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AN ANALYSIS OF ACTUAL AND POTENTIAL EXPORTS OF PAKISTAN WITH SAARC COUNTRIES: A PANEL DATA ANALYSIS

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Among the SAARC countries, India, Bangladesh and Sri Lanka had a share of 2.1 per cent, 1.4 per cent and 0.9 percent respectively, in the total exports of Pakistan. Therefore, it becomes imperative to study Pakistan's export potential in relation to SAARC countries. It was further recorded that all SAARC countries' trade including Pakistan is intense with one or two markets during the study period. Therefore, the present study aims at finding whether Pakistan has the potential to export to these nations by using gravity model. Pakistan's export potential to SAARC nations (Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka) was calculated with the help of gravity model of exports using panel data methodology (pooled model, fixed effect model and random effect model) by employing the data over time period 1981-2005. To find out the convergence and divergence of Pakistan's exports to SAARC members, speed of convergence has been used. The study revealed that, there was presence of convergence in Pakistan's exports with SAARC countries; in other words, actual Pakistan's exports to SAARC countries converged towards the estimated export potential. The study also found that among SAARC countries, Pakistan's net export potential exists for Bhutan, India, Maldives and Nepal. Bhutan, Maldives and Nepal are not only far away from Pakistan but they do not have any common borders with Pakistan. Therefore, Pakistan needs facility for transit trade with Maldives, Nepal and Bhutan, through India to realized its export potential.

I. Introduction

International trade plays an important role in the progress of economic development in any country. Exports are important to increase the import capacity. With the increase in import capacity, industrialization could be enhanced to ensure economic growth. Therefore, trade is considered as the most important factor to achieve rapid economic growth and development. Like in all economies, this foreign trade sector has also an important place in the Pakistan's economy. The trade-GDP ratio (openness ratio) has increased from 28.1 percent in 2000 to 36.06 percent in 2008. The average annual growth rate of exports has increased from 8.1 per cent in 1980-90 to 12.7 per cent in 1995- 2005. Though this sector is growing in the Pakistan economy, yet it suffers from an increase in trade balance deficit (from -2812 US $ million to 16562 US $ million in 2006-08) [GOP, (2009)]. In addition, it's share in the world's exports, imports and trade is still very low in comparison to its Asian neighbours.

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Among SAARC countries, India, Bangladesh and Sri Lanka enjoy a share of 2.1 per cent,1.4 per cent and 0.9 percent, respectively, in relation to the total exports of Pakistan (Table 1). Therefore, the need to study Pakistan's export potential with SAARC countries arises.

Developed and developing countries are removing their trade barriers to expand more trade with each other. Different theories of trade have explained the importance of trade in different ways. Classical trade theory and the new trade theory explains the reasons, while gravity model answers the question of magnitude of trade between countries which cannot be explained by these theories of international trade. The classical theory implies that countries which are less similar tend to trade more. However, theory is unable to explain the huge proportion of trade between nations with similar factor endowments (i.e., intra-industry trade). This is the motivation for new trade theories, established in 1980 by Krugman (1979), Lancaster (1981), Helpman (1990), Markusen (1990) and many others. New trade theory explains that, the world trade based on the economies of scale, imperfect competition and product differentiation which are against the strict assumptions of classical theory like constant returns to scale, perfect competition and homogenous goods. Under these assumptions, each country can specialize in producing narrow range of products at larger scale with higher productivity and lower costs. Thus it can increase the variety of goods available to its consumers through trade [Markusen, (1990) and Krugman and Maurice, (2005)].

The classical and the new trade theory can successfully explain the reasons for countries to join in the world trade. However, they are unable to answer the question of the size of trade flows. Another trade theory, the gravity model, which has been used intensively to analyze patterns and performance of international trade in recent years, can be applied to analyze the trade flows empirically. This model of trade is similar to Newton's Law; and is as follows, “the trade flow between two countries is proportional to the product of each country's economic mass', generally measured by GDP, and rise to the power of quantities to be determined, divided by the distance between the countries respective 'economic centers of gravity', generally their capitals, rise to the power of another quantity to be determined” (Christie, 2002). Among the above mentioned trade theories, gravity model has been chosen to quantify Pakistan's exports with its six members of SAARC (Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka). For this, the paper has been divided into four sections. Section II presents review of relevant literature. Section III deals with database and methodology, Section IV explains the current state of intra-regional trade of SAARC nations. Section V interprets the results of gravity model while Section VI discusses the export potential of Pakistan derived from gravity model.

II. Review of the Literature

Linneman (1966) is the first author who provided theoretical background for the gravity model. He derived the gravity equation from partial equilibrium model. Anderson (1979), also derived the gravity model assuming identical Cobb-Douglas

or constant elasticity of substitution (CES) preference functions for all countries as well as weakly separable utility functions between the traded and non-traded goods. Utility maximization with respect to income constraint gives traded goods shares that are functions of traded goods prices only. Oguledo and Macphee (1994) used aggregate income to determine the level of demand in the importing country and the level of supply in the exporting country. On the contrary, Bergstrand (1985) used microeconomic foundation to explain the gravity model. By maximizing a constant elasticity of substitution (CES) utility function subject to income constraints in importing countries, the equation of trade demand for each country is derived. From the firm's profit maximization procedure in the exporting country with resource allocation determined by the constant elasticity of transformation (CET), the equation of trade supply is derived. Eaton and Kortun (1997) obtained gravity equation from Ricardian theory while Deardoff (1998) has obtained it from H-O model. Hummels and Levinsohn (1993) showed that much intra-industry trade is specific to country pairings using intra-industry trade data in gravity equation. Evenett and Keller (1998) obtained the standard gravity equation from the H-O model with both perfect and imperfect product specialization. According to Jakab et al. (2001) gravity equation can be derived assuming either perfect competition or a monopolistic market structure. Accordingly if certain assumptions regarding the structure of both product and factor market hold neither increasing returns nor monopolistic competition is a necessary condition for use of gravity model.

Empirically this model has been applied by many researchers for different countries. Rahman (2005) used gravity equation for Bangladesh with its major trading partners. The study revealed that Bangladesh's trade is determined by the size of the economy, GNP per capita, distance and openness. Blomqvist (2004) applied gravity model for Singapore and found that GDP and distance variables are important variables for Singapore's trade flows. Kaur and Nanda (2010) used gravity equation not only to explore the determinants but also to find potential for India's export with the other SAARC nations. The study revealed that India's export potential exists for Maldives, Bhutan, Pakistan and Nepal.

III. Date Base

The study, mainly covers the period of 25 years i.e. 1981-2005. Keeping in view the nature of study, secondary data has been calculated from the following sources:

1. Data on structure of production and structure of trade of SAARC nations have been obtained from the *UNCTAD Handbook of Statistics, UN.*
2. Data on direction of trade of Pakistan as well as SAARC countries have been obtained from the *Directory of Trade Statistics Year Book, IMF and Key Indicators of Asia and Pacific Countries, UN.*
3. Data on different variables have been collected from various issues of the *World Development Indicators, World Bank.*

IV. Methodology

- ***Trade Intensity Index***

The trade intensity index is used to determine whether the value of trade between two countries is greater or smaller than would be expected on the basis of their importance in the world trade. It is defined as the share of one country's exports going to a partner divided by the share of world exports going to the partner. Trade intensity of SAARC countries and SAARC as a whole has been calculated by dividing the intra-country share by the share of a country to total world trade at three points of time 1985, 1995 and 2005 in the following manner (Kojima, 1964):

$$I_{ij} = \frac{X_{ij} / X_i}{M_j / (M_w M_i)}$$

Where:

I_{ij}	Trade Intensity Index of the country *i* with *j*.
X_{ij}/X	Share of the country *j* in i^{th} country's exports
M_j, M_i and M_w	Imports of a country *j, i* and the world respectively.

It ranges between 0 to + ∞. Values greater than one indicate an intense trade relationship and vice versa. In other words, an index of more (less) than one indicates a bilateral trade flow that is larger (smaller) than expected, given the partner country importance in the world trade.

- ***Gravity Model***

The gravity model applies Newton's universal law of gravitation in physics, which states that gravitational attraction between the two objects is proportional of their masses and inversely related to the square to their distance (Zhang and Kristensen (1995) and Chrities, (2002)). The gravity model is expressed as follows:

$$F_{ij} = \frac{M_i M_j}{D_{ij}^2}$$

F_{ij} is the gravitational attraction.
M_i and M_j are mass of two objects.
D_{ij} is the distance.

The gravity model for trade is analogous to this law. The analogy is as follows, "The trade flows between the two countries is proportional to the product of each country's economic mass generally measured by GDP, and each rise to the power of quantities to be determined divided by the distance between the countries respective economic centers of gravity, generally their capitals, raised to the power of another quantity to be determined." (Christie, 2002).

Later on an astronomer, Stewart, and a sociologist, Zipf applied this law to the social sciences and attempted to apply it to spatial interactions, such as trips among cities.

The present study has used the following gravity model specification:

$$L_n E_{ijt} = \alpha + \beta_1 L_n Y_{it} + \beta_2 L_n Y_{jt} + \beta_3 L_n Pop_{it} + \beta_4 L_n Pop_{jt} + \beta_5 Rer_{it} + \beta_6 Rer_{jt} + \beta_7 L_n Pci_{ijt} + \beta_8 L_n Dis_{ij} + \beta_9 or_{ij} + \beta_{10} Lan_{ij} + e_{ijt} \quad (1)$$

E_{ijt}	=	Export flows in year *t* from country *i* (Pakistan) to country *j* (SAARC countries);
Y_{it}	=	Country *i's* GDP in year t (measured in US $ millions);
Y_{jt}	=	Country *j's* GDP in year t (measured in US $ millions);
Pop_{it}	=	Country *i's* population in year t (measured in thousands);
Pop_{jt}	=	Country *j's* population in year t (measured in thousands);
Pci_{ijt}	=	Absolute difference in per capita GDP (measured in US $ millions);
Rer_{it}	=	Real exchange rate between the exporter's currency and the US $ in period *t;*
Rer_j	=	Real exchange rate between the importer's currency and the US $ in period *t;*
Dis_{ij}	=	Distance between country *i* and *j* (Kms);
Bor_{ij}	=	Border is a dummy variable for pair of countries sharing common border; and
Lan_{ij}	=	This is also a dummy variable for a pair of countries sharing common language.
L_n	=	Natural logs

It is hypothesized that $\beta_1, \beta_2, \beta_5, \beta_9, \beta_{10} > 0$; β_3, β_4, $\beta_7 < 0$ *or* > 0 and $\beta_6, \beta_8 < 0$.

In data set of bilateral exports, some flows are recorded as zero or missing. However, omitting zero flows can bias the empirical results. Omitting zero entries observation implies losing information on the causes of (very) low trade. On the other side, a logarithmic formulation of the gravity model cannot include zero trade because logarithm of zero is undefined. Zero values may be substituted by a small constant. This approach has been followed by Linneman (1966), van Bergeijk and Oldersma (1990), Wang and Winters (1991) and Raballand (2003).Substituting small values prevents omission of observations from the sample, but is essentially adhoc. The inserted value is arbitrary and does not reflect the underlying expected value (Linders and Groot (2006) and Shepherd 2008).The study has used this approach.

A panel framework is designed to estimate the above equation for the period of 1981-2005. Panel estimation reveals several advantages over the cross section data and time series data as it controls for individuals heterogeneity (where as time and cross section studies do not control for this heterogeneity and it may give biased estimated results). Furthermore, more degree of freedom reduces the collinearity among explanatory variables, therefore, improving the efficiency of econometric estimates. More importantly, panel data can measure effects that are not detectable in cross sections and the time series data (Baltagi, 1995).

Some early studies usually investigated the gravity model with single year cross sectional data or the time series data. These methods are probably affected by problem of misspecification and yield biased estimation of volume of bilateral trade because there is no control for heterogeneity (Cheng and Wall, 2005). Matyas et al (1997), Egger (2000) etc. suggested to apply panel data in the gravity model because panel data is a general case of cross sectional and time series data.

Panel estimation can be done using pool estimation of fixed effect and random effect (Gujrati, 2003). Pool estimation is the simplest approach. Its function is as follows:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + e_{it}$$

Where i stands for cross sectional unit, t stands for time period and error term is normally distributed with mean zero and constant variance. Pooled estimation assumes that there is one single set of slope coefficients and one overall intercept. It disregards the time and space dimension of panel data; the error term captures the differences between time and individuals.

The fixed effects take into account the individuals and time effects by letting the intercept vary for each individual and time period, but the slope coefficients are constant. The model is

$$Y_{it} = \beta_{1t} + \beta_2 X_{2it} + \beta_3 X_{3it} + e_{it}$$

Where it is usually assumed that eit is independent and identically distributed over individuals and time with mean zero and variance σ_2 and all X_{it} are independent of all error terms.

One of the shortcomings of the fixed effect model is that it may not be able to identify the impact of time invariant such as distance, and this variable will be excluded from fixed effects estimation. Chang and Wall (2005) has suggested a method to estimate the time invariant variables by using the individual effects. In the fixed effect model the country pair individual effects cover all factors that remain constant over time such as: location, language, culture, and the other trade barriers. Therefore, one can indirectly calculate the effect of time invariant variables like history and distance from the individual effects. The study has estimated the model using the fixed effect estimator following Chang and Wall (2005).They estimated an additional regression of the estimated country pair effects on the time invariant variables in order to find out the importance of these variables in the fixed effects. The regression is as follows:

$$\alpha_{ij} = a_1 + a_2 L_n Dis_{ij} + a_3 Bor_{ij} + a_4 Lan_{ij} + e_{ij}$$

where:

α_{ij} is country individual effects,
a_2, a_3, a_4 are coefficients.
It is expected that $a_2 < 0$ but a_3 and $a_4 > 0$

The simple distance calculated following the great circle formula which uses latitudes and longitudes of the most important city (in term of population) or of its official capital. These distances were expressed as the distance (in kms) between the capital cities. The language dummy value is zero for all SAARC nations except India which shows that Indian and Pakistani language is well understood by both countries. Border's dummy value is zero for all SAARC nations except India which shows that their borders are not shared by Pakistan. Another approach applies to estimate panel data is random effect estimation. The random effect treats the intercept as a random variable and the observations included in the sample are drawn from a larger population. The model is written as follows:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + W_{it}$$

where $W_{it} = \varepsilon_i + U_{it}$

The composite error term Wit consists of two components, i, which is the cross section or individual specific, error component and U_{it}, which is combined time series and cross section error component. It is assumed that the individual error components are not correlated with each other and are not auto correlated across sections and time series units.

Equation (1) has been estimated by all three methods – restricted model, one-way fixed effect model and one-way random effect model. F statistic test and Hausman test (Verbeek, 2004) have been used to select the most efficient method for interpreting the estimated results.

Restricted F-test

$H_0 : u_i = \ldots\ldots\ldots\ldots u_{n-1} = 0$

$H_1 : not\ H_0$

If null hypothesis is rejected, fixed effect model is better than the pooled OLS model.

- **Hausman Test (Verbeek, 2004)**

H_0: Explained variables are uncorrelated with individual effects
H_1: Explained variables are correlated with individual effects

$$H = \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)' \left[\hat{V}\left(\hat{\beta}_{FE}\right) - \hat{V}\left(\hat{\beta}_{RE}\right)\right]^{-1} \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)$$

Where $\hat{\beta}_{FE}$, $\hat{\beta}_{RF}$ are estimated coefficients from the fixed and random effect estimators. $\hat{V}$'s are the covariance matrices of fixed and random effect. If the computed statistic H is larger than a chi-square distribution with k degrees of freedom (k is the number of elements in) then we reject the null hypothesis and conclude that random effect is not appropriate and it is better to use the fixed the effect.

- **Export Potentials**

Calculating exports potential is a line of research that has been used intensively with the gravity model. Most studies apply the point estimated coefficient to data on the explanatory variables to calculate trade potential predicted by the gravity model. This study has calculated export potentials with the help of three formula:

1. Predicted Export Flows – Actual Export Flows (P-A):

Predicted export flows are based on gravity model of exports .Positive value of P-A shows that there is a future possibility of export expansion while negative values shows that Pakistan has exceeded its export potential with a particular SAARC country (Batra, 2004).

2. Predicted Export Flows / Actual Export Flows (P/A):

If this ratio exceeds one, there is an implication in terms of potential expansion of Pakistan's exports with the respective country and vice versa (Batra, 2004).

There is an uncertainty of calculating export potential based on the above point estimates. There is another method (speed of convergence) which avoids such uncertainty.

3. Speed of Convergence

Jakob et al. (2000) has proposed the concept of speed of convergence to replace the old method to calculate potential trade. Speed of convergence is defined as the average growth rate of potential trade divided by average growth rate of actual trade between the years of observations.

$$Speed\ of\ Convergence = \left(\frac{Average\ growth\ rate\ of\ potential\ exports}{Average\ growth\ rate\ of\ actual\ exports} \right) \times 100 - 100$$

There is a convergence if growth rate of potential exports is lower than that of actual exports and the computed speed of convergence is negative. There is a divergence in the opposite case.

To estimate the convergence of the actual Pakistan's exports towards the estimated equilibrium, the study has estimated following simple regression model:

$$\Delta E_{ij,t} = \alpha + \beta \left(E_{ij,t-1} - Pot_{ij,t-1} \right)$$

ΔE_{ij} = Change in actual export value in time period *t;* and
$(E_{ij,t-1} - Pot_{ij,t-1})$ = difference between actual and potential exports in the previous period *(t-1)*.
Certainly for convergence, the β should be negative and significant.

- **Direction of Intra-SAARC Trade**

Regarding the direction of intra-SAARC countries, Table 1 shows that maximum share was of Nepal (31.88 percent) followed by Maldives (17.39 percent) and Bangladesh (7.66 percent) in 1985. In 1995, all SAARC countries, except India and Bhutan experienced decline in their exports to SAARC countries. Nepal witnessed a rapid decline in export to SAARC countries (as share decreased from 31.88 percent in 1985 to 9.23 percent in 1995). In 2005, Nepal had a maximum share (41.42 percent) followed by Bhutan (37.38 percent) and Maldives (12.61 percent) indicating the increasing intra-regional exports of small SAARC countries. As compared to 1985, countries namely Bangladesh, Maldives and Pakistan experienced decrease in export share to SAARC exports in 2005 (share decreased from 7.66 percent, 17.39 percent and 5.29 percent to 2.00 percent, 12.61 percent and 4.56 percent respectively), while other SAARC nations namely Bhutan, India, Nepal and Sri Lanka experienced an increase in share (as share increased from negligible to 37.38 percent, from 2.95 percent to 5.06 percent, from 31.88 percent to 41.42 percent and from 3.99 percent to 12.42 percent in 2005).

TABLE 1

Direction of Export of SAARC Countries (percent)

Country	Years	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	SAARC
Bangladesh	1985	-	-	3.00	0.01	0.50	4.20	0.02	7.66
	1995	-	0.01	1.14	-	0.31	0.85	0.37	2.68
	2005	-	0.03	1.28	0	0.04	0.56	0.09	2.00
Bhutan	1985	-	-	-	-	-	-	-	-
	1995	6.00	-	15.53	-	0.59	1.74	0.0	23.5
	2005	3.43	-	27.76	-	-	0.19	0.0	37.38
India	1985	1.14	-	-	0.01	0.90	0.13	0.78	2.95
	1995	3.14	0.04	-	0.04	0.35	0.23	1.26	5.06
	2005	1.64	0.10	-	0.06	0.83	0.64	1.88	5.06
Maldives	1985	-	-	-	-	-	-	17.39	17.39
	1995	-	-	0.13	-	-	-	13.12	13.25
	2005	-	-	1.01	-	-	-	11.60	12.61
Nepal	1985	-	-	28.12	-	-	1.25	2.50	31.88
	1995	1.09	-	7.71	-	-	0.14	0.20	9.23
	2005	0.32	-	40.68	0.01	-	0.39	0.01	41.42
Pakistan	1985	2.37	-	1.39	0.01	0.00	-	1.54	5.29
	1995	1.92	0.01	0.49	0.02	0.04	-	0.69	3.16
	2005	1.46	0.02	2.10	0.02	0.02	-	0.96	4.56
Sri Lanka	1985	1.09	-	0.45	0.39	0.01	2.05	-	3.99
	1995	0.32	-	0.84	0.37	0.00	1.13	-	2.66
	2005	0.30	-	10.78	0.51	0.00	0.82	-	12.42

Source: Worked out from the data given in *UNCTAD Handbook of Statistics:* Various Issues.

Intra-SAARC exports show that for Bangladesh and Sri Lanka, Pakistan constituted main export market with share being 4 percent and 2 percent while for India and Pakistan, Bangladesh constituted the main export market with share being 1.14 percent and 2.37 percent, respectively and for Nepal, India constituted main market with share being 28.12 percent in 1985. In 1995, all SAARC countries main export market remained same except Bangladesh and India. The share of Bangladesh in Indian export increased from 1.14 percent in 1985 to 3.14 percent in 1995. In 2005, for most of the countries, namely Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka, India constituted the main market with its share being 1.28 percent, 27.76 percent, 40.68 percent, 2.10 percent and 10.78 percent respectively. For Maldives and India, Sri Lanka constituted the main market with its share being 11.60 percent and 1.88 percent, respectively in 2005, indicating lack of market diversification of exports of SAARC countries.

Trade Intensity Index

Trade intensity indices highlight the importance of secular changes in the bilateral trade flows. If it takes a value above (below) unity, the countries have greater (smaller) bilateral trade than the world. Trade intensity indices of different SAARC countries is shown in Table 2, and depicts that in 1985, trade intensity index of Nepal with SAARC was maximum i.e. 23.93 percent followed by Maldives (13.05 percent) and Bangladesh (6.82 percent). The country-wise analysis shows that Bangladesh's trade was most intense with Pakistan (24.69 percent), India with Nepal (39.67 percent), Maldives with Sri Lanka (189.85 percent), of Nepal with India (35.5 percent), Pakistan with Bangladesh (18.70 percent), and Sri Lanka with Maldives (148.29 percent). As compared to 1985, trade intensity index of Bangladesh, Nepal, Pakistan and Sri Lanka with SAARC experienced decline in 1995. Nepal witnessed a rapid decline from 23.93 percent in 1985 to 8.09 percent in 1995. In 2005, index of Nepal with SAARC was maximum i.e. 23.93 percent followed by Bhutan (18.12 percent) and Sri Lanka (7.16 percent).Country-wise analysis shows that Bangladesh's trade was most intense with Bhutan (6.42 percent), Bhutan with Bangladesh (26.45 percent), India with Nepal (47.18 percent), Maldives with Sri Lanka (140.66 percent), Nepal with India (31.25 percent), Pakistan with Sri Lanka (11.61 percent) and Sri Lanka with Maldives (73.28 percent). Heavy dependence on either one or two markets led to reduction in intra-SAARC exports of countries like Bhutan, Maldives and Nepal.

Thus, it is clear that all SAARC countries' trade including Pakistan is intense with one or two markets. Therefore, the present study investigated whether Pakistan has the potential to export to these nations by using gravity model.

- **Gravity Variables**

The study has taken different variables to estimate the gravity model of Pakistan's export. These are:

(a) **Gross Domestic Product of the Exporter Country:** A high level of income in the exporting country indicates high level of production which increases the availability of goods for export. Therefore, it is expected that coefficient for this variable to be positive [Harris and Matyas, (1998); Matyas, et. al., (2000); Zorzoso and Lahman, (2000); Abraham and Hove, (2005) and Rahman (2005)].

TABLE 2

Trade Intensity Index of SAARC Countries (percent)

Country	Years	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	SAARC
Bangladesh	1985	-	-	1.32	3.80	2.66	24.69	6.87	6.82
	1995	-	4.67	1.71	0.0	12.14	3.87	3.72	2.35
	2005	-	6.42	0.98	0.0	2.30	2.36	1.09	1.15
Bhutan	1985	-	-	-	-	-	-	-	-
	1995	47.96	-	23.26	-	23.01	7.87	0	20.55
	2005	26.45	-	21.33	-	24.70	0.80	0	18.12
India	1985	8.95	-	-	3.77	39.67	0.44	8.45	2.20
	1995	25.06	18.69	-	7.75	13.63	1.05	12.69	4.43
	2005	12.48	21.11	-	8.52	47.18	2.67	22.50	2.88
Maldives	1985	-	-	-	-	-	-	189.85	13.05
	1995	-	-	0.19	-	-	-	225.86	19.83
	2005	-	-	0.78	-	-	-	140.66	7.38
Nepal	1985	-	-	35.5	-	-	4.27	27.28	23.93
	1995	8.76	-	11.54	-	-	0.65	2.82	8.09
	2005	2.46	-	31.25	0.14	-	1.64	0.15	23.90
Pakistan	1985	18.70	-	1.75	3.79	0.13	-	16.76	3.96
	1995	15.40	4.67	0.74	3.90	1.56	-	6.94	2.77
	2005	11.23	0.32	1.61	2.87	1.15	-	11.61	2.62
Sri Lanka	1985	8.62	-	0.57	148.29	0.44	6.97	-	2.91
	1995	2.67	-	1.26	72.12	0.0	5.15	-	2.33
	2005	2.31	-	8.28	73.28	0.05	3.46	-	7.16

Source: Worked out from the data given in *UNCTAD Handbook of Statistics:* Various Issues.

(b) **Gross Domestic Product of the Importer Country:** Since a high level of income in the importing country suggests higher demand for imports, therefore it is also expected that coefficient for this variable to be positive [Harris and Matyas, (1998); Matyas, et. al., (2000); Zorzoso and Lahman, (2000); Abraham and Hove, (2005) and Rahman, (2005)].

© **Population of the Exporter Country:** The coefficient estimated for population of the exporter country may be positive or negative depending on whether the country exports less when it is big (absorption effect) or whether a big country exports more than a small country (economies of scale) [Harris and Matyas, (1998); Matyas, et. al., (2000); Zorzoso and Lahman, (2000); Abraham and Hove, (2005) and Rahman (2005)].

(d) **Population of the Importer Country:** The coefficient of the importing country's population has also an ambiguous sign due to the above reasons [Harris and Matyas (1998), Matyas et al (2000), Zorzoso and Lahman (2000), Abraham and Hove (2005) and Rahman (2005)].

(e) **Real Exchange Rate of the Exporter Country:** Real exchange rate is defined as local currency value of 1 unit in US$ multiplied by Pakistan's deflator and divided by US's deflator. It is expected to be positive as Pakistan's exchange rate depreciates with respect to other and will have a positive impact on Pakistan's export [Harris and Matyas, (1998); Matyas, et. al., (2000); Zorzoso and Lahman, (2000) and Abraham and Hove, (2005)].

(f) **Real Exchange Rate of the Importer Country:** This rate is obtained by local currency value of 1 unit in US$ multiplied by the importer country's deflator and divided by US's deflator. The coefficient for this variable is expected to be negative as importer country's currency depreciates with respect to other countries, whose export will fall [Harris and Matyas, (1998); Matyas, et. al., (2000); Zorzoso and Lahman, (2000) and Abraham and Hove, (2005)].

(g) **Difference in Per Capita Income:** According to the H-O theory, the sign of this coefficient would be positive as similar countries trade less than dissimilar ones. On the other hand, based on the Linder Hypothesis, the sign would be negative as similar countries trade more than dissimilar ones. [Zorzoso and Lahman, (2000); Batra (2004); Rahman, (2005) and Montanari (2005)].

(h) **Distance:** Distance between the two countries is expressed as the distance (in km) between the capital cities. Distance has a negative impact on volume of exports. As the distance between the exporting and importing countries increases exports will fall. The distance is a factor which is used as a proxy to consider the impact of transport cost and other transaction costs. Therefore, the coefficient for this variable is expected to be negative [Zorzoso and Lahman, (2000); Abraham and Hove, (2005) and Rahman, (2005)].

(i) **Border:** This is a dummy variable for a pair of countries sharing common border. As the sharing borders increases the export between the given pair of countries increases. Therefore it is expected that coefficient for this variable to be positive [Zorzoso and Lahman, (2000); Abraham and Hove, (2005) and Rahman, (2005)].

(j) **Language:** This is also a dummy variable for a pair of counters sharing common language. It is also expected that coefficient for this variable to be positive as the exports (trade) will be more between two the countries if language is well understood in both trading partners [Zorzoso and Lahman, (2000); Abraham and Hove, (2005) and Rahman, (2005)].

- **Estimation Results of Gravity Model**

The estimation results of bilateral exports of Pakistan with six SAARC members (Bangladesh, Bhutan, India Maldives, Nepal and Sri Lanka) are reported in Table 3. The gravity model of Pakistan's export has been estimated by restricted (pooled) model, fixed effect model and random effect model. The restricted model is the

pooled model with restrictive assumptions of single intercept and with the same parameter over time and across the trading partners. The unrestricted model (fixed effect model), however is the same behavioral equation but allows the intercept to vary across the trading partners. Formally, F-test was carried out to test for the null hypothesis that the country specific effects are jointly zero. In Table 3, the value of F test was 63.23 at (5,137) d.f. which was far larger than tabulated value and supported the alternate hypothesis indicating SAARC countries having different propensities to export with Pakistan . The pooled estimation gives biased results due to the omitted variables. Next, the Hausman test was also performed to compare the fixed and random effect estimators. The statistic result had a value of 60.01 at 7 d.f. which was also far larger than the critical value. This suggested that the fixed effect is a better choice than the random effect. Therefore, the direction of the study focuses on the fixed effects estimation.

TABLE 3
Results of Gravity Model

Variables	Restricted/Pooled Estimation		Fixed Effects Estimation		Random Effects Estimation	
	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat
Constant	-0.01	0.002	-16.54**	4.67	-15.13**	-3.68
Gross Domestic Product of Exporter Country	-0.37	0.26	0.39	0.46	0.32	6.33
Gross Domestic Product of Importer Country	2.40**	9.31	-0.50	1.08	-0.20	0.39
Population of Exporter Country	-0.44	0.21	4.31**	2.43	2.24	1.52
Population of Importer Country	-1.39**	5.89	-1.13	0.73	0.87	1.74
Real Exchange Rate of Exporter Country	-0.002	0.09	0.003	0.22	0.001	0.08
Real Exchange Rate of Importer country	0.02**	5.49	-0.001	0.58	0.0001	0.28
Per Capita Difference	0.20*	1.98	0.047	0.63	0.03	0.38
R2	0.77		0.92		0.37	
Restricted F-test			63.23** (5,137)			
Hausman Test					60.01 (7)	

Source: Based on data given in Direction of Trade Statistics Year Book & World Development Indicators.
*Significant at five per cent level. Figures in parentheses are degrees of freedom.**Significant at one per cent level.

Exports equation has run through the above mentioned three estimation methods. Estimated coefficients had nearly all the expected signs except for GDP of importer country, population of importer country, real exchange rate of importer country and per capita difference. However, the magnitudes of the coefficients in pooled and random effect estimation were notably different from those in the fixed effect method suggesting that there might be biased results due to ignoring the country individual effects in pooled estimation and inconsistent estimates because of correlation between the individual effects and other regressors in the random effect method. Even F-test and Hausman test had also supported the same argument for the present data. Gravity model results given in Table 3 show that economic size (GDP) of exporter country (Pakistan) came out to be non-significant but positive, affecting Pakistan's export and showing that Pakistan tends to export with larger economies but economic size (GDP) of importer countries (SAARC nations other than Pakistan) non-significantly and negatively affect Pakistan's export. An increase by one percent of Pakistan's GDP will go on increasing Pakistan's exports by an average index of 0.39 percent and an increase by one percent of SAARC member's GDP (other than Pakistan) will go in decreasing Pakistan's exports by an average index of 0.50 percent. This may be due to the reason that with increase in GDP, importer countries will import from other economies rather than Pakistan; like Bhutan and Nepal (land locked economies) trade through India. But it is remarkable to note that the coefficient of this variable in pooled model is positive and significant. This is due to ignoring country individual effects in pooled estimation.

However, the market size (population) of Pakistan had highly significant and positive affects on Pakistan's exports; one percent increase in market size of Pakistan will increase Pakistan's exports up to 4.31 per cent on an average. Market size (population) of SAARC members (other than Pakistan) had non-significant and negative affects on Pakistan's export showing absorption effect i.e. country exports less when it is big. On the one hand, a large population may indicate a large resource endowment, self-sufficiency, and less reliance on international trade. If this effect dominates, then it is expected that coefficient will be negative. On the other hand, it is possible that a large domestic market (population) promotes the division of labour and will create opportunities for trade in a wider variety of goods, then the expected sign of the coefficient will be positive. Here, the first argument seems to be applicable. One percent increase in market size of SAARC members (other than Pakistan) will decrease Pakistan's exports up to 1.13 per cent on average. Surprisingly, real exchange rate of exporter country (Pakistan) had non-significant and positive effect on Pakistan's exports. One percent increase in country's value of exchange rate (depreciation of the exporter currency) may increase Pakistan's export by 0.003 percent on an average only. The non-significance of this variable may suggest that the two conflicting effects (supply and demand) cancel each other out. Furthermore, the real exchange rate of importer country also had non significant and negative effect on Pakistan's export. One per cent increase in currency of SAARC nations (other than Pakistan) may decrease in Pakistan's exports up to 0.001 per cent only. The coefficient of difference in per capita income was insignificant and positive suggesting that H-O theory dominated in Pakistan's export. According to the Linder trade model, bilateral trade will be greater, when the per capita GDPs of the trading countries are more similar. The coefficient value was 0.047 percent implies that Pakistan's export with SAARC increases as difference in per capita GDP between Pakistan and SAARC increases.

As the fixed effect model is better, therefore only fixed effect model's country effects are ranked and reported in Table 4. India followed by Bangladesh, Sri Lanka and Nepal had the highest propensity with Pakistan's exports and Maldives and Bhutan had the lowest propensity with Pakistan's export during 1981-2005. Table 5 reports the results obtained when the fixed effects from model are regressed on the distance variables and dummies which are fixed over time (Border and Language). According to the results, all the non-time variant variables (Distance, Border and Languages) were found to be non-significant and had expected sign. If distance reflects comparative advantages related to geography (Melitz, 2001), it is not clear which sign can be expected for: an increase in distance might increase, not diminish, trade, if differences in comparative advantage prevail. A very low R2 coefficient (0.35) means that there were other determinants of the trading pair effects (which have not included in the analysis).

TABLE 4

Country Effects

Country	Fixed effects
Bangladesh	2.69(2)
Bhutan	-3.98(6)
India	3.99(1)
Maldives	-3.49(5)
Nepal	-0.55(4)
Sri Lanka	1.33(3)

Source: Based on the results of gravity model.
Source: Figures in parentheses are ranks.

TABLE 5

Cross-Section Regression Results
(Individual Effects regressed over Distance and Dummies for Language and Border)

Variables	Coefficient	t-statistics
Constant	-0.140	0.004
Language	4.691	0.745
Border	4.691	0.745
Distance	-0.198	0.019

D.W = 1.78, $R^2 = 0.35$
Source: Based on the results of gravity model.

- **Export Potential**

The gravity model is not only useful to find out determinants of bilateral export flows, but it can also be used to predict future trade flows or export flows. In particular, it is used to calculate export potentials i.e., difference between the predicted and the actual bilateral export flows. Predictions are based on the gravity model estimates. The study estimated the export potentials by fixed effect model only since fixed effect model had been proved as better model than random effect model.

Table 6 reports the export potential by calculating the difference between the potential (P) and actual level of exports (A) i.e., value of P-A. A positive value indicates future possibilities of export expansion while a negative value shows that Pakistan has exceeded its export potential with particular SAARC countries (Batra, 2004). The average of export potential had been calculated to find out the export potentials of SAARC members with Pakistan over a period of time. The average of P-A was highest for Bangladesh (15.65) followed by Sri Lanka (4.31) during 1981-2005 showing that for Bangladesh and Sri Lanka, Pakistan had export potential with these nations whereas for other SAARC members, it was negative showing that Pakistan has exceeded its export potential with these nations.

Export potential was also been calculated with the help of ratio method. The ratio of export potential (P) as predicted by the model and actual trade (A) was also used to analyze the future direction of export for Pakistan. If the value of P-A exceeds one, there is a potential expansion of exports with the respective country (Batra, 2004). The results of this ratio are given in Table 7. The average of this ratio was maximum for Bhutan (1.86), Nepal (1.42), Maldives (1.30), India (1.22), Bangladesh (1.13) and Sri Lanka (1.09) indicating that Pakistan had the highest potential of exports with Bhutan and Nepal during 1981-2005.

TABLE 6

Export Potential between Pakistan and SAARC Members using (P-A)* Approach

(US $ Millions)

Year	Bangladesh	Bhutan	India	Maldives	Nepal	Sri Lanka
1981	-62.9775	0.0177	-88.5835	0.2328	0.2844	-39.8270
1982	-69.0070	0.0242	-50.0951	0.5037	0.3703	-18.7627
1983	-11.0161	0.0290	-15.3088	0.2040	0.2671	3.8500
1984	-5.5235	0.0324	-5.9188	-1.6933	0.4544	13.3705
1985	-34.5630	0.0397	-18.4480	0.0976	0.4671	7.7921
1986	6.5164	0.0422	4.1262	0.4176	0.1366	-17.4919
1987	-52.1620	0.0431	5.6496	0.2470	-1.2696	-18.9331
1988	-54.7602	0.0482	-23.9570	-0.1168	-0.2812	-16.1786
1989	-2.4017	0.0562	7.3130	-0.3546	-0.4413	-39.4931
1990	-41.7853	-0.2063	-15.1989	0.1178	-0.3819	-22.2315
1991	-22.1804	-0.7963	5.3263	-1.0020	0.4399	-18.3058
1992	-44.8750	-0.6092	-7.4309	-1.0318	-0.2887	-28.6426
1993	2.6736	-0.4901	18.4626	0.1443	0.9134	8.2584
1994	-1.4791	-0.4966	25.0163	-0.0495	-2.1516	-1.3647
1995	-20.5684	-0.8691	38.5072	-0.2559	-1.4965	20.7762
1996	35.1016	-0.4192	46.1683	-1.5019	-3.7568	5.6039
1997	59.1715	-0.2720	53.4018	-0.0794	-2.4219	-4.5651
1998	51.4460	0.0843	-95.7803	-0.4104	-5.3342	-0.8838
1999	64.9692	-0.1335	14.3087	0.0973	0.1169	-0.0300
2000	66.9276	-0.0487	66.1391	0.2009	-0.3462	34.4181
2001	91.2952	0.0223	58.6910	0.0153	0.0496	47.6309
2002	125.2158	0.0302	74.7564	-0.5975	0.0866	61.1589
2003	105.3091	0.0049	53.7392	-0.4734	-1.5729	62.3238
2004	100.8049	0.1277	-29.0116	0.2254	0.2016	34.5037
2005	104.9921	0.0925	-120.6420	-0.2343	-0.0742	34.6723
Average (1981-2005)	15.6449	-0.14585	-2.6258	-0.2118	-0.6411	4.3059

Source: Based on the results of gravity model
*P=predicted by gravity model, A=actual values

TABLE 7

Export Potential between Pakistan and SAARC Members using (P-A)* Approach

(US $ Millions)

Year	Bangladesh	Bhutan	India	Maldives	Nepal	Sri Lanka
1981	0.3545	2.0820	0.1923	1.7900	2.7375	0.3729
1982	0.3867	2.6222	0.3304	6.6113	3.4747	0.5915
1983	0.8104	3.0569	0.6123	1.5166	1.9469	1.1684
1984	0.8934	3.3931	0.8255	0.2295	4.3491	1.8422
1985	0.5908	4.0414	0.6187	1.2263	4.5721	1.2964
1986	1.1277	4.3274	1.1563	3.9927	1.2693	0.6740
1987	0.5366	4.4754	1.2127	1.6422	0.3606	0.6754
1988	0.5554	4.9981	0.6032	0.8534	0.7292	0.7304
1989	0.9688	5.8147	1.2087	0.6727	0.6573	0.5490
1990	0.6394	0.2604	0.7242	1.1888	0.7029	0.7005
1991	0.7972	0.0978	1.1046	0.4525	1.8642	0.7550
1992	0.6847	0.1401	0.4779	0.4594	0.8034	0.6780
1993	1.0248	0.1893	1.3405	1.1755	3.5732	1.1416
1994	0.9875	0.2103	1.5438	0.9532	0.3745	0.9805
1995	0.8627	0.1466	2.0081	0.8133	0.4855	1.3857
1996	1.3355	0.2898	2.1732	0.4444	0.2960	1.0729
1997	1.6828	0.3944	2.5749	0.9394	0.3980	0.9489
1998	1.5190	1.8280	0.4906	0.7542	0.2423	0.9899
1999	1.6689	0.5983	1.1795	1.0821	1.0685	0.9996
2000	1.5331	0.8224	2.2626	1.1601	0.8594	1.4704
2001	1.8679	1.1107	2.0060	1.0105	1.0246	1.7185
2002	2.3949	1.1491	2.7676	0.7265	1.0395	1.9980
2003	1.7478	1.0204	1.7542	0.7829	0.6152	1.8746
2004	1.6160	1.8837	0.7789	1.1392	1.0798	1.3100
2005	1.5555	1.4735	0.5567	0.9009	0.9744	1.2793
Average (1981-2005)	1.1257	1.8570	1.2201	1.3007	1.4199	1.0881

Source: Based on the results of gravity model
*P=predicted by gravity model, A=actual values

- **Speed of Convergence**

There is a convergence if growth rate of potential is lower than that of actual exports and the computed speed of convergence is negative. There is a divergence in the opposite case. The argument for the prominent efficiency of this method over the point estimated method is that the speed of convergence exploits the dynamic structure of the data during estimation, which offers more reliability than the analysis of point estimates. The results of potential exports using speed of convergence are reported in Table 8. Exports with six SAARC members presents an interesting situation separating trade partners into two groups, the first group characterized by an overtrade situation and the second one reflecting potentials to develop export. Pakistan had convergence in exports with four SAARC members (Bhutan, India, Maldives and Nepal) and divergence with two SAARC members (Bangladesh and Sri Lanka). In other words, Pakistan did not exploit all its export potentials in trading with six SAARC members. There is a large scope for export expansion for Bhutan, India, Maldives and Nepal. Speed of convergence for Bangladesh was maximum i.e.7.88 percent showing that Bangladesh had over exported by Pakistan. The increasing FDI can help to explain the over-utilized export potential between Pakistan and Bangladesh. For Sri Lanka, it was 2.04 percent depicting that Sri Lanka had also over-exported by Pakistan. For diverging economies, Bhutan's speed of convergence was negative showing that in Bhutan, maximum export potentials are under-utilized and also, in case of Maldives, India and Nepal, the Pakistan's exports potential are not fully utilized.

- **The Convergence of Pakistan's Actual Exports towards Potential Exports**

It is worth examining whether the estimated exports flows represent an empirical equilibrium as well, in other words, whether there is convergence of the actual data towards the estimated equilibrium. For this purpose, the study has estimated a model regressing the change in actual export values on the difference between the actual and potential export values in the previous period. Certainly for convergence, the estimated coefficient should be negative. The results for this model have been reported in Table 9, which shows that the coefficient of the explanatory variable was -0.39 and significant. Thus, the results indicated that there was presence of convergence in the Pakistan exports with SAARC countries and in other words, actual Pakistan's exports to SAARC countries converged towards the estimated export potential.

TABLE 8

Speed of Convergence (percent)

Countries	Potential growth of exports	Actual growth of exports	Speed of convergence
Bangladesh	9.495369	8.80202	7.877155
Bhutan	9.423344	106.604	-91.1604
India	9.415337	30.04998	-68.6677
Maldives	6.184831	49.58425	-87.5266
Nepal	8.128049	68.43581	-88.1231
Sri Lanka	8.318303	8.152335	2.035834

Source: Based on the results of gravity model

TABLE 9

The Convergence of Pakistan's Actual Exports towards Potential Exports

	Coefficients	t-Test
Constant	44.23**	2.41
Difference between actual and potential exports	-0.39**	2.11

D.W = 2.31, R2 = 0.34
Source: Based on the results of gravity model

Heavy dependence on either one or two markets led to reduction in intra-SAARC exports of countries like Bhutan, Maldives and Nepal; but the potential for widening the scope of this type of trade within the region is rather large. This can only be realized if import duties are low. Intra-industry trade is largely driven by product differentiation and increasing return to scale. Therefore, regional countries should develop technological capacity to produce different product varieties at declining average cost to achieve an increased level of intra- industry trade. Formation of SAFTA can be helpful in increasing intra- industry trade. To ensure the success of SAFTA, all countries must have a very small negative list. If the list is large, the SAFTA would become redundant. There should be firm basis to exclude product and transparent ground rules should be laid down (Kemal, 2004).

The study also reveals that among SAARC countries, Pakistan's export potential exists for India, Bhutan, Maldives and Nepal. The later three are not only far away from Pakistan but they don't have any common border with Pakistan. Therefore, Pakistan should ask India to provide her the facility for transit trade with Bangladesh, Nepal and Bhutan.

Trade potentials between India and Pakistan are bright. For this purpose, India can consider import of pulses, fruits and nuts (excluding cashew nuts), textile and textile products and chemicals from Pakistan, India on the other hand, has developed a competitive advantage in certain manufactured exports as auto mobiles, pharmaceuticals and agricultural implements etc. Therefore, Pakistan, in addition to the import of agricultural products, can consider import of these manufactured items from India, obviously at much cheaper rates. Both governments of India and Pakistan must rise to the occasion and take necessary steps to dismantle the political barriers. The opening of rail route can bring dividends only if more rail wagons are permitted and for the land route to be more beneficial, the present cargo clearance systems at Wagah border need to be upgraded. In addition, Pakistan should consider import of more items via land route (Verma, 2007).

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