

The Role of Preferential Trade Agreement (PTA) between Iran and Malaysia in their Intra industry Trade (IIT)

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Abstract

Early trade liberalization in the East Asian newly industrialized economies took place against a backdrop of rapid growth. Later, following the instability of the international economy in the late 1970s/early 1980s, several developing countries adopted major economic reforms including trade liberalization somehow in the form of preferential trade agreements. Increasing openness and mutual trade relations are likely to be associated, not only with increasingly competitive product markets but also with intra industry trade (IIT), that is, the simultaneous exports and imports of products within the same industry. Intra industry specialization has attracted considerable attention in recent years, and an increasing number of researchers have developed econometric models to explain intra industry trade. This paper has two objectives. First it strives to calculate the extent of bilateral intra industry trade of Iran and Malaysia, using Grubel & Lloyd index at the 6-digit level of harmonized tariff schedule over the years 1997-2001. Secondly, some of the various sources of intra industry trade are combined in a panel gravity method to explore the impact of implementing any PTA between two countries on the bilateral Iran-Malaysia trade relations. The results of our econometric study support the hypotheses put forward in literature as far as the common characteristics of the countries in question are concerned. Thus, the regression coefficients of the average gross national income, Linder variable, average country size, inequality in country size, distance, and preferential trade agreement all have the expected sign and are statistically significant in 10 percent level in the fixed effect model. The findings support our hypothesis, showing that preferential trade agreement plays a significant role in the rapid increase of IIT between the two countries.

Keywords: Iran-Malaysia Trade Relation, Intra industry Trade, Trade Integration, Gravity Model

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1- Introduction

The world trade patterns have changed very markedly in the past few decades. The simple nineteenth century Ricardian model or the Heckscher Ohlin explanation of inter industry trade patterns no longer dominates international trade. One of the most important trends in the world trade has been the emergence and growth of intra industry trade (IIT), particularly between developed countries, which is defined as the simultaneous import and export of goods within the same industry. The growth of intra industry trade has attracted increased attention in the economic literature. A number of studies have discussed the conceptual and statistical problems involved in trying to measure intra industry trade. Some of the notable works are those of Balassa (1966), Grubel and Lloyd (1975) and Aquino (1978). Economists have also centered on questions that have important implications for economic policy. These issues revolve around the impact of trade liberalization on the levels of intra industry trade and the cost of adjustments following removal of trade barriers between trading partners.

The concepts of intra industry trade and the economic integration in the form of preferential trade agreements (PTA) have been closely associated since the formation of the EEC in 1950s. Balassa (1966) provided evidence of intra industry trade patterns following European integration. The major issues in this paper are as follows: First, do preferential trade agreements foster intra industry trade? Second, what are the determinants of intra industry trade? The experience of a preferential trade agreement between Iran and Malaysia provides an opportunity to examine whether trade liberalization has promoted more intra industry trade between these two Asian countries. In this study, we compute first the 6-digit level of IIT for Iran and Malaysia to explore the flow of trade between the two countries over 1997-2001. Then, by measuring 6-digit level of intra industry trade for Iran and all of its IIT trading partners (including Malaysia), we examine the hypothesis in which the conduction of trade integration between Iran and Malaysia, for example, in the form of preferential trade agreement (PTA), can foster intra industry trade of such partners. This, in turn, can be on the basis of a model specification, which relies on the gravity theory. The plan of the paper is as follows. First, a theoretical review of IIT is presented in Section 2, while the related IIT indicators for Iran in relation with its partners (including Malaysia) are computed and relevant results are analyzed.

Third, in Section 3, the impact of a preferential trade agreement plan between Iran and Malaysia is examined by specifying a panel IIT model based on gravity theory. Finally, some concluding remarks are presented in Section 4.

2- Theoretical Review of Intra Industry Trade

Since three decades, the theory of intra industry trade has been presenting a specific interest as far as simultaneous exports and imports of similar goods represent a large and increasing share of international trade. Thus, trade structure may not be predicted only by the traditional theory of trade. As a matter of fact, Ricardian and Heckscher-Ohlin types of model explain the nature of trade by supply side differences. Following these models, one would expect that trade only appears between countries characterized by different factor endowments. Nevertheless, world trade is essentially dominated by trade between developed countries with similar economic structures and factor endowments. In models of monopolistic competition, the preference for variety on the demand side combined with the presence of economies of scale on the production side play a crucial role in the appearance of intra industry trade. All countries have a preference for the variety of goods. However, only a small number of them are domestically produced. This happens because of the presence of increasing returns to scale, which favors the concentration of production by limiting the optimal number of varieties, which may be produced in each country. Lancaster (1980) and Krugman (1979, 1981) maintain that intra industry trade expansion is a result of product differentiation in markets with monopolistic competition and increasing returns to scale. According to these authors, trade in differentiated products is most likely to place between countries with similar factor endowments and high levels of per inhabitant income. Following Helpman and Krugman's (1985) standard model on intra industry trade, economies of scale stimulated international trade and specialization. Helpman and Krugman (1985) incorporate factor endowments, decreasing costs and product differentiation in a model, which generates both intra and inter industry trade.

2-1- Measuring Intra Industry Trade

Balassa (1986) proposed the first measure of intra industry trade that measured the degree of trade overlap-simultaneous import and export of goods-within an industry. He suggested that it be measured by the extent to which

exports of a given good are offset by imports of an equivalent good. Algebraically, if X_i is the value of the exports of commodity i by a country, and M_i is the value of the “matching” imports then the Balassa index is:

$$B_j = \frac{|X_i - M_i|}{(X_i + M_i)} \quad (1)$$

This index, the ratio of net trade to gross trade, ranges from 0 to 1, with 0 representing "perfect" trade overlap, and therefore pure intra industry trade, while 1 represents pure inter industry trade. In other words, if there is no intra industry trade then either there are no exports ($X_i = 0$) or no imports ($M_i = 0$), $B_i = 1$, if there is “perfectly matching” intra industry trade then ($M_i = X_i$) and $B_i = 0$. In order to calculate intra industry trade at the country level, Balassa took a simple average for each B_j :

$$B = \frac{1}{n} \sum B_j \quad (2)$$

Where n is number of industries. This can be generalized to be a weighted index:

$$B = \sum_j w_j B_j \quad (3)$$

Where w_j is industry j 's share of total trade.

The Balassa index has not found much favor, because an index, which measured intra industry trade that gave pure trade overlap a value of zero, was not intuitively appealing. Most studies use the Grubel and Lloyd index, which, as we shall see, is a simple modification of the Balassa formula. The index is defined as:

$$GL = \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} = 1 - B_j \quad (4)$$

This index assigned pure intra industry trade a value of 1 and pure inter-industry trade a value of 0. As with the Balassa index, the Grubel-Lloyd index

has been calculated as a/an (un) weighted average to measure the degree of intra industry trade at the country level. This class of index has been criticized for suffering from categorical/sub-group aggregation issues. These issues have two basic forms that bias the index toward 1: the grouping of two products in the same industry which should not be classified together; and trade imbalance.

The principal difficulty with Balassa index (and indeed other measures) is the problem of ambiguously defining the term “industry”. Invariably, the index is measured at a particular level of statistical aggregation, which may be the appropriate level for some activities but not for the others. There is not a priori reason why one particular level of aggregation is necessarily more appropriate than any other; although a number of researchers have argued that the third digit of SITC (or its equivalent in national classifications) is a suitably disaggregated level for empirical analysis. Even at the third digit however, it is quite possible to find activities with different production functions grouped into the same category. The consequence of this misclassification can be referred “categorical aggregation”. One solution for solving this problem is probably to regroup the basic data such that only activities with similar production function and/or end use are grouped together. The absence of a unique criterion for regrouping makes this option problematic.

Trade imbalance can occur when sub-groups are not appropriately aggregated. This problem arises when the net trade-gross trade ratio is characterized by opposite trade imbalances for the sub-groups (Greenaway and Milner, 1983). The source of the problem is that the Grubel and Lloyd index at any given level of aggregation is a weighted average of the indices for the next most disaggregated groups. We may show this formally as follows:

Let i be the aggregated group, so that X_i and M_i are the exports and imports in that group. Suppose there are n commodities/ sub-groups within i , with the exports and imports in the subgroup being X_{ij} and M_{ij} respectively. Then we may write the Grubel and Lloyd index for the aggregated group of i as:

$$B_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} = 1 - \frac{|(X_{1i} - M_{1i}) + (X_{2i} - M_{2i})|}{(X_{1i} + M_{1i} + X_{2i} - M_{2i})} \quad (5)$$

If $X_{1i} - M_{1i}$ and $X_{2i} - M_{2i}$ have the same sign, then $|(X_{1i} - M_{1i}) + (X_{2i} - M_{2i})| = |(X_{1i} - M_{1i})| + |(X_{2i} - M_{2i})|$ and we have

$$B_i = w_{1i}B_{1i} + w_{2i}B_{2i}$$

Where:

$$B_{ij} = 1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \quad (6)$$

Is the Grubel and Lloyd index for subcategory j , and

$$w_{ij} = 1 - \frac{|X_{ij} - M_{ij}|}{(X_i + M_i)} \quad (7)$$

Is the share of subcategory j trade in category i trade.

If however $X_{1i} - M_{1i}$ and $X_{2i} - M_{2i}$ have the opposite sign, then $|(X_{1i} - M_{1i}) + (X_{2i} - M_{2i})| < |(X_{1i} - M_{1i})| + |(X_{2i} - M_{2i})|$, and so

$$B_i > w_{1i}B_{1i} + w_{2i}B_{2i}.$$

In other words, if the country in question is a net exporter (importer) in both sub-groups the weighting effect of the ratio is maintained, but if the country is a net exporter of one good and a net importer of the other good, the weighting effect is lost and the Grubel-Lloyd index will take on a different value (Greenaway and Milner, 1983).

Various methods have been suggested for modifying the Grubel-Lloyd index to meet this problem. Greenaway and Milner (1983) discuss such problems in greater depth and say the index can be corrected by replacing the original net trade-gross trade ratio with the following one:

$$\frac{\sum_{i=1}^n |X_{ij} - M_{ij}|}{(X_j + M_j)} \quad (8)$$

Where i is the sub-group i within industry j . This adjustment removes the trade imbalance bias that results from countries being a net exporter in one

sub-group of an industry and a net importer in another sub-group as well as the simple aggregation bias. So we are left with the following index of intra industry trade:

$$GL'_j = 1 - \frac{\sum_{i=1}^n |X_{ij} - M_{ij}|}{(X_j + M_j)} \quad (9)$$

Generally speaking, if a country is a net exporter/importer in both goods, $GL = GL'$, but if a country is a net exporter in one good and a net importer in another, $GL < GL'$; $0 \leq GL \leq GL' \leq 1$ (Greenaway and Milner, 1983).

There was another adjustment suggested to the Grubel-Lloyd index by Aquino (1978), which was in response to an imbalance in overall trade. The index of intra industry trade for any pair of countries (IIT_{jk}) after adjustment for imbalance in total trade between any pair of countries will be:

$$IIT_{jk} = 1 - \frac{\sum_i |X_{jki}^e - M_{jki}^e|}{\sum_i (X_{jki}^e + M_{jki}^e)} = 1 - \frac{\sum_i \left| \frac{X_{jki}}{X_{jk}} - \frac{M_{jki}}{M_{jk}} \right|}{\sum_i \left(\frac{X_{jki}}{X_{jk}} + \frac{M_{jki}}{M_{jk}} \right)} \quad (10)$$

$$X_{jki}^e = X_{jki} \frac{X_{jk} + M_{jk}}{2X_{jk}} \text{ and } M_{jki}^e = M_{jki} \frac{X_{jk} + M_{jk}}{2M_{jk}} \quad (11)$$

Where X_{jki}^e and M_{jki}^e refer to the adjusted exports and imports of commodity i in trade between country j and k . X_{jk} and M_{jk} , respectively stands for the total exports and imports of country j in trade with country k . The index takes values from 0 to 1 as the extent of intra industry trade increases. Greenaway and Milner (1983) subsequently showed that the suggested adjustment is more likely to induce, rather than remove, distortion in the Grubel-Lloyd index. Not surprisingly, this Aquino adjustment has fallen out of favor.

2-2- Intra industry Trade: Evidence from Iran and Malaysia

To compute the degree of intra industry trade, we use Grubel-Lloyd indicator (GL). The index has been computed by using data on Iran's bilateral trade relations at the 6-digit level of Harmonized tariff classification (HS), which have been extracted from PC-TAS (2001) for the period 1997-2001.

Iran and Malaysia have continued to concentrate on their area of comparative advantage in recent years. According to the data extracted from PC-TAS (2001); bilateral trade between the two countries in 357 products makes Iran as Malaysia's fourth largest trading partner in West Asia after the United Arab Emirates, Saudi Arabia and Turkey. These two nations exchange different types of goods within 6-digit HS level; Iran tends to produce live animals, vegetable and mineral products, products of the chemical or allied industries, textile articles while Malaysia produces digital goods and electrical equipments, plastics, machinery and mechanical appliances. These categories cover 332 products in bilateral inter industry trade of the two countries.

Table (1) summarizes computed Grubel-Lloyd indicators between Iran and Malaysia. The results show that a specific IIT strategy has not been available for both countries in recent years, while intra industry trade, as a proportion of Iran's international trade with Malaysia has been increased. The number of products in which Iran had intra industry trade with Malaysia has been increased from 12 to 18 over the years 1997-2001 and inter industry trade of the two countries has been decreased. Thus, the composition of trade has changed in this period from inter to intra industry trade. Trade overlap between the two countries mostly occurs in electrical equipments, sound recorders and accessories of such articles, vehicles, aircraft, vessels and associated transport equipments. Out of 25 good categories in the table, 16 products are manufactured articles (The codes start with 8). The results support the proposition that intra industry trade is likely to be more dominant in industries, which have a high degree of product differentiation, rapid innovation and specific technology. Developed economies have the capacity to promote and produce differentiated products. Thus, the high levels of intra industry trade in the advanced manufacturing countries may be related to their greater degree of differentiation by kinds, quality and characteristics of goods and greater external competition. Since Malaysia is a newly industrialized country (NIC), the above fact can be justified. In other words, Iran's intra industry trade with newly industrialized countries such as Malaysia tends to lie in industrialized products.

Table 1:GL Intra Industry Trade for Iran and Malaysia in the HS 6-digit level (Percent)

Code	Product	1997	1998	1999	2000	2001
290531	Ethylene glycol (Ethanediol)	63.37	38.02	89.93	93.53	5.74
294150	Erythromycin and its derivatives, in bulk; salts thereof	0	75.16	0	0	0
330499	Beauty or make-up preparations; sunscreen or sun tan preparations	9.76	76.39	72.16	0	0
390760	Polyethylene terephthalate	0	0	0	0	1.43
392690	Articles of plastics or of other materials of Nos 39.01 to 39.14	22.73	7.33	8.7	0	6.03
490199	Books, brochures, leaflets and similar printed matter	0	66.67	0	0	30.77
700529	Float glass etc in sheets, non-wired	0	0	20.45	0	0
700910	Rear-view mirrors for vehicles	0	0	0	0	29.87
845899	Lathes for removing metal	0	0	87.08	0	0
847192	Input or output units, whether or not presented with the rest of a system	0	0	4.44	0	30.06
847193	Storage units, whether or not presented with the rest of a system	0	0	31.53	0	47.05
847199	Automatic data processing machines and units thereof	58.46	0	58.91	0	1.64
847330	Parts & accessories of automatic data processing machines & units	95.73	0	0	0	2.2
850440	Static converters	6.27	53.41	11.81	62.4	23.24
852490	Recorded media for sound or other similarly recorded phenomena	38.71	4.55	80	4.76	9.18
852520	Transmission apparatus, for radiotelephone incorporating reception	0	84.75	5.71	0	0
853400	Printed circuits	18.05	10.57	20.68	0	91.89
853690	Electrical app for switching/protecting electrical circuits, not exceed 1000V	74.07	76.19	66.67	0	16.96
853710	Boards, panels, including numerical control panels, for a voltage $\leq 1000V$	0	0	17.39	0	63.41
854211	Monolithic integrated circuits, digital	58.06	0	78.69	0	87.89
854290	Parts of electronic integrated circuits and micro assemblies	29.11	0	0	0	0
870870	Wheels including parts and accessories for motor vehicles	0	17.39	75.47	0	0
871690	Trailer and other vehicle parts	0	0	0	0	45.42
880330	Aircraft parts	0	0	88.75	0	2.56
9999AA	National Chapter 99 data	21.54	24.23	23.13	4.13	5.29

Source: Compiled by the authors.

In general, as Table (1) shows, there is a wide gap between IIT s for all categorized products during the period, changing from 0 to about 96 percent. According to the results reported, a low magnitude of IIT exists in Code 390760 (Polyethylene terephthalate) over the years 1997-2001. The highest value of IIT has obtained for the code 290531 (Ethylene glycol (Ethanediol)) in 2000, which is almost 94 percent. However, it has been declined sharply in 2001 to about 6 percent. In general, low levels of intra industry trade are observed for all products in 2000, while they fluctuated in 1997, 1998 and 2001. A possible explanation can be identified as being pertinent with regard to Malaysia that is the recovery of Malaysia from Asian economic crisis. The Malaysian economy has been recovering strongly from the crisis. Lending rates have been falling steadily since 1999 but the decline has slowed down in 2000. The stock market has slowed down much in 2000 after its strong recovery from the fall in 1999. Thus, the exports of Malaysia have been declined sharply in 2000 due to the aforementioned events, which also caused low levels of intra industry trade. It seems that attempts to free up trade between the two nations, through preferential trade agreements can generate many conditions, which are causative factors of intra industry trade. The next section will examine the impact of any integrated trade relations on fostering trade flows through IIT improvement.

3- Impacts of Preferential Trade Agreement on Iran-Malaysia IIT

It is often stated that the increases in international trade during past decades are mostly intra industry, where we see two-way trade in the same industry. This phenomenon started in industrialized countries almost three decades ago. Australia, Japan and the newly industrialized nations of the Asia-Pacific region also experienced rapid growth in their intra industry trade. This trend is also observed in other regional integration efforts, such as Latin America, and Sub Saharan Africa. Intra industry trade (IIT), however, can result from completely different causes. The high level of a country's IIT with its trading partners can be attributed to a number of country specific factors including: level of economic development and differences, size of domestic markets and differences, distance and the existence of common borders, similar consumer tastes, language, culture, institutional, political and transport links, and more important, economic integration in forms of FTA or PTA. Several countries can have a high degree of integration due to a number of multilateral

trade agreements even in the frame of a block, such as East Asian countries in ASEAN or members of NAFTA. Basically, the theoretical arguments of the subject have been developed in the literature by Grubel and Lloyd (1975), Krugman (1979), Lancaster (1980) and Balassa (1986), and others. These results fit almost perfectly such theoretical profile outlined here.

3-1- Determinants of Intra Industry Trade

In examining possible hypothesis to explain the extent of intra industry trade between any pair of countries, consideration will be given to general country characteristics, including five broad categories: level of economic development, size of domestic markets, distance and the existence of common borders, economic integration, and levels of protection. Economic development is deemed to be a determinant of intra industry trade between two countries in two ways: 1) the level of economic development, and 2) the difference in economic development. High levels of economic development are seen as conducive to intra industry trade since highly developed economies have the capacity to produce differentiated products. And corresponding to this capacity comes highly differentiated demand. The most common variable used to capture this determinant is gross domestic (national) product (Income). The volume of intra industry trade is largest when the two trading countries are the same (both for economic development and market size). Therefore gross national income can be used to capture the level of economic development but some studies separate GNI of the two countries, while others average them. If this measure is averaged, it is necessary to include a variable that measures the differences between the two countries. Thus, one can hypothesis a negative correlation between the extent of intra industry trade between any pairs of countries and the inequality of the two levels of economic development. The measures of this inequality are the absolute value difference between the gross domestic (national) products per capita of the two countries under study (Anderson, 2002).

Lancaster (1980) showed that owing to the economies of scale, the equilibrium number of differentiated manufactured products would be the greater; the larger is the size of the market. Correspondingly, it may be hypothesized that the extent of intra industry trade between any two countries will be positively correlated with the market size. There are a variety of

measures used for this determinant. All studies use GDP or population, but some separate the GDP / populations of the two countries, while others sum the GDP /populations or average them and also use the inequality measure aforementioned.

Geographical proximity considers three determinants of intra industry trade. The first is transportation costs. In models of intra industry trade, such as that by Krugman (1979), transportation costs will reduce volume of such trade. The second is that two geographically close countries are more likely to be similar in culture and tastes, which increases the potential for intra industry trade. And third, geographically close countries are more likely to have a similar resource base, and therefore, participate in the same industries. Geographical proximity is captured by a dummy variable taking a value of one if the two countries share a border. It is also possible to capture this variable by a measure of distance between the two countries. It may be hypothesized that the extent of intra industry trade between any two countries will be negatively correlated with the distance between them. Furthermore, as Grubel and Lloyd (1975) mentioned, intra industry trade will be higher between countries sharing common border, than between countries, which do not have common borders.

Virtually, all countries are now members of at least one economic block and many belong to more than one. The growth of regional trade integrations has been one of the major developments in international relations in recent years. Regional trade agreements in forms of PTA or FTA vary widely but all have the objective of reducing barriers to trade between member countries that frequently result in increasingly trade flows and economic growth. In general, the theory of trade integration expresses that; countries make efforts to minimize trade restrictions amongst themselves and to collaborate in financial activities. After integration, trade transactions followed by a decrease in costs and resource reallocation will result in an increase in products, economic welfare for members and intra industry specialization. Since, many industries, in the process of integration, take advantage from scale economies and a high potential of goods differentiating, we can assume a revealing increase of intra industry trade. Trade integration between countries in the form of free trade agreement FTA, preferential trade agreements (PTA) or trade liberalization, can foster intra industry trade of such trading partners. It seems that attempts to free up trade between the nations, through trade integration, can generate many conditions,

which are causative factors of intra industry trade. Thus, Integration schemes are positively correlated with intra industry trade reflecting increased possibilities of intra industry trade within block integration. In an IIT regression model, economic integration is usually represented by a dummy variable taking a value of one if the two countries have entered into a custom or monetary union. Such countries have taken measures to lower or eliminate barriers to trade and its transaction costs. Thus, the extent of intra industry trade between two countries is positively correlated with participation in integration schemes. Also, the trade integration can be used as a proxy for culturally similar countries, which increases the potential of intra industry trade.

Trade agreements move gradually towards a global reality, such that all countries around the world are trying to remove or to reduce trade obstacles in order to reach finally a global regionalization. WTO is now involved in conjunction with such activities. In fact, regionalization stands for liberalizing economic activities of trade, investment and financial flows among partners in a region. Trade liberalization, by expanding market between two nations, will lead to a rising variety of products. Barriers to trade such as the average tariff level, the inequality of tariffs all hinder international trade, in general, and intra industry trade, in particular. Non-tariff barriers to trade may be captured by a trade orientation variable that measures deviation from a hypothetical level of per capita export. Countries that have higher than the hypothetical value have low non-tariff barriers to trade, while countries that have lower than the hypothetical value have high non-tariff barriers to trade.

3-2- The Empirical Model

Since the pioneering work done by Gruble and Lloyd in the mid-70s, a good amount of empirical work has been undertaken to examine IIT determinants. Cross-country models of intra industry trade have long been studied to explain the sophistication of the trade structure and the level of countries development. The key determinants for the IIT model are drawn from the theoretical and empirical literature. Following Helpman (1981), Balassa (1986), and Bergstrand (1990), the IIT model we estimate can be a function of aforementioned determinants. Thus, in this paper a panel regression analysis is specified on the basis of gravity theory to explore the impacts of those determinants on Iran's IIT.

Initially, two regressions have been estimated. The dependent variable in the first regression is IIT obtained from the Grubel and Lloyd index in the period 1997-2001. The independent variables are the average value of gross national income, Linder variable, average value of the populations, the absolute difference in populations, and trade imbalance defined as:

$$IMB_{ij} = \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \quad (12)$$

Where X_{ij} and M_{ij} stand for exports and imports between countries i and j . The index ranges from 0 to 1, with 0 representing trade balance and 1 representing trade imbalance. If $X_{ij} = M_{ij}$, then $IMB_{ij} = 0$, and if the country is only exporter/importer of the good ($X_{ij} = 0$) or ($M_{ij} = 0$), $IMB_{ij} = 1$. Thus, the model can be specified upon a gravity theory-based as follows:

$$IIT_{ijt} = f(AGNI_{ijt}, LIN_{ijt}, AMS_{ijt}, DMS_{ijt}, IMB_{ijt}) \quad (13)$$

Where:

IIT_{ijt} : Intra industry trade for any pair of countries in year t

$AGNI_{ijt}$: Average of gross national income for any pair of countries in year t

LIN_{ijt} : Linder variable for any pair of countries in year t AMS_{ijt} Country size (average of populations in year t)

DMS_{ijt} : Differences in the country size (absolute value difference in populations)

IMB_{ij} : Trade imbalance between the two trading partners

Where IIT_{ij} is an index of trade overlap between countries i and j in 6-digit harmonized system (HS). Gross national income proxies income levels, and population represents country size; both variables have been calculated on average for each pair of countries. $AGNI$ is measured on a bilateral basis using the average GNI (in current US\$) of the declaring country i and her partner j , following the methodology put forward by Bergstrand (1990), where it has a positive effect on the dependent variable. AMS stands for the average market size of two countries, which is proxied by population. The main hypotheses state that the bilateral volume of intra industry trade is positively related to the

averages of market size. LIN, which denotes Linder variable proxies by the square value differences in GNI of the two countries and it would be expected to have a negative relationship with intra industry trade. DMS stands for the differences in the market size of the two countries. As Lee and Lee (1993) discuss, IIT is biased by the degree of trade imbalance. Accordingly, we use trade imbalance, IMB, as a variable to control the bias in the estimation.

It is now to specify a stochastic gravity model to investigate the effect of preferential trade agreement between Iran and Malaysia on their intra industry trade flows during the period considered. Due to the advantages of panel data over cross sections or time series data (more informative data, more variability, less co-linearity among variables and more efficiency), we have combined time series of cross sections observations. So data for each pair of countries on the preceding six variables are calculated for the period 1997-2001. Since the countries, which have had intra industry trade with Iran during this period are Armenia, Australia, Austria, Azerbaijan, Bahrain, Belarus, Belgium, Brazil, Canada, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Kazakhstan, Korea, Rep., Lebanon, Malaysia, Netherlands, Norway, Oman, Poland, Russian Federation, Saudi Arabia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Turkmenistan and United Kingdom, there are 43 cross sections (individuals) in the regression pooled within 5 years. In all, therefore, we have 215 observations. Thus, a panel version of IIT regression can be defined as:

$$IIT_{ijt} = \alpha_{ijt} + \sum_{k=1}^k \beta_{kijt} x_{kijt} + U_{ijt} \quad (14)$$

Where ij stands for the cross-sectional units and t for the time period. α and β refer to the intercept and slope coefficient, respectively, x stands for the explanatory variables and U is the error term following the classical econometric assumptions. Any attempt for estimating Equation (14), which assuming intercept is homogeneous for trading partner pairs, yields biased results. That is because countries are often different in historical, cultural and political structures. It is evident that the crucial source of the bias is as a result of failure to applying Ordinary Least Squares (OLS) methods to deal with the heterogeneity among bilateral trade relationships. Accordingly, one of the

solutions to control heterogeneity is the use of Panel Data procedure in which allows intercepts of the model to be specific to each trading pairs. As mentioned previously, one way to take into account the “individuality” of each two countries or each cross section unit is to let the intercept vary for each two countries but assume that the slope coefficients in the model are constant across countries. In the literature, this kind of model is known as the fixed effect model (FEM). The fixed effects model can be expensive in terms of degrees of freedom if we have several cross section units. And so instead of treating intercepts as fixed, we can assume that there are random variables. This method is called error component model (ECM) or random effect model (REM). The challenge facing a researcher is to select between panel and pooling methods and if the panel approach has been selected, we should choose fixed effect or random effect model. We will implement this through F_{Leamer} test and choose between pooling and panel. There is a formal test that will help us to choose between FEM or ECM, which is called Hausman test. In technical words, Hausman-statistic tests for the null hypothesis that the explanatory variables and individual effects can be uncorrelated. The fixed effects estimates are consistent with the both null and alternative hypotheses, whereas the random effects estimates are only compatible with the null hypothesis. Therefore, RE method is preferred if the null hypothesis holds, otherwise FE method can be applicable (Baltagi, 1999 and Hsiao, 1986).

The second regression model uses the intercepts obtained from the fixed effect model as the dependent variable, which rely on individual effects. The independent variables are the geographical distance and preferential trade agreement between the two countries. The regression is estimated by ordinary list squares method. Thus, the model can be written as:

$$Y_{ij} = \alpha + \beta \text{Distance}_{ij} + \text{PTA}_{ij} + e_{ij} \quad (15)$$

Geographical distance is measured in terms of kilometers between the centers of geographical gravity of a pair of countries. In addition, PTA denotes a dummy variable, which is used for testing a hypothesis that integration schemes such as the Iran and Malaysia in the light of a conducive preferential trade agreement should be positively correlated with IIT reflecting increased possibilities of intra industry trade within block integration. The value of the

variable is unity if there is a plan of trade integration between two partners, otherwise zero. The scenario conducted here is the presence of preferential trade agreement between Iran and Malaysia.

Tables 2 and 3 report estimation results of the IIT model obtained by using Panel Data, for 215 observations consisting of Iran and its 43 trading partners plus the time period from 1997 to 2001. The computer results summarized in the table are based upon methods of panel data (particularly fixed effects model). As the values of F_{Leamer} test shows [$F_{Leamer}=7.56, (P=0)$], the null hypothesis of the same individual effects can not be acceptable, that is implying that OLS results are biased and, more specifically, there exists heterogeneity for each pair of trade partners. It means that, concerning on different individual effects, the

Table 2: Estimation Results for the IIT Model Obtained by Panel Data

Explanatory Variables	Pooling Data	FE Estimates	RE Estimates
Constant	0.52 (4.5)	—	0.46 (3.74)
AGNI	0.01 (3.92)	0.02 (1.96)	0.08 (1.69)
LIN	-0.01 (-3.92)	-0.01 (-1.67)	-0.09 (-1.52)
AMS	-0.15 (-0.71)	0.07 (2.35)	-0.07 (-0.17)
DMS	0.02 (0.22)	-0.04 (-2.17)	-0.02 (-0.08)
IMB	-0.28 (-2.13)	-0.17 (-1.25)	-0.18 (-1.69)
R²	0.09	0.61	0.60
Number of Observations	215	215	215
F_{LEAMER}	7.56 (0)		
Hausman -Statistic	19.73 (0)		

* Values of t-ratio are represented in parentheses. Also the probability of null hypothesis Acceptance for F-statistic and Hausman statistic is available in parentheses

problem of heterogeneity may be controlled. The results clarify the reasons that FE and RE methods have been concerned with individual intercepts which enable to explain heterogeneity between each pair of countries, they are

relatively powerful in goodness of fit rather than OLS (Pooling Data). In addition, the Hausman statistic [$H=19.73$, ($p=0$)] approves that *FE* results are more reliable than those obtained by RE.

The results support the hypotheses put forward in Section 3 as far as the common characteristics of the countries in question are concerned. Thus, the regression coefficients of the average gross national income, Linder variable, average market size, inequality in market size in Equation (14) and distance and PTA in Equation (15), all have the expected sign and are statistically significant in 10 percent level in the fixed effect model. The trade imbalance coefficient has its expected negative sign but it is statistically insignificant. In other words, income level on average and size of the trading partners exerts a positive effect on IIT. Distance, differences in income levels and market sizes exert negative effects on IIT. Subsequently to the integration process, PTA, which is the integrating scenario between Iran and Malaysia through preferential trade agreement, implies that decreasing tariff barriers between two countries seem to have intensified effect on intra industry trade. In general, PTA between the two countries facilitates a growing production specialization and a better use of scale economies. Trade liberalization, by expanding market between two nations, will lead to a rising variety of products. Taken together, these common characteristics of the countries explain much of the variation in the extent of

Table 3: Estimates of Equation 15

Variable	Coefficient	T-Statistic	Prob.
C	-0.19	-0.42	0.68
Distance (1000 Kilometers)	-0.0003	-2.88	0.01
PTA	1.92	4.93	0.00
R-squared	0.18	Mean Fixed Effects	-1.39
Adjusted R-squared	0.14	S.D. Fixed Effects	1.94
S.E. of regression	1.81	Akaike Info Criterion	4.09
Sum squared residuals	130.53	Schwarz Criterion	4.21
Log likelihood	-84.89	F-statistic	4.32
Durbin-Watson	1.41	Prob (F-statistic)	0.02

Source: Compiled by researchers

intra industry specialization, with the coefficient of determination by about 0.61 for fixed effect model, which stands for the explanatory power of the regression.

4- Conclusions

This paper has first reviewed theoretically and practically the importance of intra industry trade (IIT), and then has calculated the extent of Iran-Malaysia IIT. The results have supported the propositions that Iran-Malaysia IIT is likely to be more dominant in industries, which have a high degree of product differentiation, rapid innovation and specific technology. To examine the impact of implementing conductive trade integration between two nations on their intra industry trade flows, we have specified an econometric framework based upon gravity theory. Using data for the period 1997-2001 among trading sectors of two countries and all Iran's IIT trading partners, some of the various sources of intra industry trade described in the literature, are combined in a panel regression analysis to determine if this proposed behavioral causes could be empirically verified.

The main results of the regression highlight the great importance of the country-specific variables, especially following the gravity theory, the criteria of economic condition (AGNI), income gap (Linder variable), country size, market inequalities and PTA play a key role. As estimation of the preferential trade agreement between Iran and Malaysia is quite reliable, integration seems to have an important impact on the nature of trade and particularly for these nations. Thus, this implies that many industries, in the process of integration, take advantage from scale economies and a high potential of goods differentiating, so that we can assume a revealing increase of intra industry trade. It seems particularly interesting to analyze the development of intra industry trade in order to determinate continuity periods of the process. As a result, we propose for posterior studies to improve this measure incorporating variables such as tariff and non-tariff barriers.

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