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# What Leads to Intra-Industry Trade between Sri Lanka and South Asia?

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## Abstract

This study ascertains the determinants of Intra-Industry Trade (IIT) with particular reference to IIT between Sri Lanka and its major trading partners in South Asia; namely; India, Pakistan and Bangladesh. The study uses secondary data published in World Development Indicators, Penn World Table from 1992 to 2017. The level of IIT is calculated by using data gathered from Comtrade Data Base. Using panel data regression, the study adopts Random Effect model to analyze the regression results. The study concludes that economies of scale measured by difference of value added in the net output of the manufacturing sector and market size measured by average gross domestic product exert a significant influence on the level of IIT in the South Asian region. Differences of per capita Gross National Income (GNI - difference in income level) and tariff rate (the proxy for trade barriers) poses a negative influence on the level of IIT. The policymakers should be concerned about the possibility to increase IIT in the South Asian region. Based on the findings of the study, the present research offers policy recommendations to promote IIT within the region.

**Keywords:** Country-Specific Determinants, Developing Countries, Industry-Specific Determinants, Intra-Industry Trade, Intra-Regional Trade, South Asian Region

## 1. Introduction

Intra-Industry Trade (IIT); the two-way exchange of goods within the same industry, is an international trade pattern which was observed among European countries in the period of post-world war II. This trade pattern could not be explained in the traditional trade theory which was based on comparative advantage. Verdoon (1960) investigated that international trade patterns that were taken place among the European nations were mainly within industries rather than between industries. Since that era, IIT became a constant pattern of trade in international trading and its share in international trade is increasing by about 4-5 percent per annum. Consequently, the IIT consists of one-fourth of the total international trading in the world economy. With cheaper and reliable communication and transportation methods, the world is more integrated than a few decades ago. It implies that it is more efficient and profitable to outsource the production to countries where factors of production prices are cheaper for the comparative advantage. This concept of product fragmentation is

considered as the determining factor of IIT level. According to empirical evidences by Hanson (1997), Yeats (2001) and Hummels and James (1993), it proves that fragmentation of a product causes to surge in intermediate products and most of the trade flows in intermediate products are in intra-industry nature among the advanced regional grouping. Hence, IIT is considered as the dominant trade pattern between countries that are having similar economic development. Accordingly, several studies that deal with IIT have been conducted by focusing only on advanced or industrial countries' contexts and empirically proved that the IIT share of total trade in developed countries is higher than the under developing countries and its increasing rate is around 5% per annum (Akram & Mahmood, 2012). But there are few studies that have focused on the level of IIT in less developed countries (Willmo, 1972).

Usually trade between developing versus developed countries has been explained with traditional trade theories, such as Heckscher-Ohlin theorem. Therefore, there is a lack of trade relations between developing and developed countries in terms of Intra-Industry Trade. But, Tarakan (1986) and Balassa (1986) argued that there is a substantial Intra-Industry Trade between developed and developing countries by their empirical studies.

All the countries in the South Asian region (perhaps except India), are in the same level of economic development. All of them are labor-intensive and importing capital-intensive products, more than 50% of the GDP is contributed by the service sector, 50% of the respective labor force of the country is employed in the agriculture sector and the manufacturing sector is recording a substantial growth. Therefore, the South Asian region can be considered as a region that satisfies the fundamental economic characteristics of the theory of Intra-Industry Trade. But the statistical evidences that intra-regional trade in the South Asian region is growing very slowly as a portion of total international exports and imports<sup>1</sup>. Therefore, it is pertinent to ask the question of how to increase the participation of South Asian countries to the intra region trade and what factors determine the potential for trade within the region. Some important studies have commented on this regard. Kemal et.al (2001), Mohanty (2003), Mukherji (2004), and Pitigala (2005) have examined numbers of factors that can affect the growth of intra-region trade in South Asia, and all of them primarily address the potential for developing production network in South Asia and strengthening the IIT, in order to increase both the growth of the intra-regional trade and regional economic growth.

On the other hand, according to the author's calculations, based on data from Comtrade data base, it proves that only limited categories of production have contributed significantly to increase the level of IIT between Sri Lanka and other selected South Asian countries. But there is higher potential to gain the benefit of IIT due to the country-specific and industry-specific characteristics which underpin the basic theories of Intra Industry trade and pave the path to intra-regional trade.

Thus, this study intended to identify the determinants of Intra-Industry Trade in the South Asian region; with particular reference to the IIT between Sri Lanka and its major trading partners in South Asia, namely; India, Pakistan and Bangladesh. Given the importance of IIT, the contribution of this study can be judged since, this study investigates the level of IIT and its determinants, for continuous 25 years' period and this is one of the few studies which provides the analysis on the determinants of IIT in Sri Lanka with the other three major economies in South Asian region. Additionally, if this study will investigate the factors that are contradicting to the traditional determinants of international trade and could be generalized to the developing countries' trade patterns, it may have other welfare and policy implication for the developing countries.

Moreover, the remainder of this study is organized as, firstly, Literature Review to present the theoretical and empirical background of the determinants of IIT and secondly, the methodology that employed in the study will be presented. The third section will analyze the results and discuss the findings and finally, the last section presents the conclusion and recommendation of the study.

<sup>1</sup> The Handbook of Statistics, United Nations Conference on Trade and Development shows that, the Intra-region exports by SAARC have just amounted to 5.6% of their total international exports while 25% in ASEAN, 53.8% in NAFTA, and more than 67% in the EU.

## 2. Literature Survey

Intra-Industry Trade- the simultaneous exports and imports within the same industry have been defined as the residual that proposition after deducting inter-industry trade from total trade (Grubel & Lloyd, 1975). In the 1960s, the concept of Intra-Industry Trade was introduced to the world and it provided the base to a large number of empirical and theoretical studies.

In the period of Post-World War II, the space for trade amongst nations that produce similar commodities by using similar factors of production was created. Many industrialized countries had been exercising international trade with their trading partners in a significant proportion of their total trade as within the industry import and export trade patterns. In other words, the countries which have similar capital endowments and technology started to trade with each other and gained profits? from it. Those trade flows took place within the same industry rather than between industries. This international trade pattern based on Economies of scale and differentiated products is identified as the Intra-Industry Trade (Akram, 2013). Even though there are early identifications on trade within the industry by Ohlin (1933) and Hilgurt (1935), studies at the beginning of the 1960s connected to consequences of the formation of the European Economic Community (EEC), the phenomenon of IIT was discovered by Balassa (1986). Balassa and Bauwens (1987) began IIT literature by analyzing the customs union in Europe. The study explained the nature of IIT by investigating the trade within industries of the customs union in Europe. After introducing an index as a comprehensive measurement to measure the level of Intra-Industry Trade by Groubel and Lloyd (1975), the studies were driven through a different aspect. The comprehensive study on IIT began/commenced by their classic book in 1975, *Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products*. The book examined the measurement of IIT and since then, the suggestions of the authors have been the standard measure of IIT. Therefore, it is used in most of the empirical studies in order to measure IIT (Lundberg, 1981), (Gavelin and Lundberg, 1983), (Culem, 1986), and (Rodgers, 1987). Grubel and Lloyd (1975) have given some explanation regarding why IIT arises. They identified an important role of product differentiation in IIT in a non-formal way. The development of theoretical models in which IIT occurs as an outcome of their works.

According to the writer's knowledge, there are only a few studies available that address issues of IIT in the South Asian region. Among them, most of the studies were based on India and Pakistan international trade patterns. The others have focused on the intra-regional perspective of IIT. Among them, have analyzed the reasons for the low level of intra-regional trade within South Asia. He emphasizes that political differences and restrictive policies, almost identical pattern of competitive advantages, lack of complementarities among trading partners are the plausible factors of growth within South Asian regional trade. Furthermore, Mohanty (2003) emphasized the significant potential to trade and investment in the South Asian region. He observed the need for profound and strategic liberalization of trade to foster inter-regional trade. On the other hand, Shahbaz and Leitao (2010) studied the determinants of IIT for Pakistan with its ten major trading partners and over 26 years: from 1980 to 2006. They concluded that the similarities in taste and preference of the customers in two trading partner countries, economies of scale and product differentiation are influencing factors to the level of Intra-Industry Trade.

According to the above review of different studies led to the judgment that IIT is beneficial for producers by allowing them to produce fewer varieties with economic efficiency as well as consumers by providing them a wide range of choice of available goods at lower prices. But, there is a lack of empirical studies available that analyses the determinants of intra-industry trade in final goods and intra-industry trade focus on countries of the SAARC region. The present study attempts to bridge this research gap.

## 3. Sample and Methodology

This research conducts a comparative analysis of IIT between Sri Lanka and other selected South Asian countries in order to identify the Determinants of IIT. In this work, secondary data has been used and data collection instruments were secondary data sources such as the Com-trade database and the World Bank's World Development indicators. Data on IIT and other variables from the year 1992 to 2017 for 25 years were collected for this purpose.

### 3.1 The Target Population and The Sample

The research population comprised all countries in the South Asian Region. According to the World Banks' definition the number of countries in the South Asian region is eight, Namely; Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

The study selected four countries namely Bangladesh, India, Pakistan and Sri Lanka as its sample size. Basically, this research compared the IIT between Sri Lanka and other selected South Asian countries; Bangladesh, India and Pakistan. The study used the convenience sampling technique in order to address the total population. Therefore, these countries were selected into the sample due to the data availability and convenient approach for data collection.

### 3.2 Methodology

#### Model specification

In line with the past literature, this study applies Gravity Model and Panel Regression to examine the effect of selected explanatory variables on Intra-Industry Trade. The gravity model can be defined as,

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2} \quad (1)$$

Where,  $F_{ij}$  stands for the Force of attraction between two countries  $i$  and  $j$ , and  $M_i M_j$  represents the Mass of the countries respectively.  $D_{ij}$  is the Distance between the countries  $i$ ,  $d j$  and  $G$  is the Gravitation model. The gravity model can be written in the same manner as the Newton law, and transforming the Newton's law to the trade,

$$Y_{ij} = \alpha \frac{y_i y_j}{D_{ij}} \quad i = 1, \dots, N \text{ and } j = 1, \dots, N \quad i \neq j(2)$$

Where,  $Y_{ij}$  is the bilateral trade between countries,  $y$  is the economic size of trading partners and  $D_{ij}$  is the distance taken as the trade barrier.

The gravity model in its logarithmic form defined as,

$$Y_{ij} = a + b_1 \log y_i + b_2 \log y_j - b_3 \log D_{ij} \quad (3a)$$

In this study, the core gravity model will be augmented with its independent variables to examine the flows of Intra-Industry Trade in the South Asian Region. The variables of the study comprised, the Intra-Industry Trade as the dependent variable and Difference in Per Capita Income, Market Size, Economies of Scale and Barriers to Trade as independent variables. The regression model is a multivariate model stating that the Intra-Industry Trade as a function of the selected independent variables.

Thus, the regression equation will be,

**IIT = f (Difference in Per capita income, Economies of scale, Product differentiation, Barriers to trade)**

Therefore, the augmented gravity model which this study used is,

$$Y_{j|ht} = C + \log DPCGDP_{hft} + \log AGDP_{hft} + \log DVADD_{hft} + \log TR_{hft} \quad (3b)$$

Where,  $Y_{j|ht}$  stands for Intra-industry trade flow between home country  $h$  and Trading partner  $f$  in year  $t$  in industry  $j$ , and  $DPCGNI_{hft}$  is the Difference in per capita GNI between the home country and its trading partner  $f$  in year  $t$ .  $AGDP_{hft}$  represents the Average GDP between the home country and its trading partner  $f$  in year  $t$ .

$DVADD_{hfi}$  represents the Differences of Value added in the net output of the Manufacturing sector and  $TR_{hfi}$  is the ratio of actual Tariff charges imports in the home country.

### 3.3 Definition of Variables

The dependent variable is the level of exports and imports of products, produced within the same industry, between countries. That is the level of Intra-Industry Trade. The extent of the Intra-Industry Trade level is calculated by using the Grubel–Lloyd index model (Groubel & Lloyd, 1975).

They defined IIT as the difference between the trade balance of specific industry and the total trade of the identical industry.

Adjusted G-L index is defined as;

$$IIT = 1 - \frac{|X_i - M_j|}{(X_i + M_j)} \iff IIT = \frac{(X_i + M_j) - |X_i - M_j|}{(X_i + M_j)} \dots \dots \dots (4)$$

The index takes values between 0 and 1. If the index is equal to 0 it indicates pure Inter-Industry Trade which means there is no Intra-Industry Trade and value 1 shows, all trade is of the Intra-Industry pattern. In this study, the value of IIT index is measured according to SITC (Standard International Trade Classification) revision-3, section 6 and section 8 which is described as manufacturing goods classified chiefly by the material and Miscellaneous Manufactured Articles, respectively.

### 3.4 Independent Variables

DPCGNI- absolute difference in GNI per capita between Sri Lanka and its trading partner is used as a proxy for income differences between trading countries. Linder (1961) investigated that per capita GNI can be used as a measurement of people's taste and preferences. Further, the studies explained that countries which have similar taste and preferences have similar level GNI per capita level and therefore they engaged in bilateral trade more than countries which have different per capita GNI levels (Helpman & Krugman, 1985; Hanson, 1997). Therefore, it is expected to be a negative sign between the level of bilateral trade in terms of IIT in total international trade and difference in per capita GNI. Annual difference in Per Capita Gross National Income which is constant to 2011 in USD is used to measure the DPCGNI and the data for the variable has been collected from the Penn World Table data base.

AGDP- The average GDP of Sri Lanka and its trading partner represents the market size of the economies. Annual GDP constant to 2010 in USD for each country is used to measure the variable and data is gathered from World Bank's World Development Indicators. Both GDP and the population have been used as a measurement of the market place in the gravity model. The market size of domestic firms will be increased by trade. thus, it increases the benefits by decreasing the average cost of production and increasing productivity (Krugman 1979). Many differentiated goods can be produced in large markets under the condition of economies of scale and there is a huge demand for foreign differentiated goods from the domestic market. Therefore, the possibility of IIT is very high. Also, as Ethier (1982) explained, with the free trade patterns, an increase in economies size enables the scale of production. Therefore, it is expected to be a positive sign of the share of IIT and the average GDP.

DVADD - Absolute differences of Value added in the net output of the manufacturing sector is used as a proxy for economies of scale. Manufacturing Value Added which is constant to 2010 in USD has been used to this purpose and data is collected from World Bank's World Development Indicators of the respective countries. Economies of scale that origin in a firm due to its large production scale is considered as negatively related to product differentiation. Ethier (1982) and Feenstra and Hanson (1997) argued that intra-industry trade in final manufactured goods is an increasing function of component varieties produced in both trading countries and that the economies of scale are a result of the greater division of labor rather than due to large plant size. Hence, the

small plant size is positively related to IIT in final manufacturing goods. He expects a negative sign between economies of scale which occurred due to large plant size and IIT.

TR - The probability of IIT in highly protected countries is very low. On the other hand, if the trade barriers are lowered the overall portion of IIT may rise. Therefore, the expected coefficient sign is negative. The average level of the tariff and non-tariff barriers for the home country and each of the trading partners can be used as an ideal measure of trade barriers (Gabriel, 1987). Due to the data and resource constraints, this study only uses the average tariff barriers for other countries. Tariff rate, the ratio of actual tariff charges imports act as a proxy variable to represent the trade barriers. The data was collected from the World Bank's World Development Indicators.

### 3.5 Hypotheses Development

This study aims to identify the determinants of Intra-Industry Trade in South Asian region. Thus,

H0 = there is no significant relationship between dependent variable and independent variables.

H1 = there is a significant relationship between dependent variable and independent variables.

## 4. Analysis and Discussion

To find out the determinants of Intra-Industry Trade in the South Asian region, this study used panel data and observed the relationship of the selected variables on IIT between Sri Lanka and selected South Asian countries; Bangladesh, India and Pakistan.

### 4.1 Summary Statistics

Summary statistics include 9 factors that represent the nature of data. The mean indicates the average values of the variable. The variance is calculated by the square of the standard deviation and it used to measure the dispersion of each variable. Standard deviation and range also show the dispersion of variables. The range can be identified as the difference between maximum and minimum values. Skewness and kurtosis are considered as measurements of symmetry and how data are tailed to a normal distribution respectively. Two factors of descriptive statistics; mean and median, can be used as the measurements of central tendency. The median of all variables which is less than its mean value indicates that all variables are positively skewed. According to the standard deviation TR has the highest variation while AGDP has the minimum variation. These results are also proved by the maximum and minimum values.

Table 1: Summary statics of the variables

Variable	IIT	TR	DPCGNI	DVADD	AGDP
Obs	78	59	75	75	75
Mean	.3275594	2.863112	.0219676	0.322271	.0529993
Minimum	.0090653	2.051556	-.0301158	-.5998096	.0117912
Maximum	.9886605	4.44640	.0744836	.7373915	.083149
Median	.200997	2.70069	0.209975	.3222123	.0512123
Std.div	.3112109	.5020051	.0174703	.1297896	.0159110
Variance	.0968522	.2520091	.0003052	.168453	.0002532
Skewedness	.9516957	.8856437	-0.171854	.4868324	-.135849
Kurtosis	2.387274	3.70069	4.215978	20.71301	2.4154

Source: Author Compiled

### 4.2 Empirical Analysis

This study uses 25 years of available secondary data based on IIT between Sri Lanka and other selected three South Asian countries in order to identify the determinants of IIT in the South Asian region. For that purpose,

the data set was estimated using panel data analysis, which has two dimensions; three country pairs and 25 years. The data for measuring the level of IIT reported in SITC (Standard International Trade Classification) revision 3-section 6 and 8- Manufacturing Goods classified chiefly by Materials and Miscellaneous Manufactured Articles respectively.

Before the estimation, it should be tested whether any econometric problem occurs in the data. For that purpose, the study has tested for the presence of Stationarity, heteroscedasticity and multi collinearity problems. To detect and overcome these econometric problems diagnostic tests such as Unit root test, Breusch-Pegan test and VIF test are employed.

The study has focused on two techniques that are used to analyze the panel data such as fixed effect and random effect which allow accounting for individual heterogeneity. To select the most appropriate method between the FE method and the RE method to analyze the empirical results of the model, the Hausman test is used. According to the results (P-Value= 0.7456>0.05) of the test the Random effect model was selected as the appropriate model to analyze the estimated results. Then Breush-Pegan Langrange multiplier (LM) is used to diagnose whether the most appropriate method is the random effect model or simple Ordinary Least Squared (OLS) regression model. According to the LM test, the results(P-Value=0.0082<0.05) indicated that the Random effect is more suitable to analyze the regression results. Therefore, this study ran/analyzed the regression under the random effect model to determine the factors which are affecting the IIT level. The regression is included the level of IIT as the dependent variable and the four predictor variables to analyze the relationship between these two types of variables.

Table 2: Regression Results of Random Effect model

VARIABLES	Coefficient	t-Statistic
<b>d_lgdpcgni</b>	-0.0282	-0.0821
<b>Lgtr</b>	-0.0630	-0.565
<b>d_dvadd</b>	-0.641***	-5.057
<b>d_agdp</b>	0.381***	3.861
<b>Constant</b>	-2.129	-0.961
R-square	0.3649	
Prob>f	0.0000	

z-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

According to the results of the regression model all the signs of the variables are as expected.

According to the model, there is a positive relationship between IIT and the Average Gross Domestic Production (the proxy for the Market Size) and this relationship has been ensured by Akram & Mahmood (2012) and Turkan (2005). The reason behind this relationship is when the market size increases there is a feasibility for firms to increase their productivity and gain the benefit of economies of scale. It enables firms to compete in the international market by decreasing the average cost of production. Hence, the increase in opportunities for profit-making, increase the IIT consequently.

The variable difference in Value-Added in net output of the manufacturing sector, the proxy for economies of scale, is negative and statistically significant. This result is in-line with Greenaway et al (1995) and Akram and Mahmood (2012) who concludes that production fragmentation causes to increase the number of differentiated productions, and economies of scale that origin in a firm due to its large production scale is negatively related with product differentiation. But this result is against the predicted theory by Krugman (1979) and concluded that the plant size should be reduced in order to increase the IIT level.

The Difference in per capita GNI has a negative insignificant (prob=0.337) correlation with IIT which means when the difference of PCGNI is increased and it causes the downfall in the level of IIT. Also, the ratio of actual tariff charges imports in home country (TR) also indicate a negative insignificant correlation with IIT, which implies that when increase the tariff barriers, limitations of IIT arise.

## 5. Conclusion

Determinants of IIT with special reference to IIT between Sri Lanka and South Asian region: this study observes the determinant of Intra-Industry Trade used for 25 years by 3 pairs of countries, namely; Sri Lanka- India, Sri Lanka- Pakistan and Sri Lanka- Bangladesh. Though international trade in terms of IIT is increasing in the South Asian region there are only a few empirical studies which have examined the determinants of IIT between South Asian countries. Theoretically, there are two types of factors that are affecting IIT namely; country-specific determinants and industry-specific determinants. This theoretical debate is examined by empirical studies and they have suggested mixed results. However, this study is different from those studies because it examines both country-specific and industry-specific determinants which influence the level of IIT between Sri Lanka and other selected South Asian countries. To achieve this objective, this study has run a panel regression model which have two dimensions; country and time. The panel data technique can be performed in two ways Fixed effect model and Random effect model. The results of the Hausman test provided evidence to select Random effect as the more appropriate model to estimate the results.

According to the results of the Random Effect model, it concludes that the economic size and the economies of scale have a significant influence on the Intra-Industry Trade level between the two countries. In particular, Average GDP between Sri Lanka and partner countries (the proxy for economic size) found to be positively correlated with the Intra-Industry Trade and Difference in Value added to net out-put (the proxy for economies of scale) is negatively correlated with the IIT for Sri Lanka. Variables namely; difference of per capita GNI (difference in income level) and tariff rate (the proxy for trade barriers) negatively influence to the level of IIT though they cannot be considered as a major determining factor of IIT in Sri Lanka, according to the results of the model.

Moreover, the study implied an increasing pattern of IIT between Sri Lanka and its partners in the South Asian region. Thus, this study suggests that Sri Lanka and other South Asian trading partners should make a collaborative exertion to increase the level of IIT in order to sustain and strengthen the regional economic interest and enhance the volume of the regional trade.

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