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WTO and Economic Integration: An Application of Gravity Model

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Abstract

Perhaps the transition from GATT to WTO on January 1,1995 and emergence of EC99 on January 1,1999 are two important events during the 20th Century for the world economic system Both these events have far reaching implications in the explanation of economic globalization in a multilateral trading system particularly for the larger developing economies such as India. These economies are on the cross road and are skeptic about their future under the changed trade environment. Even the developed countries agree that the view that the dual presence of abject poverty and unparallel prosperity can not be marginalized in any trade negotiations leading to globalization or regional integration of world trade (Sen, 2001).In the present paper an attempt is being made to examine the determinant of integration considering the SAARC economies using the gravity model. Several studies have identified a number of barriers to trade which need to be removed for a faster economic growth in the analysis of bilateral trade. Most of our conclusions are regarding economic welfare in developing economies based on asymmetry in the world trade. An effective integration of developing economies should be regarded as a prelude to an effective gain from WTO.

Introduction

Perhaps the transition from GATT to WTO on Jan 1,1995 and emergence of EC99 on January 1,1999 are two important events during the 20th Century for the world economic system. Both these events have far reaching implications in the explanation of economic globalization in a multilateral trading system particularly for the larger developing economies such as India. These economies are on the cross road and are skeptic about their future under the changed trade environment. Even the developed countries agree that the view that the

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dual presence of abject poverty and unparallel prosperity can not be marginalized in any trade negotiations leading to globalization or regional integration of world trade (Sen,2001). In the year 1991 several economic reforms were introduced in the Indian economy with a view to remove the constraints on its growth. Globalisation was one of the important aspect of the economic reforms. This implies that in the analysis of bilateral trade several studies identified a number of barriers to trade which need to be removed for a faster economic growth. Besides various studies have been studied in the analysis of the pure theory of international trade which determines the size, the commodity composition and welfare effects of the bilateral trade flows. Of late the analysis of barriers in the bilateral trade or trade resistances or trade impediments are being considered. A resistance to bilateral trade implies any factor (or factors) which prevents (prevent) the normal or standard flow. Two types of resistance have been distinguished namely objective and subjective. Objective resistances are the ones which may be overcome only at some cost, whereas the subjective resistances are those derived from imperfect information, internal constraints on profit maximizing behaviour and any other factors that affect the volume or commodity composition of trade. Depending upon the cost, the objective resistance can be further decomposed into transport barriers and official barriers. The official barriers include tariffs, quotas and other obstacles imposed by the government on trade, the pure theory of international trade has confined to these types of resistances. Only recently some authors have recognized other types of resistances to bilateral trade in the determination of volume and composition of trade flows. Regional economic cooperation of various economies is a natural outgrowth of the desire of the member countries to maximize the economic gains from trade and cooperation. This desire increases the rate of transport barriers in the analysis of trade flows. The interest in the intra-regional trade is based on the presumed relationship between trade creation through integration and improvement in the resource allocation thereby increasing the welfare of the member countries.

Three well known effects of regional economic integration are trade creation, trade diversion and gross trade creation. The trade creation refers to the emergence of new flows of trade among the member countries replacing domestic production. On the other hand trade diversion refers to the replacement of [low cost] non-member imports by member countries [high cost] imports. Trade creation and trade diversion combined to yield gross trade creation which signifies a growth in trade among the member countries regardless of the reason for the growth.

In the present paper an attempt is made to discuss the quantitative approaches in a systematic analysis of the determinants of bilateral trade flows in the light of recent policies of globalization. The second section discusses the evolution of these approaches, starting with specification of Tinbergen. Empirical findings of the earlier studies have been discussed in the third section. Fourth section deals with the empirical analysis of the gravity model. Finally, the conclusions and policy prescription for the globalization are given in section five.

II Evolution of the Gravity Model:

Two approaches have been suggested in the analysis of the determination of trade flows. These are gravity model approach and intensity approach. The gravity model approach explains each bilateral trade flows independently in terms of trade potential of two economies and resistances to bilateral trade. The intensity approach entails the computation of intensity indices[1] in the measurement of deviations from bilateral trade flows. The analysis is confined to the trade between countries as annualized by Tinbergen, Poyhonon, Pulliainen and Linnemann.

Any empirical analysis of globalization entails the measurement of the *ex-post* integration effects. One such model that has a focus on the flow from origin to destination has been proposed by Tinbergen to measure the integration effect of and is termed as gravity model. Under this approach hypothetical intra-member trade flows are generated. In general, a gravity model relates flow from region i to region j (i.e., Xij) to (a) demographic variables pertaining to i and or j (e.g. population); (b) economic variables pertaining to i and or j (e.g. working population, unemployment, wages); (c) sociological variables pertaining to i and or j (e.g. religion, language, urbanization, education); and (d) economic costs of such flows (i.e. distance between the regions, the absence of common border etc.). A few examples of socio-economic flows annualized by econometric gravity models are migration, trade between countries, tourism between countries and telephone calls between cities. The basic purpose of gravity model is to determine the normal or standard pattern of international trade that would prevail in the absence of discriminating trade impediments. Assuming impediments to be of stochastic nature, Tinbergen made bilateral trade levels, a function of two-potential trade variables namely gross national products (GNPs) of exporting and importing countries and three resistance variables for distance, common membership of a preferential area and neighbourhood. The GNP of the exporting country represents its economic size while that of importing country represents the size of the market. Finally the distance was taken to measure the transport cost. In contrast to the other two factors the distance variable has a negative influence on trade flows. In one of the formulation Tinbergen has taken degree of commodity concentration measured in terms of Gini coefficients of export commodity.[2] No separate demand and supply functions were estimated for exports, and hence in this respect a single equation represents a turnover relation without separate price variable.

Elaborating the Tinbergen model, Linnemann derived a trade flow equation by expressing a trade flow from country i to country j as a fixed proportion to the product of the export of i and import of j divided by the trade resistance between the country i and country j. The additional variables considered by Linnemann to represent potential trade are the populations of the two trading countries. The most import contribution by Linnemann is an index of complementarities between the two countries. Considering two vectors whose elements are the percentage of trade in the different commodity classes identifying the 'cosine of the angle

1 Intensity of trade index concentrates on variations in bilateral trade levels resulting from differential resistances.

2 For a country exporting only one commodity, the value of Gini coefficient is 100 and its value is lower if the export package is more diversified.

between the vectors'. In other words, the choice of the angle between the vectors is the scalar product of the vectors divided by the product of their absolute values. Its value is zero if there is no trade and is one if there is maximum trade between the two countries. Subsequently the variable (C_{ij}) is considered as an explanatory variable in the trade flow equation. The introduction of this variable does influence the R-coefficients, but the coefficients which might be influenced in a systematic way, are the preference parameters (See for details Chawla, 1991). The approach of Leamer and Stern in the explanation of trade flows is based on a matrix of rows and 'n' columns. The rows and columns totals indicate the total value of exports and imports of a particular country in question. Assuming the randomness, the assignment of suppliers to demanders affected by the same set of costs or resistance factors between the two countries.

Thus the gravity model gives greater empirical content to resource endowment, utility structure and resistance variable. The negative correlation between the size and trade flows and the geographical distance covered assumed by Tinbergen and others is also corroborated by Poyhonen Geraci and Prewo used a vector or trade resisting factors comprising of both qualitative components in a multi-country trade network. The distance variable used suffers from certain limitations. First, the cost of transportation is sometimes influenced by other factors such as weight of the commodity, mode of transport and value of the commodity. Second, the cost of transportation is the same in either direction between any pair of trading countries. This assumption is very restrictive in nature. Finally, distance as a 'proxy' variable for the cost of transportation is not a relevant variable in predicting future trade flows, because distance always remains constant while the cost of transport does not. To modify this variable, Geraci and Prewo have assumed the resistance variable comprising of quantitative and qualitative components. The ratio of true c.i.f. value to f.o.b. value is the first quantitative component. However, these variables being unknown, the corresponding observed values are considered. The second quantitative component is the average nominal tariff rate. For the qualitative components, three dummy variables to represent some preferential trading group, trading countries having common language and trading countries being neighbors have been considered. The modification of transport variable results in three-equation system which may be reduced to two-equation model if errors-in-variable formulations is employed.

There has been a significant economic improvement in the specification of the gravity model. Employing the Tinbergen-Linnemenn formulations, Aitken considers the three dummy variables of Geraci-Prewo type in the analysis of the effects of two integration schemes namely EEC and EFTA. Consequently, the one dummy variable refers to neighborhood and two dummies for the preferential area, one each for EEC and EFTA.

Following the Aitken type of model, Sapir has analyzed the trade benefits under the Generalised System of Preferences (GSP) Schemes among the EEC member countries. As a result, Sapir makes use of two dummy variables one for trade between EEC and GSP beneficiary countries and the other for trade between Portugal and other EFTA countries.[3] One of the

3 The function falls in the same spirit as Aitken (1981), but in this case neighborhood dummy was not included.

applications of the gravity model can be found in the work of Wolf and Weinschrott in which besides the geographical distance, the socio-cultural distance is also considered. The model employed is a variant of the Tinbergen-Linnemann model in which socio-cultural distance has been considered in the exponential form along with other factors reflecting size, economic and technological structures. The economic structure is measured as a ratio of total exports of a country to its GNP. On the other hand, the technological structure has been measured in terms of two ratios namely ratio of per capita income of the pair of trading countries and ratio of percentage of labor force in agriculture in the pair of trading countries. Similar form of expression can be used for imports with exports replaced by the imports and S_1 is the ratio between total imports to its GNP. For the purpose of estimation, S_2 and S_3 have been constraints to be greater than unity by using their reciprocal; whenever the denominator exceeds the numerator. The exponential of the structural and socio-cultural variable has been justified since each variable is expected as binary or as a percentage or as a ratio of two percentages.

While analyzing the effects of integration in case of Council of Mutual Economic Assistance (CMEA), Pelzman has utilized the gravity model for cross-section trade flow situation for both aggregate and disaggregate analysis. The cross-sectional and time-series are pooled and the Zellner's SURE estimation procedure is employed. The specification of trade flow equation is exactly similar to one adopted by Aitken with one dummy variable reflecting membership preference in the CMEA region for the aggregate and disaggregate analysis. To examine the effect of economic integration among developed and developing countries, Brada and Mendez have re-specified the gravity model with five explanatory variables. In treatment for five regional groupings namely EEC, EFTA of the western world, CMEA of planned economies and LAFTA and CACM of developing countries, five dummies are included each reflecting preferential treatment. Since the study is based on the countries belonging to different groupings, they have considered inter- and intra-regional trade flows. A modified version of the gravity model has been employed with five explanatory variables and one dummy variable.[4]

The authors have further examined to test whether distance and level of development alone are sufficient to explain all the differences in the trade augmenting effects of the preference areas . The model is novel in one more aspect in that multiplicative dummy variables have been used if the two countries belong to the same preference area belong to different or no-preference areas. On the basis of the studies cited above, the final form of trade flows equation can be expressed for 'k' economic integration as :

$$X_{ij} = a_0 \cdot Y_i^{a_1} \cdot Y_{j\,2}^{a} \cdot D_{ij\,3}^{a} \cdot N_{i\,4}^{a} \cdot N_{j\,5}^{a} \cdot A^{d} \cdot (\,? \; (P_k)^{d}_{k} \; e^{\mu}$$

This is the most general form of the gravity model in which

A = adjacent or neighbouring countries

P_k = dummy variables for the k^{th} preference of the trading partners

e^{μ} = log-normal error term.

4 The dummy variable has been used in both additive and multiplicative form.

An attempt has been made here to present various modifications suggested by several authors in specification of the gravity model pioneered by Tinbergen. The model has been estimated in varying degree of details using cross-section or time-series or both types of data, after transforming it in a log-linear form. In the present section, the purpose is to see what type of data were employed and what were their findings. In the estimation, the results were obtained by least-square method. With the help of the estimated equation, it is possible to obtain theoretical trade flows.

The deviations from actual trade are taken from the standardized or theoretical trade for each trade flow individually. Subsequently, these deviations are totaled for each exporting and importing country. Once the total exports and total imports deviations are derived, the sum total of the deviations are expressed as a percentage of the actual value of the corresponding economic magnitude. The relative deviations are generally considerable if the coefficient of determination of the equation is high. Since the purpose of the analysis of these deviations is to find out which countries are affected by discriminatory trade restrictions, the negative deviations are of special importance.[5] The deviations of the actual from the estimated may be due to several reasons:

(i) A positive deviation may be due to any one or more of several reasons such as preferential treatment of the exports of the countries; the running down of previously accumulated stocks of foreign exchange; a positive service balance, and to a net inflow of new capital or amortization;

(ii) A negative deviation may be due to a negative deviation on the export side (due to discriminatory treatment of the exports of the country concerned); or import restrictions imposed by the importing country itself (in order to build up foreign exchange resources, or to obtain foreign exchange for debt repayment); or a negative service balance or a net outflow of new capital or amortizations.

Similarly positive deviations could be expected in the developing countries on the import side and the developing country on the export side. The empirical findings of the studies undertaken by Tinbergen, Poyhonen, Linnemann, Aitken, Geraci and Prewo, Sapir, Wolf and Weinschrott, Brada and Mendez and Pelzman are discussed in Chawla (1991). All these studies reveal the importance of gravity model in studying the regional integration. Most of the studies including the present one suggest that integration among the economies would enhance the greater welfare vis-à-vis globalization. Panagariya(1998) has offered a plausible example in which a regional trading arrangements even with a distant partner may be superior. The proximity of the member economies may not be relevant for a viable trading bloc. The theoretical trade flows obtained by estimating a gravity model are then compared with the actual trade flows. If the deviation is positive then it indicated a preferential treatment, while a negative deviation may be due to discriminatory treatment. Thus, a positive deviation is expected for developing countries on their imports. Some of the time-series studies conclude that the estimated elasticities are stable over time.

5 The negative deviation implies that actual trade export or import or both are lower than what could be expected based on the experience of the other countries.

III Empirical Analysis of Gravity Model for the SAARC and the ASEAN Countries

The most of the earlier studies reviewed in the preceding section on regional economic integration have examined in terms of the effect of the formation of a preferential trading areas on the volume of trade among members. This can be examined in the light of recent craze for the globalization. In the analysis a relation between trade creation through integration and improvement in resource allocation, 'thereby increasing the welfare of the member countries' is preferred, and the technique of gravity model is employed, relating the varying type of variables to both intra and inter-regional trade flows. According to this model, trade flows from the i^{th} member to the j^{th} member is determined by the supply conditions at the origin and demand conditions at the destination in addition to other restraining forces relating to the specific flows between i and j within the region.

In the present section specification of the gravity model for the countries belonging to the SAARC and the ASEAN regions has been attempted. The ASEAN countries are considered mainly because the characteristics of these countries are quite similar to those of the SAARC countries. Secondly, ever since the ASEAN came into existence the cooperation among themselves has been growing steadily and this has been considered a successful regional grouping among developing countries. However, there is no doubt that ASEAN economies have been able to maintain their relatively high growth momentum despite various international problems such as world recession. Yet, it has not attained the requisite level of economic development in the region. This is mainly because ASEAN was formed on the basis of a political arrangement among its members in the emerging geo-political balance of the Asia-Pacific region. The security motive was a sufficient incentive for the ASEAN countries to subordinate their diverse national interests to joint action. In fact such a concern increased shortly in the immediate post-Vietnam war, which provided a much needed impetus to escalate the ASEAN organization into its present higher level of co-operation. With the result, the first ever Bali Summit in the 1976, led the members of ASEAN grouping to take a more serious approach to regional cooperation.

That is why; regional economic cooperation in ASEAN is destined to be a long drawn out process. The countries of this regional grouping feel that successful economic growth will render economic structures and social systems of member countries more flexible for their regional reorientation and generate more resources to overcome the various externalities arising from cooperative endeavors. Further, regional economic cooperation should not be planned to lead economic development, rather it should be considered as a part of development process. Hence SAARC can share some of the rewarding experiences of ASEAN. In order to promote the concept of south-south cooperation in general, there is much scope of cooperation for mutual benefits among the countries of the SAARC and ASEAN regions. Diversity in sizes, different structural changes and comparative advantages and divergences in sensitivity to external shocks are some of the important factors in promoting complementarities between the SAARC and ASEAN countries. The analysis of the patterns of exports by different broad categories of products gives an idea about the nature of the revealed comparative advantage of the sub-regions and the countries.

The differences in comparative advantages between the countries of the SAARC and ASEAN regions indicate that, resource rich countries with a strong comparative advantage in the export of agriculture-based primary products would tend to have intense trade relations with countries that are resource-poor but enjoy a comparative advantage in other sectors such as fuels and chemicals. By employing Balassa's Index of Revealed Comparative Advantage, it is possible to examine the differences in comparative advantages between the countries of these two regions. The results show that while the high intensity of bilateral trade of these countries is not explained by high complementarities, a policy of non-discriminatory import liberalization in ASEAN countries would significantly benefit the SAARC countries in terms of export expansion. It is, therefore, interesting to empirically analyze the intensity of bilateral trade between these countries. However, we shall confine to the Gravity model approach to trade flows between the countries of SAARC and ASEAN regions.

The Model: In view of the importance of the Gravity model approach discussed earlier following specifications have been adopted here for the SAARC countries:

$$\log X_{ij} = a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j \qquad (1)$$

where X_{ij} = Export of country i to country j.

Y_i = National income of country i. Alternatively, the gravity model may also be expressed in terms of the per capita variables. In that case, its specification is reduced to:

$$\log \frac{X_{ij}}{N_i} = a_0 + a_1 \log \frac{Y_i}{N_i} + a_2 \log \frac{Y_j}{N_j}$$

Estimation of the gravity model has been undertaken for the SAARC and ASEAN countries taken together. For this purpose the technique of dummy variables has been employed. For each economic grouping one slope dummy has been introduced. Accordingly, following specifications have been adopted:

$$\log X_{ij} = a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log Z$$

where X_{ij}, Y_i, Y_j, N_i, N_j are given as above and

$$Z = \frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j} \cdot P_{SAARC} \qquad (3)$$

Similarly, for the ASEAN countries, we have

$$\log X_{ij} = a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log Z$$

where $Z = \frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j} \cdot P_{ASEAN}$ (4)

Here P_{SAARC} = 0 if country i and country j belong to different grouping.

= 1 if they belong to the SAARC group.

and P_{ASEAN} = 0 if they belong to different grouping.

=1 if they belong to the ASEAN group.

In these specifications 'Z' measures effects of per capita incomes or levels of development in the two countries on trade flows. In other words, if the per capita incomes of two integrating countries are higher it implies a greater proportion of tradable of each countries output and hence greater effect of integration on the volume of trade between them. To examine the impact of the individual economic grouping, intercept dummies are also introduced. The specifications in this case are given below:

$$\log X_{ij} = a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log Z + a_6 P_{ASEAN} + a_7 P_{SAARC} \quad (5)$$

where $Z = \frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j} \cdot P_{SAARC}$

and

$$\log X_{ij} = a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log Z + a_6 P_{ASEAN} + a_7 P_{SAARC} \quad (6)$$

where $Z = \frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j} \cdot P_{ASEAN}$

Subsequently, the country dummies are also included along with the intercept dummies of the grouping in the specification. The specifications with the countries are given below:

In this case

$$\log Y_{ij} = a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log Z + a_6 P_{ASEAN} + a_7 P_{SAARC} + a_8 D_{IND} + a_9 D_{BD} + a_{10} D_{NP} + a_{11} D_{PAK} + a_{12} D_{SLA} + a_{13} D_{INDO} + a_{14} D_{MAL} + a_{15} D_{PHIL} + a_{16} D_{SING} \quad (7)$$

where $Z = \frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j} \cdot P_{SAARC}$

Here, $D_{IND} = 1$ if either country i or j is India.
$= 0$ otherwise.

$D_{BD} = 1$ if either country i or j is Bangladesh.
$= 0$ otherwise.

$D_{NP} = 1$ if either country i or j is Nepal.
$= 0$ otherwise.

$D_{PAK} = 1$ if either country i or j is Pakistan.
$= 0$ otherwise.

$D_{SLA} = 1$ if either country i or j is Sri Lanka.
$= 0$ otherwise.

$D_{INDO} = 1$ if either country i or j is Indonesia.
$= 0$ otherwise.

$D_{MAL} = 1$ if either country i or j is Malaysia.
$= 0$ otherwise.

$D_{PHIL} = 1$ if either country i or j is Philippines.
$= 0$ otherwise.

$D_{SING} = 1$ if either country i or j is Singapore.
$= 0$ otherwise.

If Z is defined as follows :

$$Z = \frac{Y_i}{N_i} \cdot \frac{Y_j}{N_j} \cdot P_{ASEAN}$$

Then we have

$$\log Y_{ij} = a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log Z + a_6 P_{ASEAN} + a_7 P_{SAARC} + a_8 D_{IND} + a_9 D_{BD} + a_{10} D_{NP} + a_{11} D_{PAK} + a_{12} D_{SLA} + a_{13} D_{INDO} + a_{14} D_{MAL} + a_{15} D_{PHIL} + a_{16} D_{SING} \quad (8)$$

Here, D_{IND} = 1 if either country i or j is India.
= 0 otherwise.
D_{BD} = 1 if either country i or j is Bangladesh.
= 0 otherwise.
D_{NP} = 1 if either country i or j is Nepal.
= 0 otherwise.
D_{PAK} = 1 if either country i or j is Pakistan.
= 0 otherwise.
D_{SLA} = 1 if either country i or j is Sri Lanka.
= 0 otherwise.
D_{INDO} = 1 if either country i or j is Indonesia.
= 0 otherwise.
D_{MAL} = 1 if either country i or j is Malaysia.
= 0 otherwise.
D_{PHIL} = 1 if either country i or j is Philippines.
= 0 otherwise.
D_{SING} = 1 if either country i or j is Singapore.
= 0 otherwise.

IV Estimation of the Gravity Model

For the purpose of estimation of the Gravity Model for SAARC countries, there are (5x4=20) observations. While considering SAARC and ASEAN countries together there are (10x9=90) observations and the equations have been estimated by the method of the Ordinary Least Squares (OLS) for the years 1972, 1976, 1978, and 1984. These years chosen here belong to the period before the Uruguay round commenced in 1986. Secondly, the year 1972 represents the year before the first oil crisis of the year 1973 and is assumed to have been diffused by the year 1976. Similarly, the year 1978 represents the period before the idea of SAARC had gained momentum and the year 1984 represents to some extent the post-SAARC period and pre-Uruguay round. Data sources are given in Appendix (Table A to C).

In the above formulation of the gravity model the income variables generally represent country's endowment, productive potentials and potential export supply of the exporting country. Similarly, the income variable of the importing country represents its purchasing power and economic recovery. The population variable has been included to represent the taste and size of the market of the trading country. Theoretically, the income variables are expected to have positive effect on the trade flows. Brada and Mendez have argued that large countries generally have more diversified. Production structure in order to satisfy a greater proportion of domestic demand while small countries tend to be more specialized and more dependent on trade, implying that 'a_3' becomes negative. On the other hand, population of the

importing country should have a positive sign because a larger proportion allows a greater division of labor and diversity of production, thus making 'a_4' positive. In some cases, where a greater degree of self-sufficiency leaves to less-reliance on international trade, both 'a_3 and 'a_4' become negative. In this manner thus 'a_3 and 'a_4' cannot be sign a priori. Distance variable represents resistance to trade and seen to have a significant depressing effect on trade. Due to certain limitations like the cost of transportation, etc, we focus our attention to other two variables for our analysis. However, this variable deserves more careful study. The estimated results for the equation (1) are given in Table 1 for the years 1972, 1976, 1978 and 1984. For the year 1972, the coefficient of Y_j (i.e.a_2) is negative along with the coefficient of N_j (i.e. a_3). The value of R^2 is reasonably high from the point of the cross-section nature of the sample. The t-ratios given in the parentheses are not significant.

This shows the complex absence of any economic integration among the countries of the SAARC region. In the year 1976, when the impact of the first oil-crisis had almost diffused, all the coefficients turn out to be significant and are positive with an exception of 'a_4'. The overall fitness of the equation is quite reasonable (0.48). Subsequently, in the year 1978, which is the year just before the idea of SAARC was mooted, the coefficients of income are positive, whereas those of population are negative. Finally, in the year 1984, the estimates of the coefficients further improve, raising the value of R^2 to 0.53. From this result, it is apparent that the income coefficients may be regarded as stable, whereas the population coefficients are not only unstable but also display unpredictable coefficients. When the equation with per capita income is esti-mated the value of R^2 declines drastically. The coefficient of the exporting country is higher than that for the importing country. With an exception of the year 1972 where the coefficient of the country is negative, in all other cases it is found to be positive. These results are shown in Table 2.

The empirical results of equation 3 are reported in the Table 3. In the result the elasticity coefficients for incomes and populations are significant. The per capita income effect for all the years under consideration is significant indicating that the SAARC countries are not much affected by the external factors like the oil shocks, etc. The SAARC countries could set off the oil shock because of a sudden increase in foreign exchange reserves due to foreign remittances.

Similar analysis with the ASEAN countries is presented in Table 4. Both income and population elasticities are significant. However, the effect of per capita income is significant only in two years 1972 and 1978. In the year 1976, most of the countries of the region were reeling in the first oil shock of the year 1973. However, by 1978 its impact was diffused. But the second oil crisis of the year 1979-80 once again put these economies in shambles making the per capita effect insignificant in the year 1984. The impact of rise in the fuel prices and other external factor such as recessionary tendency in the industrial world is more in the ASEAN countries than in the SAARC countries. Thus, these countries are sensitive to the external factor as compared to the SAARC countries. The value of 'R2' is quite reasonable considering the cross-section nature of the data. From this, one can conclude that the effects of trade preferences on integration are influenced by the level of development of the integrating countries and this conclusion is at variance with the conclusion for the developed countries. The positive coefficient of per capita income indicates that integration between higher per

capita income countries result in greater increase in trade flows than does integration among low income countries. Similarly, the coefficients for income and population for the destination countries do not have the expected signs as has been reported in (Brada and Mendez, 1985).The estimated coefficients are quite stable over time after the year 1976.

Similar results are obtained when the region dummies are included in the specification of the gravity model. These results are reported in Table 5 and Table 6. The SAARC dummies are significant in 1976 and after. The ASEAN dummies are never significant, but always have a negative sign. The positive coefficients of the SAARC dummies indicate that integration does reduce the resistance to trade among member countries. It means the negative coefficient of ASEAN dummies implies that greater integration among them does not reduce the resistance to the trade among themselves. The results in Table 5 are based among per capita income effect for the SAARC countries with the region dummies. The SAARC dummies are significant in the year 1976 and 1984, whereas the ASEAN dummies are significant in the year 1972. In the year 1978, dummies are not significant neither in the case of SAARC nor ASEAN countries.

Finally, the empirical results with the country dummies and the region dummies introduced in the intercept do not reveal significant improvement in the result. The results are shown in the Tables 7 and 8. Hence the individual country fails to influence the trade flows which are affected more by the characteristics of the region as a whole. This is an important conclusion which does not corroborate the observation of Pangariya.

V Conclusion:

We have examined the effect of two integration schemes namely SAARC and ASEAN on the volume of inter- and intra-member country trade by means of a gravity model of trade. Parameters for the model are estimated from observations on bilateral trade flows among 10 countries of these two groupings for the years 1972, 1976, 1978 and 1984. It is observed that the level of development of the integrating countries influences the effects of trade preferences on integration. The per capita income effect is significant for all the years under consideration indicating that the countries of SAARC region have greater potential of effective integration than the ASEAN region because the former region is more immune to the external factors than the latter. In the light of these findings it may be argued that the impact of globalization will be less pronounced as compared to the integration effect among the developing economies. After the September 11, 2001 event and the subsequent Doha meet which concluded recently, the need for greater cooperation among the developing economies is expected to bring not only greater welfare but may prove a perquisite to face the attempt by the members of the Quad. Like subsidy issue which is dear to the heart and purse of the EU, there may be many such issues which need to be explored through the economic integration among developing countries.

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