



An Overview of India's Intra-Industry Trade

Amit Srivastava¹ and Yaj Medury²

Intra-Industry Trade (IIT) is a simultaneous exports and imports of goods and services of the same industry and now it has become an integral part of the world trade. The present paper has tried to analyse the nature and pattern of India's IIT at 6-digit level. The paper shows that, with the passage of time, not only the degree of IIT but also the contribution of IIT in total trade have increased significantly. The paper also reveals that, overall, India's IIT is vertical in nature and decrease in tariff rate helped in increasing the degree of IIT.

Keywords: *Intra-industry Trade, Horizontal and Vertical Intra-industry Trade, Import-weighted Average Tariffs*

Introduction

International trade, also called as cross-border trade, is a special form of trade in which exchange of goods and services across international borders takes place. It involves trade between different countries and countries engage themselves in these types of trades because they are getting benefitted out of it. The benefits of international trade have been discussed by so many economists. Initially it was explained by Adam Smith with the theory of Absolute Advantage and by David Ricardo with the theory of Comparative Advantage, later on Heckscher and Ohlin proposed Factor Endowment Theory. All these theories emphasised the supply side factors as a reason for international trade and they meant that the benefit of the trade to a country will depend on its overall efficiency for producing a good. If a country is relatively efficient in producing a good, it will export otherwise import. Therefore, these theories explained that a country will either export or import goods of an industry, and the corollary of the theory was that it cannot simultaneously exports and imports goods within the same industry. But with the progress in the research on international trade, it was found that most of the countries are involved in simultaneous exports and imports of very similar goods and services, this was contradictory to the traditional theories, and these types of trade were termed as "intra-industry trade (IIT)".

The evidence of intra-industry trade (IIT) changed the perspective of analysing international trade. It was first

observed in 1960s and then after research had started in this direction to explain the reason for and nature of IIT, since traditional trade theories were unable to explain this nature of trade therefore it requires a fresh look to analyse it. Initially it was observed that IIT is a substantial part of trade of developed countries but later on it was found that developing countries are also involved in such types of trade substantially. With the progress in the research of IIT, thereafter, it was possible to disentangle IIT into two categories – horizontal and vertical. In horizontal intra-industry trade (HIIT), products differ in their *attributes* but do not differ in quality or price and it is assumed that the producers, in the industry, are using same factors of production and same production techniques; on the other hand, in vertical intra-industry trade (VIIT), goods differ in terms of quality and price significantly because producers here are using different factors of production and different production techniques.

The present paper will discuss the nature and pattern of India's IIT with world and the time frame taken here is from 2000 to 2008. The paper is different from some earlier works (Veeramani, 2001; 2003 and Burange and Chaddha, 2008) on two grounds, first it discusses the nature of IIT at somewhat more disaggregated level, i.e., at HS-6 digit and second the paper will also discuss about nature and pattern of HIIT and VIIT of India, which has not been discussed so far. Apart from this, we shall also try to find out the relationship between IIT and tariff rate using the concept of "import-weighted average tariff".

¹Department of Professional Development, Jaypee University of Information Technology, Wanknaghat, Solan – 173234, H.P., India

²Jaypee Education System, New Delhi, India

¹E-mail: sriam_2000@yahoo.com

Literature Review

Till 1950s, international trade was considered to be an inter-industry trade and factor endowment theory was able to explain such type of trade behaviour. It was assumed that a country will produce and export goods which it can efficiently produce, otherwise it will import. In 1950s, Leontief found that although US is a capital abundant country but it exports labour-intensive commodities and import capital-intensive commodities, and this paradox were called as Leontief Paradox. This finding compelled the researchers to analyse trade pattern carefully. Later on, in 1961, Linder observed that a country with high and similar per-capita income has similar demand pattern which leads to exchange of similar but differentiated products, and this was termed as Linder's hypothesis. This hypothesis initiated more research in this direction and the focus of explaining international trade was changed from supply side (as in traditional trade theories) to demand side factors. Later on Linder's hypothesis was proved empirically by Hanink (1988) and he found that the fundamental relationships discussed by Linder were valid. Apart from this Linder also said that (Hanink 1988) the trade between similar but poor country is not supposed to be very high. Although he talked about IIT but he did not use the term specifically. The term *intra-industry trade* (IIT) was first used by Balassa (1966). Initial empirical work was done by Grubel (1967) where he tried to establish a relationship between natures of IIT with trade liberalisation of EEC (European Economic Community). Grubel and Lloyd (1971) developed first index to measure the degree of IIT as well as they proved that IIT is a "pure phenomenon".

Initial work on IIT was based on Monopolistic kind of market structure, i.e., products are slightly differentiated. Dixit and Stiglitz (1977) proposed *love-of-variety* approach, where they said that consumers would prefer variety to one product only; while Lancaster (1980) proposed *most-preferred goods* or *ideal goods* approach, where he said that if different specifications of a same product is available before a consumer, he will prefer his ideal one. Both of these theories stressed on demand side aspect of trade in similar kind of products. Krugman (1979, 1980, 1981) also emphasised on the trade of similar products but his approach was different, he worked on monopolistic competition under increasing return

and concluded that international trade is very much possible in economies of similar factor endowments and in-fact, similar countries will trade more.

Falvey (1981) worked on somewhat different characteristics of IIT, whereas all of the above work was based on the similar types of products, i.e., horizontally differentiated products, he worked on vertical product differentiation and IIT. He showed that vertical IIT and inter-industry trade can co-exist and increasing return-to-scale is not an essential condition for trade. Davis (1991) also found the similar result. He worked on the relationship between economies of scale and IIT and found that IIT is very much possible even with constant return, and in-fact, increasing return-to-scale is not necessary. He proposed a model for that and concluded that IIT will be maximum when countries have identical factor endowment ratios. Falvey and Kierzkowski (1987) worked on the correlation between the share of vertical IIT and the average market size of the two countries and they found that these two are positively correlated, and in-fact, it will be more if the difference in capital-labour endowment between the two countries is more. Shaked and Sutton (1983) and Sutton (1986) also worked on vertically differentiated products but their work was based on oligopoly market environment rather than monopolistic environment. They concluded that trade of vertically differentiated products are possible in oligopoly environment where the main burden of quality improvement is on R&D and other fixed costs and unit variable costs will rise only slowly with increase in quality.

Along with these theoretical developments regarding different models of intra-industry trade, some work regarding measurement issues of IIT was also being conducted. The first striking work on measuring IIT was done by Grubel and Lloyd (1971). They worked on Australian trade data (on two sectors – iron and steel, and petroleum) and found that degree of IIT is related to the level of aggregation of trade data. As the aggregation level increases, the degree of IIT, as expected, will also increase. They also conducted an empirical study and had similar findings that Australian IIT is maximum with countries of similar factor endowments (New Zealand and South Africa). Greenaway and Milner (1981, 1983) also worked on the measurement issue of IIT. In their first work, they showed that IIT is a product of industry characteristics

and not of macro-economic adjustment process, and in second work they discussed the problem of categorical aggregation in the measurement of IIT and the way to identify and check it. Balassa and Bauwens (1987) conducted an empirical study to understand different factors affecting the degree of IIT. Their work was based on multi-commodity and multi-industry framework and results were matching with the theory. Bergstrand (1990) also conducted an empirical study on trade data of OECD countries (mainly with horizontally differentiated products) and tried to find out the effects of different determinants on degree of IIT. His findings were also similar to that of previous one, that in most of the cases the determinants are having same sign as expected theoretically.

Till 1990, although lot of work had been done on horizontally and vertically differentiated products but there were no formal criteria to make distinction between them. The first formal distinction between the two categories of products was done by Abd-el-Rahman (1991). He said that if the difference between export and import unit value is maximum upto 15 per cent, the product will be said to be horizontally differentiated; and if this difference exceeds the 15 per cent limit then it would be considered as vertically differentiated products. Some other work regarding focusing on the importance of disentangling horizontal intra-industry trade (HIIT) with vertical intra-industry trade was also conducted by some researchers like Greenaway, Hine and Milner (1994, 1995), Gullstrand (2002) and Andresen (2003). Fontagne, Freudenberg and Gaulier (2005) had categorised world trade into three categories – inter-industry, intra-industry in horizontally differentiated products and intra-industry in vertically differentiated products. They found that it is VIIT which is dominating in the world's IIT. Cabral, Falvey and Milner (2008) also worked on different hypotheses regarding HIIT, VIIT and NT (Net Trade), and they found that the prediction for HIIT was quite conventional that larger endowment differences would reduce the level of HIIT; while the result of VIIT was little bit different, theoretically it should increase with increase in endowment differences but actually it grew as long as the endowment differences remains small. In case of larger factor endowment differences, the degree of VIIT depends on whether the specific factor is used by the industry or not, if it is used then the share of VIIT will increase with increase in

endowment differences of trading partners (and vice-versa), on the other hand if it is not used then VIIT will decrease with increase in endowment difference (and vice-versa). Brulhart (2008) have calculated GL-index for world and found that the degree of IIT has increased significantly from the year 1962 to 2006, and we cannot overlook the contribution of IIT in world trade.

Some recent works have been done with respect to India also, some of them have been discussed here. Veeramani (2001, 2003) has conducted some studies on India's IIT. In his first work he calculated GL-IIT index at 4-digit level for the period ranging from 1987 to 1999. He categorised the total trade into two categories – primary commodities and manufactured commodities. He found that both GL-index and export growth of primary commodities was lower while for manufactured commodities it was higher. He also found that overall India's IIT is vertical in nature because trade is more with dissimilar countries rather than similar countries. In his second work, he analysed the effects of India's liberalisation process on India's IIT and found that it helped in promoting IIT. Burange and Chaddha (2008) have also conducted a study on India's IIT for the period ranging from 1987-88 to 2005-06. They categorised the entire world into seven country groups (as defined by World Atlas) and calculated GL-IIT at 4-digit level, and they found that India's IIT is more with dissimilar countries.

As far as the above three India related works are concerned, they helped in understanding the nature and pattern of India's IIT but their major limitations are two folds – first these studies have been conducted at higher aggregation level, i.e., 4-digit level; and second they have not disentangled HIIT with VIIT therefore not studied the nature and pattern of India's HIIT and VIIT. This paper has taken care of both of these two limitations, it is based on somewhat more disaggregated level, i.e., at 6-digit level and we have disentangled total IIT into HIIT and VIIT and analysed their nature and pattern.

Methodology

The most important thing regarding measuring intra-industry trade is that at what degree of aggregation it should be measured or what level of aggregation should be considered as an industry. Although there

are different ways of defining the aggregation level for an industry, but here we have considered 6-digit ITC-HS level as an industry. Moreover, different level of aggregation normally affects the degree of IIT (degree of IIT will be more at higher aggregation level) but, in general, it does not affect the pattern of IIT.

Once the aggregation level is decided, the next job is to select which index should be used to measure the degree of IIT. There are so many indices proposed in the literature, but here we have used the most popular one, the Grubel-Lloyd index for measuring intra-industry trade, i.e., GL-IIT. The formula used for measuring GL-IIT is shown in the next section

Since the objective of the paper is to understand the nature of India's IIT in detail, as discussed in the Section IV, therefore we need to disentangle IIT into horizontal intra-industry trade (HIIT) and vertical intra-industry trade (VIIT) and to do that we have followed the method of disentangling IIT into HIIT and VIIT as developed by Rahman (1991). Not only this, we have also used 15 per cent as dispersion factor to separate HIIT from VIIT, the method is discussed in the second next section.

Do the changing tariff rates affect the degree of IIT? This question can only be answered if we study the relationship between these two, therefore this is one of our objectives as discussed in Section IV. Average tariff rate has not been used here because it may give some misleading result since it does not consider the import-value of individual product and give equal importance to tariff rate of entire products. To avoid this problem, we have taken import weighted-average tariff rate (as discussed by Mikic and Gilbert, 2008) and its methodology has been discussed in the coming Section under the heading of "Calculation of Import-Weighted average tariff."

Index used for Measuring Intra-Industry Trade

There are different indices proposed in the literature to measure the level of intra-industry trade, but in this paper we have used the most used index which is Grubel-Lloyd index (GL-index). We have used it because of its wide acceptability. The formula proposed by them for measuring IIT for individual product group or industry i , is:

$$IIT_i = \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} \times 100 \quad \text{---- (1)}$$

where X_i and M_i represents the exports and imports of the product group i respectively and IIT_i is the degree of intra-industry trade for the product group or the industry i . Here the value of degree of IIT will ranges between 0 to 100, 0 means absolutely inter-industry trade and 100 means absolutely intra-industry trade. After then they proposed a modified formula, which was a weighted average one, to calculate the level of IIT for a country, but the formula did not allow any imbalance in a country's total trade and had downward bias. Therefore, they proposed another "adjusted" formula which takes care of these limitations. The adjusted formula is shown as:

$$IIT_j = \frac{\sum_{i=1}^n (X_i + M_i) - \sum_{i=1}^n |X_i - M_i|}{\sum_{i=1}^n (X_i + M_i) - \left| \sum_{i=1}^n X_i - \sum_{i=1}^n M_i \right|} \times 100 \quad \text{----(2)}$$

We shall use equation 2, i.e., adjusted GL-IIT, for our calculation.

Disentangling Horizontal and Vertical Intra-Industry Trade

Total IIT (TIIT) is sum of HIIT and VIIT, as shown in equation 3

$$IIT = HIIT + VIIT \quad \text{----(3)}$$

While to disentangle IIT into HIIT and VIIT, equation 4 is used, which is shown as

$$1 - \alpha \leq \frac{UV_{exp}}{UV_{imp}} \leq 1 + \alpha \quad \text{---- (4)}$$

where UV_{exp} and UV_{imp} are unit-value of export and import respectively. " α " is called as "dispersion factor". There is no unanimous value of α , for disentangling IIT into HIIT and VIIT but the most preferred value is 0.15 (15 per cent). It means if the ratio of UV_{exp} to UV_{imp} lies between 0.85 to 1.15, the product will be called as horizontally differentiated (HIIT) while if the ratio is lower than 0.85 or greater than 1.15, the product will be said to be vertically differentiated

(VIIT). Moreover, if the ratio is lower than 0.85 it will be called as low-quality VIIT (LQVIIT) and if it is higher than 1.15 it will be called as high-quality VIIT (HQVIIT).

The formula used to calculate unit values are shown as

$$UV_{exp} = \frac{\text{Value}_{exp}}{\text{Units}_{exp}} \quad \text{and} \quad UV_{imp} = \frac{\text{Value}_{imp}}{\text{Units}_{imp}} \quad \text{---- (5)}$$

where values are mentioned in terms of dollars and units are in terms of selling units like kg, tonne, etc.

Calculation of Import-Weighted Average Tariff

To understand the effect of tariff rate on the level of intra-industry trade, we have used “import-weighted average tariff (IWT)”. Here import-weighted tariff has been used rather than simple tariff because IWT will take into account of each product in the import profile of the economy which was not possible otherwise. The formula used for IWT is shown in equation 6

$$IWT_j = \frac{\sum_{i=1}^n (w_i \times m_i)}{\sum_{i=1}^n m_i} \quad \text{---- (6)}$$

where j stands for a country, w stands for weighted-average of tariff, m stands for the import value and n represents the total number of imported products imported at that level.

Data Analysis

The basic objective of the paper is to understand the nature and pattern of India's IIT, HIIT and VIIT with world so that we can understand that, has the intra-industry trade changed over the period of time and does that signify any changes in economic condition of the country. For our study, the data have been taken from WITS (World Integrated Trade Solution) website. The time period used is from 2000 to 2008, and level of aggregation is used as 6-digit ITC-HS classification. In this paper, we are going to test few hypotheses, these are – First - with the passage of time, both degree of IIT and contribution of IIT in total trade, have increased. Second – being a developing

country, degree of IIT should be lower as well as VIIT should dominates HIIT. Third – the sign of correlation coefficient between IIT and tariff rate should be negative, i.e., decrease in tariff help in promoting IIT.

Now we shall take-up all these hypotheses one by one. To test the first hypothesis, as shown in Table 1, we have taken trade data on total basis as well 6-digit total intra-industry trade, both the trade figures are in thousand dollars and taken from WITS web site. We then calculated GL-IIT index for different years, from 2000 to 2008. We have also calculated percentage contribution of 6-digit intra-industry trade in total trade and to do this column 4 of the Table 1 has been divided by column 3 and then multiplied by 100. At the end of the table, we have calculated the percentage change of different columns. It is clear from Table 1 that both the degree of IIT and contribution of IIT in total trade have increased significantly from 2000 to 2008, it is increased by 24.8 per cent and 27.2 per cent respectively. Not only this, for the same time period, the increase in 6-digit total intra-industry trade is more than increase in total trade, the former has been increased by 555 per cent while the latter by 415 per cent only.

Table 1: Degree of IIT and Contribution of IIT in Total Trade

Year	GL-IIT	Total Trade (\$ '000)	6-digit Total IIT (\$ '000)	% Contribution of IIT in Total Trade
2000	27.2	96626890	72880535	75.4
2001	19.9	96214972	87638593	91.1
2002	20.8	113589589	104908158	92.4
2003	23.2	140235570	135150908	96.4
2004	26.6	188082018	182026762	96.8
2005	28.3	253154133	238225459	94.1
2006	27.6	311510437	300876063	96.6
2007	29.3	364543347	355961115	97.6
2008	34.0	497573004	477512788	96.0
% Change	24.8	415	555	27.2

Source: Trade data compiled from WITS web site

Table 2: Degree of IIT, HIIT and VIIT

Year	GL-IIT	HIIT	VIIT
2000	27.2	10.3	89.7
2001	19.9	10.3	89.7
2002	20.8	11.7	88.3
2003	23.2	14.5	85.5
2004	26.6	15.8	84.2
2005	28.3	16.6	83.4
2006	27.6	17.3	82.7
2007	29.3	15.1	84.9
2008	34.0	14.2	85.8
% Change	24.8	37.9	-4.4

Source: Trade data compiled from WITS web site

Data regarding second hypothesis is shown in Table 2. From Table 2, we can say that although the degree of IIT has increased significantly but still is not very high because the maximum value of IIT is 34.0 in the year 2008. Another thing which is very clear from the Table 2 is that VIIT dominates HIIT, but interestingly, over the years, the level of VIIT decreased by 4.4 per cent while that of HIIT has increased by 37.9 per cent.

Table 3: Relationship between the Degree of IIT and Import-Weighted Average Tariff Rate

Year	GL-IIT	6-digit IWT
2001	19.9	26.47
2004	26.6	22.82
2005	28.3	13.41
2007	29.3	10.41
2008	34.0	6.12
Correlation Coefficient		-0.93

Source: Trade data compiled from WITS web site

Table 3 shows the data regarding our third hypothesis, i.e., the level of GL-IIT and 6-digit import-weighted average tariff, for the period from 2000-2008. In this case, it is noteworthy that, since

each year tariff data was not available therefore only those years' tariff data which was available is shown in Table 3.

Out of the nine years period under consideration, tariff data were available only for five years, as shown in the Table 3. It is very clear, from Table 3, as expected theoretically, decrease in tariff promoted increase in IIT. The sign of correlation coefficient is negative and it is strongly correlated.

Result

The analysis shows that, all the three hypotheses proposed in the previous section are accepted. With the passage of the time the degree of India's IIT has increased along with the contribution of IIT in total trade. This shows the importance of intra-industry trade in India's total trade. Increasing intra-industry trade may also reveals that now the demand-pattern of the country is changing and consumers are demanding different varieties of a product rather than having several products with one variety only. This trend can be justified with the fact that as the economy grows the demand of different varieties of a product increases, this is because of the increase in disposable income of consumers. This trend fits well with our case of India, that India is also a developing country and economy has grown significantly during the last ten years period, therefore one can expect that the number of consumers with more disposable income has increased resulting increase in demand of different varieties of a product which ultimately leads to increase in intra-industry trade of the country.

In the second test, we found that vertical intra-industry trade dominates over horizontal one and this pattern of trade can be explained by the fact that although India is a developing country most of its trade are with developed country, i.e., with dissimilar economies. Although the trade figure is not shown over here but India's major trading partners are USA, European Union, China and Singapore and all these economies are much bigger than Indian economy. India acts as manufacturing and outsourcing base for these countries which also leads to more VIIT than HIIT. Therefore we can accept our second hypothesis that India being a developing country, VIIT dominates HIIT.

In the third test, it was found that an inverse

relationship exists between IIT and import-weighted average tariff rate, this is again confirming our hypothesis that decreasing tariff helps in promoting IIT. Theoretically this can be explained easily that as tariff rate will decrease it will lead to increase in trade. Now the hypothesis that was tested over here shows that decrease in tariff helps not only in increasing trade but also helps in increase in intra-industry trade this finding is also important because this is not necessary that increase in trade will always lead to increase in intra-industry trade. Therefore one can say that our result matches with theoretical expectations.

Conclusion

Looking at the results of analysis, one can say that the nature and pattern of India's intra-industry trade is more or less matching with the theoretical principles. Along with this increase in intra-industry trade of India signifies that over the years its economic conditions have improved because increase in intra-industry trade can be treated as an indicator of Indian people having more disposable income resulting increase in demand of different varieties of a product. The scope of the paper can be expanded further if we take cross-country as well as cross-sector analysis of intra-industry trade into consideration, then we shall get some deeper understanding of the nature of India's IIT. To conclude, the paper may ignite some more minds into this direction and we get better analysis and some more understandings regarding India's IIT, in future.

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