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GROWTH AND PATTERN OF INTRA-INDUSTRY TRADE IN MANUFACTURES IN INDIA'S OVERALL TRADE: A QUANTITATIVE ANALYSIS

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ABSTRACT

This paper analyses empirical evidences of growing volume of Intra-industry trade in India during 1975-1992. Quantitative evidences show that trade in manufactured products has increased with rapid industrialisation leading to genesis of intra-industry trade. Measures of Grubel-Lloyd Intra-industry trade indexes for India's trade with the world, the Asian economies and the developed countries are calculated. It shows that India's intra-industry trade is more with the developed countries than with the developing countries. Also, we observe that burgeoning volume of intra-industry trade is positively associated with (i) per capita GNP; (ii) trade openness; (iii) share of manufacturing exports in total exports.

Keywords: Intra-industry trade, India's trade pattern, Manufactures trade, trade openness, development, Grubel-Lloyd index.
JEL Classification: O1, F02, F15

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I. INTRODUCTION

The empirical evidences of intra-industry trade in manufactures show that for the developed as well as developing countries, there has been growing volume of two way trade over time. With regard to trade between developed and developing countries, the average share of intra-industry trade (henceforth, IIT) has increased although not as much as in the case of the developed countries. This can be attributed, *inter alia*, to economic growth and rapid industrialization in those countries. A very rapid expansion in the manufactured exports from the less developed countries (LDCs) is evident especially in the countries that followed the outward-oriented policies. According to World Bank (1997), after the newly industrializing economies of East and South-East Asia, between 1985 and 1995, South Asia's annual average per capita income growth was 2.9 percent. In this paper, we evaluate India's (South Asia's most dynamic economy with considerable progress in high technology industries) intra-industry trade performance, examine the country's economic features and assess their relative importance as determining factors. The paper is organized as follows: next section outlines some of the stylized facts and Section 3 discusses the data and methodology. Section 4 reports the intra-industry trade indices for India over 1975-92. Estimation procedure and results are documented in Section 5. Finally, section 6 summarizes.

II. STYLIZED EVIDENCES OF INTRA-INDUSTRY TRADE IN INDIA

India is a labor abundant and capital scarce country. India imports technologically sophisticated goods from the advanced, industrialized nations in the world. Also, it produces enough to export the home variety of the same goods to countries that are almost at equal and/or, higher stages of development or that lie lower to it on the technological base. Such items are mostly manufactured goods whose share in IIT is rising. This suggests that although the structure is ideal for a Heckscher-Ohlin type of specialization, the genesis of such trade can not be overlooked. However, in comparison to the developed economies, India's proportion of IIT is small.

Empirical estimates of IIT for the individual less developed countries are relatively scarce. However, some work at the country group level focused on developed country's IIT with LDCs. [see Balassa (1986), Balassa and Bauwens (1988), Havrylyshyn and Civan (1985, 1989), Tharakan (1984, 1986), Lee (1989), Culem and Lundberg (1986), Lundberg (1988), Ocampo (1986), Bergstrand (1983), Tharakan (1984, 1986)to name a few]. According to Havrylyshyn and Civan (1985), India's IIT in 1978 was 37.4 per cent of total trade with the world as compared to 15.6 percent in 1968. India's IIT with the Nelwly Industrializing Economies was 15.1 percent in 1978 as compared to 17.0 per cent in 1968. Thus, growing importance of IIT in India's trade is evident. **Table 1** below presents the IIT indices (as calculated by Havrylyshyn and Civan, (1985)) by country for 1978. It is evident from the table that like other developing countries, there have been changes in India's trade pattern during 1968-1978.

[**Insert Table 1 below**]

The increase in the share of intra-industry trade can be accounted for by giving a closer look at India's export performance.[2] According to Nayyar (1988, pp. 217-252), "the share of primary commodities in total exports declined from 47 per cent in 1970-71 to 41 per cent in 1977-78, it stayed at this level until 1980-81 but returned to its earlier level of 47 per cent in 1984-85 as the share of fuels rose to 15 per cent. The share of manufactures in total exports registered a corresponding increase from 53 per cent in 1970-71 to 59 per cent in 1977-78, thus sustaining the rapid growth of exports during this period; it stayed at this level until 1980-81, but dropped to 53 per cent again in 1984-85". A steady increase in the share of manufacturers in non-fuel exports was observed. Nayyar (1988) also

[2] It is important to note that consideration of tariff structures and its evolution over the period under consideration would give some clues to the emergence of this trade pattern. However, we do not discuss this here as it is beyond the scope of the paper. As our primary objective is more explorative, to present the quantitative evidences and seek for some inherent structural factors behind such trade as an indication of shift of trade patterns, such issue and the consideration of different time periods do not necessarily undermine our purpose.

identified a discernible change in the product pattern of manufactured exports. According to him, the share of resource based manufactures remained at the same level of 40 percent but declined thereafter to a level of 30 per cent by 1984-85. India's principal exports in this category are jute manufactures, cotton textiles, leather and leather manufactures, metal manufactures, iron and steel and gems and jewellery. As against this, the share of miscellaneous manufactured articles in export registered a gradually increasing share from 5 per cent in 1970-71 to more than 12 per cent in 1984-85. The share of manufactured articles in India's non-fuel exports was recorded in his study at 14.7 percent in 1984-85. The share of chemicals and machinery and transport equipment in total exports also registered an increasing trend from 1970-71 to 1984-85. Also, the share of manufactured exports has increased over the years from 50 per cent in 1975 to 74 per cent in 1992 for Standard Industrial Trade Classification (SITC, henceforth) 5 to 8.[3] Share of manufactured trade as a per cent of total trade in all commodities has also increased from 48 per cent to 62 per cent (see Table 2).

[Insert Table 2 below]

Upward trend in intra-industry trade might be attributable to higher level of per capita GNP. Intertemporally, India's GNP and per capita GNP have grown by around 3.5 to 4 percent per annum. This has a positive influence on demand for variety and can be analyzed in the light of India's experience of industrialization. Efforts to create an industrial base in India were remarkable during the second half of the 1950s when India embarked on modernization through the development of heavy industry. Despite uneven growth in the 1960s due to external disturbances and two excessive droughts, significant achievements towards the realization of diversified industrial structure were accomplished. The 1980s have experienced significant industrial expansion. Industrial output rose consecutively

[3] SITC 5 is defined as including chemicals and related products; Section 6 comprises manufactures; Section 7 includes Machinery and Transport Equipment; and Section 8 is Manufactures miscellaneous, not elsewhere classified.

from 3.2 percent in 1982-83 to 6.7 percent in 1983-84 and 8.4 percent in 1984-85. The Seventh Five Year Plan (1985-86 to 1989-90) laid considerable emphasis on acceleration of industrial growth by easing infrastructural constraints, liberalization of industrial licensing policy and provision of incentives for rapid growth of key segments of the industrial sector. India's sheer size offers a substantial market for consumer and producer goods.

In the face of a rise in domestic and foreign demand, the growth of industrial production rose by 9.7 percent in 1988-89. High growth sectors include some consumer goods and capital goods, and a large proportion of intermediate goods viz., chemicals, paper and paper products, basic metals, metal products, cotton, textiles, leather goods, non-metallic minerals, etc. However, sectoral analysis is beyond the scope of this study. But this highlights the fact that India's manufacturing sector has passed through different stages of development since 1951.

With the share of manufactured goods increasing from 50.3 per cent in 1970-71 to 63.6 per cent in 1987-88, the composition of exports has undergone a significant change over the years. Textile fabrics, yarns and ready-made garments accounted for 30.8percent of manufactured exports in 1987-88. Machinery and transport equipment had a share of 14.3percent. Gems and jewellery has raised its share to manufactured exports from 5.8 per cent in 1970-71 to 26percent in 1987-88. The composition of imports has been changing too. Since 1982-83 there has been a sharp rise in imports of plant and machinery and components for the transport and electronic industries. Their share in total imports in 1985/86 stood at 71 percent as compared to 54.4 percent in 1970-71.

An understanding of the extent to which growth in manufacturing output is external or internal in origin can be had from the contribution of foreign demand and domestic demand to an increase in manufacturing output. It is contended that the strong domestic market pull has caused the low level of

manufactured exports from India. However, the pressure of domestic demand improves the relative profitability of sales in the domestic market vis-a-vis exports[4].

The analysis in the preceding paragraphs shows that the importance of IIT in India's trade cannot be ignored. Although the intra industry trade pattern cannot follow the set pattern of its wealthier counterparts, there are evidences of increasing share of in-commodity trade in her total trade. Following section discusses the methodology and data whereas intertemporal pattern of India's intra-industry trade is analyzed subsequently.

III. METHODOLOGY AND DATA

III.I METHODOLOGY FOR MEASUREMENT

The most important methodological problems for measuring such trade is regarding the choice of an index for calculation and the choice about the level of aggregation/disaggregation at which the volume of intra-industry trade is to be measured. As many indices have proliferated since identification and theorizing of IIT and since all of them use some variant of the two way trade overlap proxy, the choice of a particular index becomes problematic as none of them are beyond intellectual criticism of economic theorists[5]. Since the purpose is to study the importance of such trade flows as a percentage of total trade volume, it is beyond the scope of the analysis to study the sensitivity of these indices to alternate measures. In this paper, the computation formula that has been used is the Grubel-Lloyd index (1975) [henceforth, GL(U)] given by

[4] See Nayyar (1988), p. 231.

[5] See Greenaway (1983, 1984).

$$GL(U) = 1 - \sum_{i=1}^{n} \frac{\left|X_i - M_i\right|}{\sum_{i=1}^{n}\left(X_i + M_i\right)} \qquad (1)$$

where Xi = exports (in value terms) of product group i.
Mi = imports (in value terms) of product group i.

Equation (1) gives the aggregate index over all commodities i = 1.... ... ... n.

This aggregative index has also been used in the literature. It has minimum mathematical complexity. However, all the indices do not suggest any thing about the appropriate level of aggregation/disaggregation [see Greenaway (1983)]. It is well known that GL(U) index has the discrepancy of "opposite sign"effect and "weighting" effect and the 'categorical aggregation' problem [Milner and Greenaway (1988), Pomfret (1985), Vona (1991), Vollrath (1991)]. However, these are beyond the scope of the paper.

The next important thing to consider is the choice of level of aggregation. However, the 3 digit level is the most commonly used in analysis of IIT. As to the degree of disaggregation, 2 digit level is chosen because of the ease with which separate product categories of an industry can be identified and also to avoid discrepancies between products at further levels of disaggregation. Moreover, for the period chosen i.e., 1975-1992, all the 3 digit SITC figures for India were not available for all the years except for 1986-1992. We have calculated the GL(U) index at 2 and 3 digit SITC level for 1975-1992 and for 1986-1992.[6]

III.II DATA

In our analysis, we have considered trade in manufactures which is Standard International Trade Classification (SITC) division 5 to 8. The data source used in this analysis is the U.N. trade data

[6] In this paper, we do not report the indexes at the more disaggregated 3-digit level for limitations of space. However, those are available from the author upon request.

classified by the SITC at the 2 and 3 digit levels of aggregation excluding SITC 3 (fuels). The basic data for computations are the 2 digit level of SITC of non-fuel manufactured goods. Regarding the trade data for India, it is available from Monthly Statistics of India's Foreign Trade.[7] It reports data using different classification system over the years. Since our analysis uses time series data over 18 years period (1975-1992), annual trade data are required. The choice of the period is dictated by the issue of comparability of data prior to 1975(reported in SITC Revision 1). The reason behind using the conventional U.N. commodity trade statistics is that our contention is not to see whether the estimates vary radically depending on the level of aggregation considered rather to trace the empirical evidences of IIT. Upto April 1987, data is quoted according to Indian Trade Classification (henceforth, ITC) which retained the broad structure of the SITC of the U.N. It was in conformity with Revision 2 (classifying the entire commodities into 10 sections). ITC was revised on the basis of SITC - Revised and was called Revised ITC (heretofore, RITC). 5 digit codes were extended to 7 digit codes as per the national requirements due to development and diversification of country's trade and industry. RITC was also revised to ITC R2 as SITC-R amended again to SITC-R2. ITC - R2 has 10 sections to 63 divisions. In DGCI&S data, trade data were quoted according to SITC-R2 up to March/April 1987. From 1987 to 1991 new sub-groupings are adopted according to Harmonized Commodity description and coding system i.e., ITC (HS). The purpose of harmonized system was to harmonize the designation and coding of countries, commodities, units of quantity, mode of transport, etc. Amendment to ITC (HS) was needed for changes in the trade pattern through diversification and emergence of new products having no identity in earlier classifications. 10,500 items at the ultimate level of 5 digit codes are included here. From 1991, again some changes were made by regrouping and reclassifications where total number of subgroupings became 10,560 as compared to 10,980 in

[7] Directorate General of Commercial Intelligence and Statistics (DGCI&S), Government of India, Monthly Statistics of the Foreign Trade of India, March Issues , Annual Number, Vol. I and II.

previous years. Further subdivision of 3 digit SITC categories, as newer goods emerged, increased. Since the level of IIT decreases with disaggregation, some decline in the measure is possible for statistical reasons. Due to these types of data problems, U.N. trade data have been used. These U.N. trade data are reported in International Trade Statistics yearbook and U.N. Commodity Trade Statistics, Statistical Papers. General imports c.i.f. (cost insurance freight) are by country or area of first consignment and national exports and re-exports are f.o.b. (free on board) by country or area of last consignment. Beginning April 1987, India reports its external trade data under the Harmonized system. The U.N. Statistical division converts these data into the SITC Revision 3.

Intra-industry trade index Grubel-Lloyd [GL (U)] is calculated for 1975-1992 for India's trade with the world. Only for 1986-1992, India's IIT with the developed, developing economies and the world is calculated at both 2 digit and 3 digit level of SITC data. The figures in these United Nations data source are value of exports and imports in thousand U.S. dollars with the world and different country groups. According to SITC Revision 2/3, Series M, SITC 5-8 contains four sections each with 9 two digit divisions except 8. Thus, there are 35 divisions for SITC 5-8. Now SITC 5, 6, 7 and 8 has respectively 33, 52, 50 and 31 groups. Thus, we have totally 166 groups at 3 digit level. In the limited scope of this study, we have considered these 166 groups for 1986-1992 to test the sensitivity of IIT index with the level of disaggregation.

Gross National Product (GNP), Gross Domestic Product (GDP) figures are collected from Economic Survey (Government of India), various issues. GNP and GDP figures are given at 1980-81 prices (in rupees crore). We have taken the GDP and GNP at factor cost as they give the aggregates of incomes of the residents as opposed to the expenditure approach. These GNP/GDP figures are converted to U.S. dollars by dividing by the average exchange rate (rupee per unit of U.S. dollar) of base year 1980-81 which is 7.91.

The GNP figures, thus calculated (in million U.S. dollars) are divided by Population (in millions) of every year to arrive at per capita GNP (PCGNP) figures for 1975-1992. The population figures are taken also from Economic Survey (various issues).

The share of exports of manufactured products in categories SITC 5-8 as a per cent of total exports in all commodities is calculated by dividing the sum of exports of SITC categories 5+6+7+8 with world by total exports of all commodities. This gives the share of manufactured exports (SME) as a proportion of overall exports.

Share of manufactured goods trade (SMT) as a proportion of total trade is obtained by dividing the sum of exports and imports in SITC 5+6+7+8 with world by total trade (i.e., exports plus imports) in all commodities.

The trade concentration ratio (TCONC) as a proxy of trade orientation is measured as the ratio of sum of exports and imports of all commodities (sum of total trade in all commodities) to the GDP. This is a measure of trade policy intervention.

In the regression analysis, the variables SME, TCONC, GNP, PCGNP are the explanatory variables and the dependent variable is India's intra-industry trade share [measured by GL (U) index] in total trade with the world (IW) calculated at 2 digit SITC level. In the next section, we document measurements of intra-industry trade of India and discuss the possible determining factors which serve as a backdrop for our time series regression analysis.

IV. MEASUREMENT OF OVERALL INTRA-INDUSTRY TRADE (IIT) OF INDIA: 1975-1992

The study by Havrylyshyn and Civan (1985) shows that IIT of India with world, using the GL(U) index, was 37.41 percent in 1978 [see Havrylyshyn and Civan (1985), p. 269]. Havrylyshyn and Civan (1983), in a cross country regression analysis, have shown that IIT levels across countries are strongly correlated with level of per capita GNP, and product diversity of an economy. India had a

share of 22.75 percent and 15.12 per cent of IIT with the developed countries and newly industrialized countries. Their calculation was based on U.N. trade data.

A study by Pant and Barua (1990)[8], using DGCI&S trade data, shows that there has been a more or less continuous increase in IIT till the year 1983-84 [33.4 percent according to GL(U)] and then a decline till 1986-87 (26 percent). Their study encompassed SITC 5-8 over the period 1959/60 to 1986-87.

In the present analysis, first we measure, using GL(U), India's IIT share with the world as a whole (IW) in value terms. **Table 3** below presents our calculation of overall IIT for India with the world over 1975-92. The product-wise IIT indices for 1975, 1981, 1986 and 1992 are given in Statistical Appendix **Table A.1**. The compound growth rate of the IW index over the years is calculated to be almost 2 percent (1.97)[9]. **Table 3** presents the Indian scenario in intra-industry trade flows between 1975-1992. The lowest value of the index, recorded in 1982-83, is 0.31 and the highest value, recorded in 1992-93 is 0.46, rise of about 48.4 percent over 1982-83 value. Over 1982-83 to 1992-93 the compound growth rate has been 4.5 percent. This increase, however, has been achieved with fluctuations with one major downturn in 1979-80 (-20.45percent). In fact, the value has increased in the terminal years by 4.55 percent. Taking the initial year and terminal year, the value has grown by 39.4 percent.

[**Insert Table 3**]

[8] Pant, M. and Alokesh Barua, (1990): `New Theories of Trade, Intra-Industry Trade and the Indian Experience', paper presented in a National Seminar on International Trade and Development, Implications of Recent Theoretical Research and Experience held at ITD Division, SIS, Jawaharlal Nehu University, New Delhi, India.

[9] Compound growth rate (r) is calculated using the compound interest formula as given below: $(\sqrt[n]{V_n / V_0} - 1) \times 100$ where r is the growth rate in percentage terms, V_n is value in terminal year 1992 and V_0 is value in initial year 1975.

The average annual growth rate of India's Intra-Industry trade flows has increased at rate of almost 3 percent. Although the trend growth rate is about 1.01 percent over this period the average annual growth rate is a pointer to the fact that over the years chosen intra-industry trade of India has been increasing.[10] It is pertinent to note that the value of index might be highly responsive to the level of aggregation used for classification of industries. This problem arises from the absence of any proper classification and distinct criterion for classifying a particular bunch of firms as belonging to an industry group. Thus, the basic issue is the choice regarding horizontal or vertical productive spectrum in the stages of production. In case of vertical specialization, several industries would be lumped together e.g., the iron and steel industry and metal goods manufacturing industry; or, other inorganic chemicals (SITC 516) and Inorganic chemical elements (SITC 522); or, paper and paper board (SITC 641) and paper, paperboard, cut etc. (SITC 642); or optical goods, NES (SITC 884) and optical instruments, NES (SITC 871); or general industrial machinery, NES (SITC 74) and metal working machinery (SITC 73), etc. In our study, products are more or less, categorized according to their substitutability i.e., horizontal specialization. Thus, import and export taking place at different stages of production of the same commodity is set in isolation.

We have chosen 2 digit levels of SITC. At a more disaggregated level, the "imperfect" close substitutes might be categorized in separate product groups or firms without any clear trend of pattern.

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[10] The exponential trend is calculated by fitting an equation $IW_t = A \exp \beta t$. The logarithmic transformation is LW = log (IW); regressing IW over T gives the trend growth rate over time as coefficients of t i.e., β. Thus, $LW = \pi + \beta t$ where $\pi = \ln A$. Average annual growth rate 'g' is calculated as $g = [\text{antilog } \beta^* - 1] \times 100$. β^* is the least square estimates of β. 'g' is the least square growth rate or regression growth rate.

However, from **Table 4** it is evident that from 1986-87 to 1992-93 the value of index (IW) has increased from 0.34 to 0.46. This is a consistent rise except for 1990-91 where there is a percentage fall of 4.4 per cent. Moreover, for the period 1986-92, we have calculated the index at 3 digit level of disaggregation also just to see the sensitivity of the index to the level of disaggregation.

We now take a bird's eye view of whether this increase in IIT with world is more with the developed economies. **Table 4** below shows the IIT index with developed (ID), developing (IG) and globe (IW) at 2 and 3 digit level of SITC 5-8 over the period 1986-92.

[**Insert Table 4**]

The above table shows that the intra-industry index calculated at the 3 digit level of SITC is lower in values than those calculated using 2 digit SITC. It is true for ID, IG, IW in the table. Using 2 digit SITC, IW has registered an increase of 35.3 percent over 1986-92 whereas for 3 digit SITC this is 34.5 percent over the same period. ID has registered an increase of 59.3 percent from initial year 1986 to 1992 for 2 digit level whereas for IG, it is 12.12 percent. Considering 3 digit SITC, ID has shown a rise of 54.2 percent & IG has shown a rise of 4.6 percent from 1986-92[11].

From this analysis, it is evident that IIT indices are responsive to the level of disaggregation but there are not much substantial differences to prejudice any discussion about evidences of such trade. Secondly, India's IIT, both at 2 and 3 digit level of SITC 5-8 i.e., manufactured products is more with the developed countries than the developing countries. The trend growth rates for this 7 year period, of IW, ID and IG are 4.47

[11] The product-wise IIT index of India for SITC 5-8 at 3-digit level of aggregation (for 1986 and 1992) are not reported here for want of space. Those are available from the author upon request.

percent, 6.37 percent and 1.7 percent respectively. At 3 digit level, this rate for ID is 5.8 percent. The average annual growth rate of IW, ID and IG over 1986-1992 are 10.8 percent, 15.8 per cent and 40.4 percent respectively. In **Table 5**, 'point to point' percentage change of India's' IIT index with developed (ID), developing (IG) and world (IW) at both 3 and 2 digit level are furnished. Although there are fluctuations in these growth rates, the trend growth rate shows an overall increase in the indices. For intra-industry trade flows with developed countries, the fall (in percent) is meager in the years 1989, 1990 and 1992.

[**Insert Table 5**]

Averaging out, percentage changes in India's intra-industry trade flows in manufactured products with the developed country group has registered an increase at an annual growth rate of 8.85 percent as compared to 2.85 percent for trade with the developing country group over the period 1986-87 to 1992-93. These figures are for 2 digit SITC level analysis. For 3 digit levels of disaggregation, these figures are 7.05 percent and 2.33 percent for ID and IG respectively.

The above analysis suggests growing importance of intra-industry trade flows in total trade of India. The annual compound growth rate of intra-industry trade of India with world (calculated at 2 digit level of SITC 5-8) is around 2 percent and the annual average growth rate is approximately 3 percent. Over the 1975-92 period, the annual compound growth rates for GNP at factor cost (in dollar values) and GDP at factor cost (in dollar values) are 4.4 percent and 4.5 percent respectively. The annual compound growth rate of per capita GNP (in dollar values) is 2.2 percent. Comparing the average rate of increase or percentage change of the value of the index (which is 2.63 percent) with the "Hindu Rate of Growth" 3.4 percent, it is noteworthy that India's growth rate of

GDP is very close to the increase in the value of the index. Thus, it is worth mentioning that the upward trend of all these indicators might imply the fact that the increasing value of intra-industry trade flows went in consonant with economic development and growth.

The empirical evidence necessitates an alternative explanation for the changing trade pattern envisaged by the gradual uprising of intra-industry trade. In the next section, we carry out the time series analysis. Within limited scope of our study, the industry-specific characteristics are not studied. However, the country features for explaining this trade phenomenon in the Indian context give insight about the possible sources of generation of IIT. Intertemporal pattern of IIT indexes with world and basic indicators for India over 1975-92 are reported in **Table 6**.

[Insert Table 6 here]

V. REGRESSION ANALYSIS AND RESULTS

V.I HYPOTHESES

Following the explanations put forward by the new trade theories, the possible explanation of the above trend can be hypothesized. Typically, the reasons for the rapid expansion of such trade are growing convergence of per capita income between countries, product innovation, exploitation of scale economies and imperfect competition among oligopolistic and monopolistic industries, brand proliferation, similarity of tastes, intra-firm trade owing to Foreign direct investment, vertical fragmentation of production and relocation of production for lower cost advantages-to name some important few.

Since the index (IW) is expressed in terms of the absolute difference between export and import of a particular product category, the attainment of high value for these manufactured goods (SITC 5-8) may mean that exports are being geared up to the level of imports over the period. It is due to the fact that India was traditional primary

commodity exporter and manufactured goods importer; over the years the rising share of manufactured exports (with rising manufacturing value added in GDP) in total exports may reflect a gradual shift in comparative advantage from inter-industry type and hence this might be a possible source of generation of IIT. Since IIT essentially refers to trade in differentiated products, especially manufactures (SITC sections 5-8), the rising value of the index may be an outcome of higher degree of diversification [Dixit and Norman (1980), Ethier (1978), Helpman and Krugman (1985)]. The variety hypothesis suggests that the growth of average levels of IIT will be directly related to the growth of per capita GNP (PCGNP). Since the demand for variety increases with per capita incomes, the international trade in differentiated goods will take place as an extension of internal demand. Thus, a formal time series test of positive IIT-PCGNP relationship is performed. One pertinent point to note is that there may not be a simply linear association between IW and PCGNP. For example, Havrylyshyn and Civan (1985) have demonstrated that although the levels of IIT of the newly industrialized countries (NIC) are much closer to those of the DCs than to the LDCs, their per capita incomes are closer to the non-NIC developing economies than to the DCs on average. However, PCGNP as a proxy for economic development implies a positive (closer) association between intra-industry trade flows and development per se.

Since India has diversified their production structure with a rising share of manufacturing value added in GNP, the share of manufactured exports showing an upward trend is expected to have a positive impact on the share of IIT in total trade.

Another hypothesis is that IIT will be higher when GNP increases. GNP is taken as a proxy for market size or size of total income. The scope for product diversification

and exploitation of scale economies can be expected to be directly related to domestic market size. Usually, the share of IIT in total trade is a positive function of market size (proxied by GNP/GDP) in a time series analysis. However, for India, traditionally it has comparative cost advantage in the sectors with standardized demand (Linder (1961), Lancaster (1991), Hanink(1990)). Since the smallness of the domestic market acts as a deterrent to the realization of economies of scale fully, there will be disadvantage in differentiated goods for a country like India. This puts a limit to the extent of appropriation of benefits from scale economies in producing differentiated goods as a result of which LDCs, usually, will concentrate on producing standardized goods with very limited attribute differentiation (horizontal differentiation). Thus, there may be a "negative" small country effect on IIT.

Moreover, trade liberalization has impact on IIT. The impact of trade concentration variable (TCONC) on IIT is expected to be positive (see Globerman and Dean(1990), Dollar (1992)). The rate of trade openness and rate of growth of PCGNP and their levels may separately or jointly constrain the size of home as well as foreign (export) markets. A positive sign of the coefficient of TCONC variable is expected although it might not be significant. More trade openness may be a stimulus to two way trade.

We now write the following time series specification of model postulating a relationship between India's IIT with world (IW) and GNP, PCGNP , SME and TCONC. Some variants of the model's variables with some alternative specifications are also used in the analysis.

The posited relationship is

$$IW_t = F [GNP_t (Size), PCGNP_t, SME_t, TCONC_t] \quad (2)$$

where t denotes time horizon. IW_t is value of IIT index over t, where t = 1975-1992. The subscript t denotes the values of the variables over time t. We now test the relationship as postulated in equation (2) and present the results below.

V.II. ESTIMATION AND RESULTS

The model specified in (2) above is tested by using Ordinary Least Squares (OLS) estimation procedures by fitting a simple linear regression model of the form

$$IW_t = \beta_{1t} + \beta_{2t} GNP_t + \beta_{3t} PCGNP_t + \beta_{4t} SME_t + \beta_{5t} TCONC_t \quad (3)$$

where β_{1t} is the constant term, β_{2t} ,β_{3t} , β_{4t} , $\beta_{5t} > 0$ are all parameters coefficients to be estimated.

The result of the estimation is presented below in **Table 7**. Overall fit is 63 percent and there is no serial correlation in the OLS estimation.

[Insert Table 7 here]

The result shows that GNP and TCONC have negative coefficients. All the other variables PCGNP and SME has expected positive sign. The coefficient of GNP being very small, the negative effect is very negligible. Since the values of GNP, PCGNP are very high as compared to values of IW, as shown in **Table 8** below, the variables become highly significant if expressed in logarithmic terms, which compresses the outliers and reduce the variability of them which is quite large compared to the variability of IW_t.[12]

[12] Now the intercorrelation among the variables has reduced the explanatory power and significance of some variables. PCGNP and GNP are highly correlated. Serial correlation reduces the overall fit, but applying correction for first order autocorrelation i.e., AR(1), the overall fit is 0.99 and D.W. statistic improves to 1.66 from 0.921 [without AR(1)]. AR(1) is very highly significant.

[Insert Table 8 here]

Another linear regression between IW_t and SME_t gives the following estimated equation (AR(1) was applied for lower values of DW statistic)[13]The value in the parentheses are T-statistic and the coefficient of determination has also increased to 0.49. The D.W-statistic is significant at 1percent level. SME is highly significant at close to 1 percent level of significance (2 tail test) with expected positive sign.

$$IW_t = 0.1226 + 0.4283\ SME_t \qquad (4)$$
$$(1.304)\quad (2.884)$$
$$R^2 = 0.46\ ;\ \text{D.W. Statistics} = 1.76$$

SME is significant at 1 percent level (2 tail test). Fitting an exponential trend equation, the trend growth rate over 1975 to 1992 of share of manufactured exports is around 1.76 percent whereas the trend growth rate of total trade in all commodities is 7.6 percent over the same period. The annual average growth rate of SME is 4.14 percent whereas for TCONC and IW, these are 6 percent and 3 percent respectively. The compound (annual) growth rates of TCONC, SME, total exports and imports (TXM) and IW are respectively 4.2 percent, 2.33 percent, 8.8 percent and 2.00 percent. Trend growth rates for TCONC and IW are 2.5 percent and 1.01 percent respectively. These figures are indicative of the fact that IW has not registered so much an increase in tune with TCONC, whereas it has

[13] Without applying correction for first order autocorrelation i.e., AR(1), the estimated equation is

$$IWt = 0.131 + 0.414\ SMEt$$
$$(2.094)\quad (4.089)$$
$$R^2 = 0.49\ ;\ \text{D.W. Statistic} = 1.34.$$

The D.W-statistic is significant at 1percent level. SME is highly significant at close to 1 percent level of significance (2 tail test) with expected positive sign.

shown an upward rising pattern more in tune with SME. **Table A.2** in Statistical Annex gives the calculated growth rates for all these variables.

In economic time series data, the variables often move unidirectionlly to give a high overall fit (i.e., high adjusted R^2 value). This does not reflect the true association between the variables rather, might imply a spurious correlation. The effect of time involving many changes, especially changes in the level of development (proxied by PCGNP); level of industrial advancement or product diversification (proxied by SME); level of trade participation (given by TCONC) and overall size of market on a dependent variable measuring share of intra-industry trade flows in total trade can in no way be ignored to capture the effect of these variables *per se* on IW net of the linear time effect (as the fitted model has an implicit assumption that time series exhibits a linear trend). This gives an idea of true association between these variables.[14] Thus, we detrend variables IW and GNP, PCGNP, SME, TCONC and run the regression on the detrended IW and other independent variables. First, we regress IW on time (T) and obtain the residuals of this regression. Next, we regress separately all the independent explanatory variables on time (T) and obtain the residuals. These residuals are free of the linear influence of time. The slope coefficients reflect the true association between IW and other variables (explanatory). In **Table 9**, the detrended results are presented showing a very high overall fit and all the variables are highly significant (2 Tail test). The variables have expected sign and the signs are the same as in the earlier results without detrending. This indicates the consistency of the results so far obtained.

[14] See Chapter 8 of Basic Econometrics, 2nd Edition, by D. Gujarati**,** 1988.

[Insert Table 9 here]

From the table above, it may be inferred that the effect of the $PCGNP_t$ and SME_t on IW_t is strongly positive and they are highly significant. The variables GNP_t and $TCONC_t$ have negative effect and the former is very significant at close to 1 percent level (2 tail test). TCONC is not significant, *per se*, in explaining intra-industry trade flows. In the next section, we summarize the findings of our analysis.

VI. SUMMARY OF FINDINGS

The time series analysis of India's intra-industry trade flows for the period 1975-1992 shows that share of this trade in total trade (based on value indicator of Grubel-Lloyd index) has registered an upward rising pattern with some fluctuations in the interim years. The analysis concentrates on the trade in manufactures only i.e., SITC 5-8 where the scope of product differentiation is evident. Although the exponential trend growth pattern is not so optimistic (the trend growth rate for such trade in manufactures is a meagre 1.01 per cent), the average annual growth rate (almost 3 percent) and the annual compound growth rate (almost 2) is far from negligible when the much professed Hindu rate of growth of GNP is 3.4 percent. The average rate of increase or percent change in the value of index IW is 2.63 over the initial to terminal year of the period chosen. From 1986-87 to 1992-93, the index shows a consistent upward movement. Much of this increase in in-commodity trade flows over this period is accounted for by India's trade with the developed countries. This is in conformity with the fact that much of India' trade partners are industrialized countries.

This can be explained quite easily by the fact that since the early 1960s, there has been a perceptible improvement in the sophistication of India's manufacturing base as is

evident from the growing share of manufactured exports in total exports of all commodities. Moreover, the share of manufactured trade (exports plus imports) as a percent of total trade has increased from 0.48 to 0.62 from 1975-76 to 1992-93. The annual compound growth rate is 1.52 percent and the percentage change from initial to terminal year is 29.2 percent which is a considerable increase. For SME, the percentage change between 1965 and 1992 is 48. We have taken the data starting from 1981-82 because the intra-industry trade index registered a lowest value of 31 percent in this year and a highest value of 46 percent in 1992-93. During the decade total industrial production increased at an annual compound growth rate of 9.46 percent and manufacturing output increased at the rate of 6.74 percent. This average annual growth rate of manufacturing output and industrial production is indicative of sophistication and diversification of industrial production structure of India which might be an important explanatory factor for the upward trend.

From our findings, PCGNP has a strong positive impact on IW confirming Linder's hypothesis (1961). PCGNP, as a proxy for development, implies higher stage or level of development with higher values and as such increases the value of IW through demand pull factor. In our analysis, GNP is not so significant with negative sign on its very small coefficients (as compared to that of PCGNP). This implies a negative small country effect on IIT. Greenaway and Milner (1983, 1988) explain it in terms of vertical specialization concentrating on highly specialized products as opposed to "attribute" differentiation. As Havrylyshyn and Civan (1983, 1985) argue, since intra-industry trade is an extension of internal trade, country size may have a negative effect on IIT. In fact, the influence of size (proxied by GNP) cannot be isolated from integration and distance

effects. As small countries do much more participate in trade, cross-border trade is important for them. Size variables, thus, can proxy this border trade also.

In the study, the TCONC variable (ratio of total trade to GDP) has an adverse impact on IW. Although the coefficients are negative, it is not statistically significant in explaining the upward trend of IW. Moreover, as the proponents of free trade doctrine argue, the pursuit of "liberalized" trade would promote minimum structural adjustment costs in case of IIT (due to minimal within-industry adjustment costs); so, higher TCONC would be expected to be associated with IW positively especially when India has been adopting an export promotion policies since the late 1960s. However, the negative insignificant effect can be explained as below. During 1975-85, share of manufacturing exports in total export was increasing at an annual compound growth rate of 1.67 percent which became 2.72 percent during 1986-1992. Total trade in all commodities increased at an annual compound growth rate of 9 percent and 10percent respectively during 1975-85 and 1986-92 period. Now, during 1975-85 period IIT showed an annual average growth rate of 0.6 percent as opposed to 5 percent. The corresponding figures for TCONC are 4.97 percent and 4.90 percent. Moreover, during 1975-85 period manufacturing output fell from 5.1percent annual growth rate to 4.5 percent and during 1986-1992 the manufacturing output increased from 6.9 percent annual growth rates to 10.5percent in 1990 and 6.3 in 1991 with slight fall in 1991-92.[15] Thus, we see that manufacturing output was not stable and did not show a distinct rise in growth rates during first 11 years of our study. Also, manufactured exports did not show a steady increase of considerable magnitude. Thus, despite there being an increase in overall trade, the trade openness

[15] Figures are from Economic Survey, 1993-94, Table 1.6.

variable (TCONC) had a negative impact on India's index of intra-industry trade with the world (IW).

There are plethora of factors like market structure, specific industry characteristics study, consideration of much disaggregated industry-level analysis, sophisticated econometric analysis incorporating Box-Jenkins approach and co-integration check, which could be analyzed more rigorously. This article addressed only a selective few to explore the evolving pattern of India's shift in manufacture trade so as to provide quantitative evidences of such trade. However, this paper is a starting point to probe beyond the quantifiable causes of such trade and giving a structural account of such new pattern of trade within a liberalized trade regime whilst embarking on the path of globalization. These are in the future research agenda.

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