to estimate the gravity equation. Review of literature shows the use of nonlinear methods including Nonlinear Least Squares (NLS), Poisson Pseudo Maximum Likelihood (PPML) and the Heckman sample selection model among other techniques. This study estimates equation 4 using the PPML techniques as according to Silva and Tenreyro (2006) the PPML addresses the issues of zeros trade data and heteroskedasticity. They estimated the gravity equation in its original multiplicative form because of the Jensen's inequality due to presence of zeros and heteroskedsticity in the data. X_{ijkt} has a Poisson distribution with conditional mean μ and is a function of bilateral and multilateral trade barriers as given below:

$$Pr\left(X_{ijkt} \mid H_{ijkt}\right) = \frac{exp(-\mu)\,\mu^{X_{ijkt}}}{X_{ijkt}} \tag{5}$$

It is assumed that X_{ijkt} is the bilateral trade flow of product k between country i and country j in time and $\mu = exp\,(\beta' H_i)$. The consistency of PPML depends on the assumption that $var\,(X_{ijkt} \mid H_{ijkt}) \propto E(X_{ijkt} \mid H_{ijkt})$. PPML has the conditional equi-dispersion property i.e., conditional mean and conditional variance must be equal [Cameron and Trivedi (2010)]. However, this property is violated because of the over-dispersion of the dependent variable. This results in inefficient estimation of PPML. Burger, et al. (2009) found that the variants of the including the Negative Binomial (NB), the Zero Inflated Poisson (ZIP), and the Zero Inflated Negative Binomial (ZINB) accommodate over dispersion of the data. Burger, et al. (2009) also considered NB as the generalization of PPML. The conditional mean of NB is also based on PPML but it has an additional parameter to capture over dispersion $var\,(X_{ijkt} \mid H_{ijkt}) \propto \mathrm{E}^2\,(X_{ijkt} \mid H_{ijkt})$. The confidence intervals of NB regression are likely to be limited as compared to PPML if the outcome variable is over dispersed. PPML and NB models fail when the observed zeros exceeds predicted zeros. In this case, Drogue and DeMaria (2011) had used Zero Inflated Models (ZIMs); ZIP and ZINB.

$$Pr\left(X_{ijkt} = x \mid H_{ijkt}\right) = \begin{cases} P(\beta i\ Hi) + (1 - P(\beta_i H_i))\, f(0 \mid H_i)\ if x = 0 \\ (1 - P(\beta_i H_i))\, f(x \mid H_i)\ if x > 0 \end{cases} \quad (6)$$

where $P(\beta_i H_i)$ is the probability of zero trade flow due to exporters decision to be absent from the market and $f(.)$ is the density function of the data generating process that produces the levels of trade flows conditioning on the decision to trade.

The ZIP and ZINB have the same conditional mean of PPML. While, in ZIP model the $var(X_{ijkt} \mid H_{ijkt}) \infty E(X_{ijkt} \mid H_{ijkt})$ like that of PPML and in ZINB the $var(X_{ijkt} \mid H_{ijkt}) \infty E^2 (X_{ijkt} \mid H_{ijkt})$ like that of NB model.

2. *Results and Discussion*

Descriptive statistics and correlation matrix of the variables used in equation 4 are presented in Table 1 and 2, respectively. The correlation matrix confirms no significant correlation column (1) between the trade value and other variables used in the analysis. This validates absence of multicollinearity in the dataset to bias results. Equation (4) is estimated using the OLS and Poisson techniques. The NBR technique is also estimated to check for the dispersion parameter. The Likelihood-ratio test of alpha is insignificant and confirms the use of PPML technique. The fixed effects models are estimated to highlight the trade pattern with the transformation of SAPTA into

TABLE 1

Descriptive Statistics

Variables	Mean	Standard Error	95% Confidence Interval	
Log of trade value	2.80	0.07	2.67	2.92
Log of per capita GDP of partner	2.18	0.02	2.15	2.21
Log of per capita GDP of reporter	2.18	0.01	2.15	2.21
Log of Distance	0.37	0.01	0.34	0.40
Border	0.19	0.01	0.18	0.21
Language	0.04	0.01	0.03	0.05
Land locked	0.31	0.01	0.29	0.33
Common colony	0.41	0.01	0.39	0.43
SAPTA	0.39	0.01	0.37	0.41
SAFTA	0.39	0.01	0.37	0.41
RTA	0.17	0.01	0.15	0.18

Note: Number of observations: 2650

TABLE 2

Correlation Matrix

Variables	Log of trade value	Log of per capita GDP of partner	Log of per capita GDP of reporter	Log of Distance	Border	Language	Land locked	Common colony	SAPTA	SAFTA	RTA
Log of trade value	1.00										
Log of per capita GDP of partner	0.02	1.00									
Log of per capita GDP of reporter	0.08	0.16	1.00								
Log of Distance	-0.12	0.25	0.26	1.00							
Border	0.43	-0.16	-0.16	-0.34	1.00						
Language	0.19	-0.04	-0.04	-0.22	0.43	1.00					
Land locked	-0.29	0.05	-0.31	-0.18	-0.03	-0.14	1.00				
Common colony	0.37	0.23	0.18	0.30	0.03	0.25	-0.56	1.00			
SAPTA	-0.07	-0.20	-0.20	0.00	0.00	0.00	-0.01	0.01	1.00		
SAFTA	0.23	0.41	0.43	-0.01	0.01	-0.01	0.03	-0.05	-0.63	1.00	
RTA	0.36	-0.03	-0.03	0.08	0.35	-0.09	-0.06	0.08	0.01	-0.03	1.00

TABLE 3

Fixed-Effect OLS and Poisson Estimates

Variables	OLS	OLS $(1+X^{p}_{ijt})$	PPML-I	PPML-II	PPML-III	PPML-IV	PPML-V
Log of per capita GDP of partner	0.499	-0.481*	0.076	0.076	0.067	0.076	0.076
Log of per capita GDP of reporter	0.574	0.333	0.249*	0.249*	0.228	0.249*	0.249*
Log of Distance	-1.966***	-0.850***	-0.644***	-0.644***	-0.608***	-0.644***	-0.644***
Border	0.975***	1.486***	0.318***	0.318***	0.389***	0.318***	0.318***
Language	-2.995***	-1.964***	-0.990***	-0.990***	-1.399***	-0.990***	-0.990***
Land locked	2.897***	-0.383	-0.487***	-0.487***	-1.065***	-0.487***	-0.487***
Common colony	2.291***	2.479***	1.514***	1.514***	1.354***	1.514***	1.514***
SAPTA	1.069***	1.053***	1.546***		1.558***	1.546***	
SAFTA	1.397***	2.938***	1.208***		1.239***		1.208***
RTA	1.814***	0.830***	0.567***	0.567***		0.567***	0.567***
Constant	-1.382***	-0.486	-0.361	-0.361	-0.232	-0.361	-0.361
Fixed Effects							
Exporting Country	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Importing Country	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Year	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observation	1306	2650	2650	2650	2650	2650	2650
Statistics							
R2	0.765	0.591					
Pseudo R2			0.392	0.392	0.385	0.392	0.392
F-statistic	0.000	0.000					
Wald Chi2			0.000	0.000	0.000	0.000	0.000

Note: * p<0.05, ** p<0.01 and *** p<0.001

SAFTA. Normally FE models are estimated to control for variation over time and specific to a region for example business cycles, business practices, political system, and many more.

Table 3 shows the estimates of gravity equation while elasticities of the PPML models are presented in Table 4. Table 3 shows that the estimated coefficients carry signs as expected in accordance with economic theory except for language. This is not surprising because of the prevailing law and order situation in Afghanistan and conflict between India and Pakistan as to some extent these countries share the common language. All the models Table 3 show that per capita GDP of partner countries insignificantly affect the flow of trade. This indicates a minimum role of income of the partner country in the flow of products as countries in the SAARC region are developing and/or least developed and low variation in per capita income. The estimated results further show that trade flows are significantly affected by the per capita income of the reporting country (+). Distance between the trading partners (-) shows a major role of transportation costs in trade flows. The coefficient of common border (+) confirms that countries sharing common border trade more. Trade through sea route is a cheaper source of transportation since long for countries. Therefore, it is a considered one of the major determinants for trade between trading partners. Our results also show the same position and the coefficient for landlocked countries (-) is highly significant. On the same lines, the countries that share common colonial relationship trade more.

In common practice, trade flow is high between the trading countries who are signatories of a mutual trade agreement. The same is true for the SAARC countries as the coefficient of SAPTA, SAPTA and trade agreements other than these two are highly significant and positive.

TABLE 4

Elasticity Estimates of Poisson Models

Variables	PPML-I	PPML-II	PPML-III	PPML-IV	PPML-V
Per capita GDP of partner	0.165	0.165	0.146	0.165	0.165
Per capita GDP of reporter	0.544*	0.544*	0.498	0.544*	0.544*
Distance	-0.240***	-0.240***	-0.226***	-0.240***	-0.240***
Border	0.061***	0.061***	0.075***	0.061***	0.061***
Language	-0.042***	-0.042***	-0.059***	-0.042***	-0.042***
Land locked	-0.151***	-0.151***	-0.330***	-0.151***	-0.151***
Common colony	0.624***	0.624***	0.558***	0.624***	0.624
SAPTA	0.598***		0.603***	0.598***	
SAFTA	0.469***		0.482***		0.469***
RTA	0.096***	0.096***		0.096***	0.096***

Note: * p<0.05, ** p<0.01 and *** p<0.00.

The elasticity estimates Table 4 show the response of trade volume due to change in the explanatory variables. Keeping all the other variables constant, about 60 per cent increase in trade volume in the SAARC region with entry into SAPTA. Similarly, the trade flow in the region has increased by almost 50 per cent with entry into SAFTA, keeping all the other variables constant. The countries in the region are also signatories of other than SAPTA and SAFTA and the trade volume for these agreements shows an increase of about 10 per cent keeping the other variables constant. Our results are in line with the previous studies and confirm the findings of trade enhancement effects of trade agreements by Coulibaly (2004), Hirantha (2004), Tumbarello (2006).

VI. Conclusion and Findings

This study estimates the fixed effects gravity model to cope with the unobserved heterogeneity due to time varying and country specific factors. The Poisson estimator is used to deal with the inbuilt heteroskedasticity due to zeros in trade data. The estimated elasticities show about 60 per cent, 50 per cent and 10 per cent increase in trade volume due to SAPTA, SAFTA and agreements other than these two respectively. The prevailing law and order situation in general in the region and conflict between India and Pakistan is depicted in the results because the trade volume as reduced between the trading partners who share common language. The study also shows a minimum role of per capita income because countries in the region are either developing or least developed and show fewer differences in the per capita income. Generally, it is believed that trade flow is high between the trading partners who are signatories of a common trade agreement. The same is true for the SAARC countries as the coefficient of SAPTA, SAPTA, and trade agreements other than these two arrangements. Elasticities estimated for SAPTA, SAFTA and agreements other than these two arrangements show about 60 per cent, 50 per cent and 10 per cent increase in trade volume, respectively in the SAARC region.

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