Intra-Industry Trade and Determinants: Evidence for ASEAN-Australia and New Zealand in the Context of AANZFTA

Sayeea Bano
The University of Waikato, Hamilton, New Zealand
Tel: 64-7-838-4931 E-mail: sbano@waikato.ac.nz

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Abstract
This study examines the changing patterns and direction of trade between Association of South-East Asian Nations (ASEAN), Australia and New Zealand in the context of the ASEAN-Australia-New Zealand Free Trade Area/Agreement (AANZFTA) signed in 2010. It investigates the extent of ASEAN’s intra-industry trade with Australia and New Zealand at the 3-digit disaggregated SITC level for the period 1990 to 2014. The study includes an analysis of intra-industry trade indices of trade intensities, the marginal intra-industry trade and the econometric model to identify the determinants of intra-industry trade. The results show that trade in general has increased and intra-industry trade between ASEAN-Australia increased specifically in manufacturing. New Zealand has developed intra-industry trade in both the manufacturing and agriculture sectors. Marginal intra-industry results suggest that some industries transforming from inter-industry trade patterns to intra-industry trade. The results of regression analysis provide some support to the thesis that increase in IIT comes naturally with high average incomes of trade partners and large average market size. As a country’s level of income goes up and its standard of living rise, its citizens tend demand and consume more high quality differentiated products, leading to higher levels of intra-industry trade. This study differs from the existing literature in terms of its scope, methods and policy perspectives. The findings have policy relevance for the ongoing negotiations for a regional comprehensive economic partnership with ASEAN 10, India, China, Japan, Australia and New Zealand. It is reasonable to suggest that intra-industry trade be given due consideration in ongoing regional and bilateral trade negotiations for potential mutual gains from trade for a sustainable regional economic growth.

Keywords: Economic integration, ASEAN, Australia, New Zealand, AANZFTA, CER, FTAs
JEL: F10, F02, F13, F14, F15
1. Introduction

The Association of Southeast Asian Nations (ASEAN) was established in Bangkok in 8 August 1967 by Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei Darussalam in 1984, Vietnam in 1995, Laos and Myanmar in 1997 and Cambodia later joined the founding members in April 1999. ASEAN’s stated aim was to accelerate economic growth, social progress and cultural development in the region; advance regional peace and stability as well as respect for justice and the rule of law; and promote adherence to the principles of the United Nations Charter in the region.

Since the 1970s, ASEAN has been one of the fastest growing regions of the world, following on the heels of the East Asian tigers (Singapore, South Korea, Taiwan and Hong Kong). Although their growth momentum was interrupted by the Asian financial crisis of 1997-1998, it resumed soon afterwards. A large part of the rapid growth in the region is widely attributed to international trade.

Geographically close by to ASEAN are the two developed countries of Australia and New Zealand, which have historically maintained close economic ties with each other. In 1983, Australia and New Zealand took a step further in their relationship and signed the Closer Economic Relations (CER), whose aim is to facilitate trade and investment linkages between them.

In 1995, formal consultations started between the Economic Ministers of ASEAN and the CER with the aim of improving two-way trade and investment between the two regions. In September 1996, the Ministers signed an MOU to promote cooperation on standards and conformance and engage in other areas of joint activity, such as customs facilitation, information exchange and human resources development. Finally, in 2010, ASEAN and the two CER countries signed the ASEAN–Australia–New Zealand Free Trade Agreement (AANZFTA), which aims to further boost trade and economic relations in the region. Since it has been eight years since the signing of AANZFTA, it is the right time to assess if the Agreement has achieved some of its objectives.

1.1 Objectives

This paper aims to analyse the changing patterns of trade in the context of ASEAN-Australia-New Zealand free trade agreement (AANZFTA) signed in 2010. In addition, the study aims to contribute to the empirical literature on intra-industry trade at disaggregated industry level, and to marginal/dynamic intra-industry trade for dynamic analysis. It is expected that the findings will be useful to policy makers in their task of enhancing and shaping trade so that its contribution to growth and sustainable development is maximized. ASEAN is important for New Zealand and Australia and Australia, New Zealand are also important trade partners for ASEAN. AANZFTA is an important case study, where two regions jointly signed an FTA.

This study has eight major parts or sections. The first section, which includes 1 and 2, serves as the introduction. The third section presents literature review relevant to this study. The fourth section presents data sources, methodology and hypotheses. In section five presents, bilateral trade with ASEAN-Australia, as well as ASEAN and New Zealand during the period...
from 1990 to 2014. This is followed, by an examination of the intensity or extent of intra-industry trade, and its determinants. The results of the examination are then analysed and interpreted. The final section presents the conclusions and the some suggestions for further research.

2. Review of Relevant Literature

The emergence of intra-industry trade (IIT) has attracted increasing attention from economists, businesses and policy makers since 1960s. With the growth of IIT, traditional trade theories, which dominated earlier periods like the Heckscher-Ohlin explanation of inter-industry trade patterns and the nineteenth century Ricardian model of exchange - in which British cloth is exchanged for Portuguese wine - were called into question. Wine and cloth, of course, belong to different industries; hence, the exchange is inter-industry, or the exchange of products belonging to different industries. Intra-industry is defined as the simultaneous exports and imports within the same industry.

Among the first to investigate the presence of IIT among advanced countries was Kojima (1964), who divided the subject countries into three groups according to the types of products that they produced and traded. His study showed that the most advanced countries, such as the US, UK and the EEC, had intense intra-industry trade in almost all commodity categories. Japan and Canada, not being as advanced (at that time) as the first group, had partial intra-industry trade, while the third group, consisting of Australia and New Zealand which produced and traded more primary products, had inter-industry trade. Kojima suggested, along Linder’s demand similarity thesis, comparative costs or economies of scale as a possible explanation for the results. Krugman (1979), who argued that economies of scale are an important driver of IIT due to imperfect competition in the relevant markets, later supported Kojima’s findings.

In a study of the trade patterns among the EEC countries, Balassa (1966) concluded that trade between industrial countries is intra-industry rather than inter-industry (and hence was not harmful to US exports). Greenaway, Hine and Milner (1994) analyzed horizontal and vertical IIT of the UK in 1988. They disentangled two kinds of IITs by unit value index; using this approach, they tested the relationships between industry-specific factors and IIT. Their findings were that vertical IIT was more important than horizontal IIT in 1988, and that scale economies, product differentiation and imperfect competition were determinants of IIT. The authors emphasized that the empirical results would have been seriously impaired by a failure to separate vertical and horizontal IIT. In another paper, Greenaway, Hine and Milner (1994) used the same methods and data set to analyze country-specific factors in the UK's vertical and horizontal IIT. Their results showed that market size and membership in a customs union, but not factor endowments, are related to the UK's vertical IIT.

Using an approach similar to Greenaway, Hine and Milner but differing in the choice of parameters, Fontagné, Freudenberg and Gaulier (2006) obtained horizontal and vertical IITs for all countries in the world. Their findings showed that while vertical IIT between European countries increased, inter-industry trade moved in the opposite direction.
Azhar and Elliott (2006) argued that the unit value approaches of Greenaway et al. and Fontagne at al. had a "disproportionate scaling issue" that may cause measurement problems and proposed instead a geometric tool that can provide a simple and more versatile method. Sawyer et al (2010) examined the level of IIT of 22 countries in East, Southeast, South, and Central Asia in 2003. IIT is measured as a multilateral trade-weighted index and is reported for ten different categories of goods in the primary and secondary sectors. A Tobit regression model is used to investigate the determinants of IIT. Their results showed that ASEAN and the high-income countries in East Asia exhibit the highest levels of IIT, followed closely by China and India. R&D spending, openness, and a higher share of manufactured exports were found to promote IIT, while geographical distance and difference in economic size among the countries had a negative effect, especially for manufactured goods.

He and Yu (2013) empirically analyzed the factors that impact the agricultural IIT between Guangxi Province (China) and ASEAN during the period 2001-2011. Per capita GDP, foreign direct investment, the labor-capital ratio and economic integration were found to contribute significantly to the development of regional IIT in agricultural products. But difference in per capita GDP between Guangxi Province and ASEAN is a major reason for the sluggish development of IIT.

Jambor (2014) identified the determinants of horizontal and vertical IIT in agriculture and food during the period 1999-2010 between the New Member States (NMS) and the original members of the EU; the results showed that economic integration (i.e., joining the EU) fostered IIT between the two groups of members.

Using panel data in the period 1997-2011, Phan and Jeong (2014) showed that the IIT of Korean and ASEAN manufacturing is positively correlated with average income levels and foreign direct investment inflows and negatively correlated with the differences in factor endowments. Overall, market size, income dissimilarity and factor endowments appear to be the most important determinants of IIT in manufacturing between Korea and ASEAN.

In a 2014 paper, Varma and Ramakrishnan used econometric analysis to study the structure and determinants of trade in agricultural and food products between India and members of selected free trade agreements (FTA). Their analysis showed that FTA had a positive impact on IIT and that relative IIT is higher for members of SAFTA (South Asia Free Trade Association) such as Bhutan, Bangladesh and Nepal of SAFTA and Singapore of the ASEAN. Similarities in demand and related factor endowments were also shown to have a positive impact on IIT. But greater dissimilarities in GDP and GDP per capita are associated with higher IIT.

Lapińska (2015) investigated the determinants of IIT between Poland and its EU trading partners. The author found out that economic integration with the EU tended to be a positive factor influencing the development of IIT, while trade barriers and the degree of trade imbalance between Poland and its partners negatively affected its development. On the other hand, Soo (2016) used UN Comtrade database and developed a model of international trade. The developed model predicted the trade-weighted Grubel–Lloyd index of intra-industry. The researcher found that intra-industry trade is positively associated with the number of exported
sectors, and negatively associated with the number of imported sectors. However, the model was not better fit for the OECD (Note 1) countries.

Wagner (2017) used transaction level data of all exports and imports about the intra-good trade in the context of Germany. The researcher segregated the firms into two groups a) the firms who export and import different goods (inter-good) and b) the firms who export and import identical goods (intra-good). Interestingly, findings revealed that intra-good trade contributes to the total trade more than the inter-good trade. Perhaps due to better research and development, high degree of productivity, and more human capital intensity. However, the researcher did not explore why some firms engage in intra-good trade. The author suggests the significant role intra-goods trade (the simultaneous export and import of identical goods by one firm) is likely to play in fostering new trade pattern. The Author suggests that future research focus may consider exploring further to investigate the role intra-goods (intra-firm) trade in international trade using data from across different countries and regions. This study attempts to fill the significant research gaps.

3. Data and Methodology

3.1 Data Sources

Data on trade between countries are measured in US dollars and are obtained from the UN COMTRADE Database, the United Nations Commodity trade website and the UNCTAD Database. The determinants of Intra-industry Trade; ALDjk, AMSjk, LDDjk and MSDjk, are calculated by the author from raw data from the World Bank’s World Development Indicators. The total trade for ASEAN includes data from seven member-countries: Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.

Time series data for the period 1990-2014 are used to estimate the share of ASEAN’s IIT with Australia and New Zealand. To make the analysis dynamic, marginal intra-industry trade is used. For the empirical tests, we use hypotheses derived from trade theories, such as Linder’s demand similarity, economies of scale, product differentiation and product life cycle. Econometric analysis is used to test the hypothesized determinants of IIT between ASEAN, Australia and New Zealand.

3.2 Methodology

A number of attempts have been made to find a suitable method for measuring IIT and these have been discussed at length in the literature. Grubel and Lloyd (1975) measured IIT as the proportion (percent) of a country’s total trade (exports plus imports) in the products of a given industry which is matched or balanced, that is, exports equal imports. In this study, four measures have been selected: (i) the Grubel and Lloyd measure at the industry level (IITBi), (ii) the Grubel-Lloyd Weighted (IITB) Index, (iii) the Grubel-Lloyd adjusted (IITC) Index, and (iv) the Aquino adjusted index. In order to address the dynamic aspects, this study considers the marginal intra-industry trade methods. Summaries of the methodologies used are presented in Appendix 1.

Hamilton and Kniest (1991) argued that although static indices of IIT, like the widely- used
Grubel-Lloyd index, are informative and most widely used, dynamic indices may be more useful. Alternative dynamic indices have therefore been developed. Brülhart (2002) introduced the development of MIIT indices in detail. The first measure is the Hamilton-Kniest (HK) Index, which captures the structural change in IIT through the ratio of first differences in exports and imports. However, it is undefined when either exports or imports decrease.

The Hamilton-Kniest MIIT index is:

\[
HK = \begin{cases} 
\frac{\Delta X}{\Delta M} & \text{for } \Delta M > 0 \\
\frac{\Delta M}{\Delta X} & \text{for } \Delta X > \Delta M > 0 \\
1 & \text{for } \Delta X = \Delta M > 0 \\
\text{undefined} & \text{for } \Delta X < 0 \text{ or } \Delta M < 0 
\end{cases}
\]

Brülhart (1994) proposed a Grubel-Lloyd style MIIT index as follows:

\[
B^A = 1 - \frac{|\Delta X - \Delta M|}{|\Delta X| + |\Delta M|}
\]

Where,

X is exports
M is imports
HK is Hamilton and Kniest index, and
BA is the Brülhart index.

The Brulhart index is similar to the Grubel-Lloyd index in that the index is zero when marginal trade in the industry is completely inter-industry and unity when it is total intra-industry. Also like the Grubel-Lloyd index, the Brülhart index can be aggregated for all industries. Other MIIT indices have also been proposed, such as the Thom and McDowell (1999) index and the Annicchiarico and Quintieri (2000) index. As Brülhart (2002) has pointed out, different indices capture different aspects of the structure of trade changes, but no one measure is able to fully capture trade.

The widely accepted Chamberlin-Heckscher-Ohlin (C-H-O) model provides explanations of both inter-industry and intra-industry trade. Under C-H-O, inter-industry trade specializes in homogeneous goods while intra-industry trade specializes in horizontally differentiated goods. Greenaway and Milner (2002), however, argue that this view is misplaced, citing evidence that the C-H-O model wrongly measured horizontal IIT as total IIT, forgetting that vertical IIT is also an important part of international trade. According to Greenaway et al, horizontal IIT is based on the need for variety of goods and economies of scale, while vertical IIT is based on the preference for variety which results from income differences.
3.3 Determinants of IIT

Selected hypotheses derived from Linder’s demand similarity theory:

Hypothesis 1: IIT is an increasing function of the average level of development \((ALD_{jk})\) of the trading partners, measured as the average per capita income of the two countries, \(j\), home reporting country and \(k\), trading partner.

\[
\delta IIT_{jk} / \delta ALD_{jk} > 0
\]

Hypothesis 2: IIT is an increasing function of the average market size \((AMS_{jk})\) of the trade partners, measured by average GDP.

\[
\delta IIT_{jk} / \delta AMS_{jk} > 0
\]

Hypothesis 3: IIT is a decreasing function of the level of development differential \((LDD_{jk})\) - i.e. absolute difference of the per capita incomes of the trading partners.

\[
\delta IIT_{jk} / \delta LDD_{jk} < 0
\]

Hypothesis 4: IIT is a decreasing function of the level of (development differential) market size differences \((MSD_{jk})\) - i.e. absolute difference of the GDPs of the trading partners.

\[
\delta IIT_{jk} / \delta MSD_{jk} < 0
\]

4. Overview of Bilateral Trade Between the Partners

4.1 ASEAN Trade With Australia

Figure 1a below shows that ASEAN trade with Australia has increased significantly over time, with exports from ASEAN to Australia increasing faster than imports, especially during 1990-2014. During the same period, the shares of ASEAN exports to Australia and imports from the latter moved in opposite directions [See Figure 1b]. In 1990-1998, the share of ASEAN exports was less than the share of imports in ASEAN’s total trade, but became greater subsequently. Overall, the share of ASEAN exports to Australia increased significantly, especially prior to 2009. By contrast, since 1990 the share of ASEAN imports from Australia has decreased gradually, although in 2013-2014 the share of ASEAN trade (both imports and exports) with Australia in ASEAN total trade remained relatively constant.

Overall, the shares of SITC 3 (Mineral Fuels) and 7 (Machinery & Transport equipment) between ASEAN and Australia have been dominant in ASEAN’s total trade with Australia [See Figure 1c]. These two sectors together accounted for more than half of their bilateral trade. However, the trends in the two shares moved in opposite directions during the period, with ASEAN trade with Australia in SITC 3 increasing significantly from 11 percent in 1995 to around 33 percent in 2014, and trade in SITC 7 decreasing gradually from 25 percent to around 21 percent in 2014. The shares of other commodities in the total trade have remained relatively constant.
4.2 ASEAN Trade With New Zealand

Figure 2a shows that both imports and exports between ASEAN and New Zealand increased significantly, with only slight fluctuations. During 1990-1999, ASEAN imports from New Zealand were greater than its exports. Since 2002, however, ASEAN exports to New Zealand have been much higher than its imports.

For 1990-2002, the share of ASEAN-New Zealand imports in ASEAN’s total trade was greater than the share of exports. For 2003-2014, the share of ASEAN-New Zealand exports
increased much faster than the share of imports. Overall, there has been an increasing trend in the share of ASEAN exports to New Zealand. On the other hand, the share of ASEAN imports from New Zealand has remained relatively constant. In recent years, the shares of ASEAN and New Zealand exports and imports moved in opposite directions [see Figure 2b].

Figure 2a. ASEAN-NZ trade over time: 1990-2014 (in US$ Millions)

Figure 2b. Share of ASEAN-NZ trades in ASEAN total trades: 1990-2014

Figure 2c. Share of NZ in ASEAN-NZ total trade by sectors

Figure 2. The shares of ASEAN and New Zealand exports and imports

Source: UNCTAD Database, 2015, Author’s calculation.

Similarly, ASEAN trade with New Zealand in SITC 0 (Food and Live Animals), 3 (Mineral Fuels) and 8 (Miscellaneous Manufactured Articles) together contributed to more than half of the share in ASEAN’s total trade with NZ. Although fluctuating, trade in SITC 3 significantly improved over the period, while trade in SITC 0 and 8 remained constant. ASEAN trade with NZ in other sectors remained relatively constant. [See Figure 2c]
4.3 Australia’s Trade With ASEAN

Since 1998, Australia has had a trade deficit with ASEAN [See Figure 3a], and since 2000, the shares of Australia-ASEAN exports and imports in Australia’s total trade have moved in opposite directions. But overall the share of Australia’s exports to ASEAN was greater than the share of Australia’s imports from ASEAN before 1998, the year of the Asian financial crisis [See Figure 3b]. Subsequently, the share of exports in Australia’s total trade decreased gradually from 14 percent to no more than 10 percent in 2000-2013. By contrast, the share of Australia’s imports from ASEAN increased steadily before 2008, but decreased from 20 percent to a constant 17 percent in recent years. In 2014, the share of exports increased slightly to 11 percent.

Figure 3a. Australia’s trade with ASEAN: 1990-2014 (in US$ Millions)

Figure 3b. Share of AUS-ASEAN trades in AUS total trades: 1990-2014

Figure 3c. Share of AUS by sectors in ASEAN-AUS total trade: 1995-2014

Figure 3. The share of Australia’s exports to ASEAN

Source: UNCTAD Database, 2015, Author’s calculation.
SITC 3 (Mineral fuels) and 7 (Machinery & Transport equipment) dominated Australia’s trade with ASEAN, but the share of SITC 7 declined while that of SITC 3 increased during the period. Australia’s trade with ASEAN in SITC 9 (Commodities and Transactions not Classified) has also been declining, which means an improvement of trade in primary sectors during the period [See Figure 3c].

4.4 New Zealand’s Trade With ASEAN

Since 2000, New Zealand’s imports have been higher than its exports to ASEAN. Moreover, New Zealand’s imports have also increased much faster than its exports, suggesting an increasing trade deficit for New Zealand [See Figure 4a].

The shares of exports and imports between New Zealand and ASEAN increased gradually over 1990-2001, with New Zealand exports to ASEAN being greater than the share of New Zealand imports from ASEAN. Thereafter, the share of imports showed a significant increase from 9 percent in 2001 to more than 15 percent in 2014, making the share of imports greater than the share of exports. By contrast, the share of New Zealand exports to ASEAN in New Zealand’s total trade remained relatively constant during the decade [See Figure 4b].

Figure 4a. NZ trade with ASEAN: 1990-2014 (in US$ Millions)

Figure 4b. Share of NZ-ASEAN trades in AUS total trades: 1990-2014

Figure 4. The share of New Zealand exports to ASEAN in New Zealand’s total trade

Source: UNCTAD Database, 2015, Author’s calculation.
SITC 0 (Food and live animals) and 7 (Machinery and transport equipment) dominated New Zealand’s total trade with ASEAN from 1995 to 2005. SITC 3 (Mineral fuels) showed a sharp increase from an average of 5 percent in the 1990’s to around 24 percent in 2014, resulting to a greater share of this sector compared to other sectors. By contrast, the share of SITC 7 decreased from 20 percent in 1995 to 17 percent in 2014, while the share of other sectors remained relatively constant, decreased only slightly over the period [See Figure 4c].

4.5 Focus on Intra-Industry Trade

Figure 5 shows the different measures of intra-industry trade between 1990 and 2014. From 1990 to 1996, IIT between ASEAN and Australia remained steady at an average of 42 percent, with the three measures of IIT moving in the same direction most of the time. Since then, IIT has tended to increase gradually given IITC and IITQ. However, since 1997 IIT has decreased significantly, from 40 percent to around 20 percent, using the Weighted Average measure - IITB. This suggests that trade between ASEAN and Australia tends to be inter-rather than intra-industry given IITB. From 2012 to 2014, IIT again decreased significantly by more than 10 percent.

![Figure 5. Intra-industry trade between 1990 and 2014 between ASEAN and Australia](http://ijafr.macrothink.org)

Source: UNCTAD Database, 2015, Author’s calculation.

5. Results and Discussion

5.1 The Summary Values of ASEAN- Australia IIT by Sectors

While intra-industry trade strengthened in Animal and Vegetable Oils (SITC 4) and Chemicals (SITC 5), it decreased or stayed constant at the other 1-digit aggregations. For example, IIT in Mineral Fuels (SITC 3) decreased from an average of around 67 percent in 1990 to 50 percent in 2014 given IITBi indices. All these suggest that trade between ASEAN and Australia tends to be inter-industry [See Tables 1a-1d].

Table B8 in Appendix B shows SITC 7 (Machinery and Transport Equipment) as having the greatest number of high IIT sectors, with nearly 100 percent levels observed in SITCs 723, 742 and 774, suggesting intra-industry trade in these sectors. On the other hand, SITC 1 (Beverage and Tobacco) and SITC 3 (Mineral Fuels) show relatively low levels of IIT,
suggesting inter-industry trade. (The detailed IITBs for each sector are available from the author.)

Table 1a. ASEAN-Australia IIT by industry 3-digit summary values 2014 (percent)

| SITC | Description                          | Av-IITBi | Av-IITCi | Av-IITQi |
|------|--------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                  | 21.26    | 59.26    | 38.04    |
| 1    | Beverage & Tobacco                   | 23.52    | 35.61    | 29.41    |
| 2    | Crude materials inedible except fuels| 2.84     | 17.42    | 5.85     |
| 3    | Mineral Fuels Lubricants & related materials | 49.87 | 82.35 | 81.27 |
| 4    | Animal & Vegetable Oils and fats     | 17.75    | 20.88    | 17.60    |
| 5    | Chemicals                            | 20.43    | 34.74    | 23.94    |
| 6    | Manufactured Goods Classified chiefly by materials | 15.23 | 20.07 | 17.80 |
| 7    | Machinery & Transport equipment      | 6.46     | 86.65    | 25.12    |
| 8    | Miscellaneous Manufactured Articles  | 16.95    | 94.79    | 46.47    |
| 9    | Commodities & Transactions not classified | 19.86 | 99.24 | 99.21 |

Table 1b. ASEAN-Australia IIT by industry 3-digit summary values 2010 (percent)

| SITC | Description                          | Av-IITBi | Av-IITCi | Av-IITQi |
|------|--------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                  | 37.89    | 74.29    | 52.63    |
| 1    | Beverage & Tobacco                   | 78.59    | 100.00   | 93.82    |
| 2    | Crude materials inedible except fuels| 5.51     | 20.97    | 8.07     |
| 3    | Mineral Fuels Lubricants & related materials | 41.51 | 88.69 | 64.84 |
| SITC | Description                                      | Av-IITBi | Av-IITCi | Av-IITQi |
|------|--------------------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                              | 41.06    | 81.93    | 45.46    |
| 1    | Beverage & Tobacco                               | 25.72    | 72.61    | 43.77    |
| 2    | Crude materials inedible except fuels            | 10.74    | 37.53    | 11.72    |
| 3    | Mineral Fuels Lubricants & related materials      | 60.50    | 96.72    | 95.02    |
| 4    | Animal & Vegetable Oils and fats                 | 21.65    | 61.56    | 37.73    |
| 5    | Chemicals                                        | 52.70    | 60.39    | 54.79    |
| 6    | Manufactured Goods Classified chiefly by materials| 28.11    | 33.80    | 26.58    |
| 7    | Machinery & Transport equipment                   | 31.84    | 87.13    | 47.34    |
| 8    | Miscellaneous Manufactured Articles              | 38.92    | 98.94    | 54.40    |
| 9    | Commodities & Transactions not classified         | 49.03    | 57.17    | 52.14    |

Table 1c. ASEAN-Australia IIT by industry 3-digit summary values 2000 (percent)
Table 1d. ASEAN-Australia IIT by industry 3-digit summary values1990 (percent)

| SITC | Description                                      | Av-IITBi | Av-IITCi | Av-IITQi |
|------|--------------------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                              | 53.02    | 68.77    | 50.86    |
| 1    | Beverage & Tobacco                               | 43.25    | 58.52    | 41.55    |
| 2    | Crude materials inedible except fuels            | 4.27     | 10.32    | 5.36     |
| 3    | Mineral Fuels Lubricants & related materials     | 67.37    | 73.96    | 70.09    |
| 4    | Animal & Vegetable Oils and fats                 | 6.25     | 26.23    | 26.13    |
| 5    | Chemicals                                        | 0.00     | 47.49    | 41.40    |
| 6    | Manufactured Goods Classified chiefly by materials| 17.44    | 30.32    | 19.24    |
| 7    | Machinery & Transport equipment                  | 43.73    | 57.23    | 47.06    |
| 8    | Miscellaneous Manufactured Articles              | 39.85    | 73.73    | 49.00    |
| 9    | Commodities & Transactions not classified        | 13.51    | 48.07    | 7.92     |

Source: UN COMTRADE Database, 2015, Author's calculations.

5.2 ASEAN-Australia Marginal Intra- Industry Trade (MIIT), Using the Different Indices

Table 1e reports the results of Hamilton-Kniest (HK) MIIT index. It is observed that the marginal trade in SITC 5 (Chemicals) and 6 (Manufactured goods) is more than 50 percent over the three sub-periods. Specifically, MIIT in SITC 6 decreased from 79 percent in the first sub-period to 63 percent in the recent/third sub-period from 2011 to 2014. This means that in recent years trade in SITC 6 between ASEAN and Australia tends to be inter-industry. By comparison, MIIT in SITC 5 improved from 78 percent in the first sub-period to 91 percent in the second sub-period from 2001 to 2010, which means that exports and imports in SITC 5 changed by more or less the same amount, which is a sign of high intra-industry trade. Similarly, SITC 1 (Beverage and tobacco) is almost intra-industry during the third sub-period from 2010 to 2014. There was a reduction in the difference between the increase in exports and imports in SITC 2, 3, 4, and 8, suggesting that trade in this sector tended to be inter-industry over the period. Given a low MIIT index, the HK indexes for other sectors also show inter-industry trade patterns.
Table 1f shows the Brüllhart (Ba) index for each sector, which is similar to what we obtained from the HK index. That is, SITC 1 and SITC 6 are almost intra-industry during some specific periods. For example, SITC 1 tends to be intra-industry trade in the third sub-period from 2011 to 2014, while SITC 6 tends to have a lower level of MIIT (78 percent) than the previous two sub-periods. In the first and second sub-periods, SITC 6 has more than 80 percent of MIIT, given by the Ba index. The high level of MIIT in those industries means that the adjustment costs or distribution effects associated with trade are supposed to be small. This is in contrast to trade in SITC 5 (not shown in the HK table), which tends to be inter-industry in recent years, although there was a high level of MIIT in the first and second sub-periods. These results provide evidence of the structural changes towards intra-industry trade between ASEAN and Australia in recent years.

Table 1e. The 10-year span Hamilton-Kniest MIIT (HK) index of ASEAN-AUS 1990-2014

| HK         | SITC 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------|--------|---|---|---|---|---|---|---|---|---|
| 1st sub-period | 0.28  | 0.06 | 0.14 | 0.31 | 0.29 | 0.78 | 0.79 | 0.15 | 0.20 | 0.19 |
| 2nd sub-period    | 0.45  | 0.29 | 0.19 | 0.26 | 0.17 | 0.91 | 0.74 | 0.07 | 0.10 | 0.22 |
| 3rd sub-period    | 0.37  | 0.98 | 0.06 | 0.22 | 0.08 | 0.63 | 0.18 | 0.09 |       |     |

Table 1f. The 10-year span Brulhart MIIT (Ba) index of ASEAN-AUS; 1990-2014

| Ba         | SITC 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------|--------|---|---|---|---|---|---|---|---|---|
| 1st sub-period | 0.44  | 0.11 | 0.24 | 0.47 | 0.45 | 0.88 | 0.88 | 0.26 | 0.34 | 0.32 |
| 2nd sub-period    | 0.62  | 0.45 | 0.32 | 0.41 | 0.29 | 0.95 | 0.85 | 0.14 | 0.17 | 0.36 |
| 3rd sub-period    | 0.54  | 0.99 | 0.11 | 0.36 | 0.16 | 0.00 | 0.78 | 0.31 | 0.16 | 0.00 |

Source: UN COMTRADE Database, 2015, Author's calculations.

Note: 1st period refers to the 10-year span from 1990 to 2000; 2nd period refers to the 10-year span from 2001 to 2010; 3rd period refers to the 4-years span from 2011 to 2014.

5.3 Intra-Industry Trade Between ASEAN and New Zealand

Intra-industry trade strengthened in Beverage and Tobacco (SITC 1) and Mineral Fuels (SITC 3), but declined slightly or stayed constant at the other 1-digit aggregations [See Tables 2a-2d]. For instance, IIT in Food and Live Animals (SITC 0) decreased from an average of around 29 percent in 1990 to 22 percent in 2014, given IITBi indices.
### Table 2a. ASEAN-NZ IIT by industry 3-digit summary values 2014 (percent)

| SITC | Description                                             | Av-IITBi | Av-IITCi | Av-IITQi |
|------|---------------------------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                                     | 22.22    | 31.19    | 25.73    |
| 1    | Beverage & Tobacco                                      | 31.52    | 58.33    | 33.58    |
| 2    | Crude materials inedible except fuels                   | 6.40     | 91.82    | 7.72     |
| 3    | Mineral Fuels Lubricants & related materials            | 19.41    | 100.00   | 97.58    |
| 4    | Animal & Vegetable Oils and fats                        | 2.04     | 2.26     | 2.19     |
| 5    | Chemicals                                               | 17.46    | 34.38    | 19.33    |
| 6    | Manufactured Goods Classified chiefly by materials      | 20.77    | 25.21    | 19.77    |
| 7    | Machinery & Transport equipment                         | 7.74     | 68.98    | 25.18    |
| 8    | Miscellaneous Manufactured Articles                     | 28.18    | 94.67    | 67.46    |
| 9    | Commodities & Transactions not classified               | 42.85    | 94.00    | 93.60    |

### Table 2b. ASEAN-New Zealand IIT by industry 3-digit summary values 2010 (percent)

| SITC | Description                                             | Av-IITBi | Av-IITCi | Av-IITQi |
|------|---------------------------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                                     | 28.87    | 39.26    | 30.09    |
| 1    | Beverage & Tobacco                                      | 75.29    | 95.59    | 76.41    |
| 2    | Crude materials inedible except fuels                   | 6.36     | 38.22    | 29.62    |
| 3    | Mineral Fuels Lubricants & related materials            | 6.74     | 99.96    | 33.17    |
| 4    | Animal & Vegetable Oils and fats                        | 2.72     | 12.86    | 12.43    |
| 5    | Chemicals                                               | 23.02    | 57.47    | 29.83    |
| SITC | Description                                           | Av-IITBi | Av-IITCi | Av-IITQi |
|------|-------------------------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                                   | 21.65    | 25.76    | 23.06    |
| 1    | Beverage & Tobacco                                    | 39.51    | 57.27    | 49.96    |
| 2    | Crude materials inedible except fuels                 | 5.50     | 37.70    | 16.57    |
| 3    | Mineral Fuels Lubricants & related materials          | 15.32    | 91.94    | 12.43    |
| 4    | Animal & Vegetable Oils and fats                      | 10.87    | 25.30    | 21.23    |
| 5    | Chemicals                                             | 30.52    | 37.54    | 34.41    |
| 6    | Manufactured Goods Classified chiefly by materials    | 34.48    | 41.88    | 32.87    |
| 7    | Machinery & Transport equipment                        | 20.35    | 92.16    | 46.11    |
| 8    | Miscellaneous Manufactured Articles                   | 19.62    | 97.66    | 43.01    |
| 9    | Commodities & Transactions not classified             | 61.45    | 99.97    | 99.97    |

Table 2c. ASEAN-NZ IIT by industry 3-digit summary values 2000 (percent)

| SITC | Description                                           | Av-IITBi | Av-IITCi | Av-IITQi |
|------|-------------------------------------------------------|----------|----------|----------|
| 0    | Food & Live Animals                                   | 29.11    | 30.87    | 28.39    |

Table 2d. ASEAN-NZ IIT by industry 3-digit summary values 1990 (percent)
| 1 | Beverage & Tobacco | 21.96 | 69.81 | 13.90 |
| 2 | Crude materials inedible except fuels | 6.31 | 23.24 | 5.04 |
| 3 | Mineral Fuels Lubricants & related materials | 0.00 | 0.00 | 0.00 |
| 4 | Animal & Vegetable Oils and fats | 7.63 | 17.20 | 16.93 |
| 5 | Chemicals | 23.95 | 27.95 | 24.30 |
| 6 | Manufactured Goods Classified chiefly by materials | 18.01 | 30.59 | 19.94 |
| 7 | Machinery & Transport equipment | 28.89 | 70.18 | 34.88 |
| 8 | Miscellaneous Manufactured Articles | 28.08 | 77.14 | 37.55 |
| 9 | Commodities & Transactions not classified | 71.73 | 99.98 | 99.91 |

Source: UN COMTRADE Database, 2015, Author's calculations.

a) ASEAN IIT with New Zealand at SITC 3

Table B9 in Appendix B shows that Manufactured Goods (SITC 6) and Machinery and Transport Equipment (SITC 7) have the higher number of IIT sectors between ASEAN and New Zealand in 2014. IIT levels of more than 90 percent are observed in SITCs 273, 581, 598, 635, 684, 694, 699, 772, 793, 871 and 872, suggesting intra-industry trade in these sectors. On the other hand, Beverage and Tobacco (SITC 1), Mineral Fuels (SITC 3) and Animal and Vegetable Oils (SITC 4) show relatively low levels of IIT, suggesting inter-industry trade.

b) MIIT of ASEAN and New Zealand

Table 2e shows that the MIIT in all the sectors is very low, except for SITC 0 (Food and live animals) and 5 (Chemicals), which show more than 50 percent MIIT in the recent sub-period from 2011 to 2014. The difference between the increase in exports and imports in SITC 5 (Chemicals) is around 60 percent in 2010-2014, suggesting that the marginal trade in this sector tends to be intra-industry compared to other sectors. In addition, the HK indices for SITC 3 (Mineral Fuels) and 7 (Machinery and Transport Equipment) during the third sub-period are only 3 percent and 2 percent, respectively, which means that there was a substantial difference between increases in exports and imports in these two sectors from 2011 to 2014.
The Brühlhart indexes provide similar results, as shown in Table 2f. For example, the marginal trade in SITC 0 (Food and Live Animals), 4 (Animal and Vegetable Oils) and 5 (Chemicals) is close to intra-industry trade in recent years, with more than 60 percent of Ba index. However, there are some industries, such as SITC 1 (Beverage and Tobacco), 6 (Manufactured Goods Classified chiefly by materials) and 7 (Machinery and Transport Equipment), which show diminishing levels of MIIT from the first sub-period to the latest sub-period 2011-2014. This means that exports and imports in those industries tend to change by different amounts and that adjustment costs in those sectors increased in recent years.

Table 2e. The 10-year span Hamilton-Kniest MIIT index of ASEAN-NZ1990-2014

| HK | SITC 0 | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   |
|----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|    | 1st sub-period | 0.06 | 0.07 | 0.14 | 0.58 | 0.15 | 0.06 |
|    | 2nd sub-period | 0.28 | 0.26 | 0.13 | 0.05 | 0.06 | 0.05 | 0.51 | 0.10 | 0.15 | 0.41 |
|    | 3rd sub-period | 0.51 | 0.10 | 0.20 | 0.03 | 0.43 | 0.60 | 0.27 | 0.02 | 0.09 | 0.54 |

Table 2f. The 10-year span Brühlhart MIIT index of ASEAN-New Zealand 1990-2014

| Ba | SITC 0 | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   |
|----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|    | 1st sub-period | 0.11 | 0.00 | 0.14 | 0.00 | 0.24 | 0.74 | 0.00 | 0.25 | 0.10 | 0.00 |
|    | 2nd sub-period | 0.44 | 0.41 | 0.23 | 0.09 | 0.12 | 0.10 | 0.67 | 0.19 | 0.26 | 0.58 |
|    | 3rd sub-period | 0.68 | 0.19 | 0.33 | 0.06 | 0.60 | 0.75 | 0.43 | 0.04 | 0.16 | 0.70 |

Source: UN COMTRADE Database, 2015, Author’s calculations.

Note: 1st period refers to the 10-year span from 1990 to 2000; 2nd period refers to the 10-year span from 2010; 3rd period refers to the 4-years span from 2011 to 2014.

5.4 Determinants of Australia-ASEAN IIT: Estimated Results

The results shown in Table 4 are measured by linear-log OLS regressions. IITB, IITC and IITQ are the dependent variables and are explained by four determinants derived from Linder’s hypothesis, namely: Average Development Level (ALD), Average Market Size (AMS), Level of Development Differential (LDDjk) and Market Size Difference (MSD) between the two countries. The estimated functions are:
The results in Table 4 IITB are inconsistent with IITC and IITQ. Specifically, a one-percent increase in the average level of development between the countries tends to reduce the IITB by around seven percent and increase IITC and IITQ by 9.5 percent and 6.4 percent, respectively. In addition, the coefficients of the market size difference (MSD) and the level of development differential (LDD) tend to be positive, which is inconsistent with the hypothesis. Therefore, hypotheses 1 and 2 are supported by the ASEAN-Australia evidence when IITC and IITQ are explained by the determinants. Hypotheses 3 and 4 are satisfied with positive coefficients of MSD and LDD when IITB is used as the measure of IIT. (Note: Can it be inconsistent with and at the same time satisfy the hypothesis?)

Table 5 shows the estimated results in the probit models on the likelihood of having high IIT between ASEAN and Australia. The dependent variables are three dummy variables, namely, High IITB, High IITC and High IITQ. They are equal to 1 if the level of IIT is at least 40 (for IITB) or 50 (for IITC and IITQ) and are equal to 0 if they are less than 40 (for IITB) or 50 (for IITC and IITQ).

The likelihood of having high IITB decreases as the average level of development and average market size between the two countries increases. This is inconsistent with the hypotheses 1 and 2. By contrast, hypotheses 3 and 4 can be satisfied with the negative coefficients of MSD and LDD when IITB is used as the measure of IIT. When high IITC and high IITQ are measured as the dependent variables, only hypotheses 1 and 2 can be satisfied. Hypotheses 3 and 4 are rejected by the positive coefficients of MSD and LDD.

Table 4. Determinants of IIT between ASEAN and Australia (1990-2013)

| OLS Regressions | IITB          |
|-----------------|---------------|
|                 | (1) | (2) | (3) | (4) |
| log(ALD)        | -6.784***    |
|                 |     |     |     |     |
|                 | (1.270)      |
| log(AMS)        | -5.307***    |
|                 |     |     |     |     |
|                 | (1.101)      |
| log(LDD)        | -2.214**     |

(Note: Can it be inconsistent with and at the same time satisfy the hypothesis?)
### IITC

| OLS Regressions | (1) | (2) | (3) | (4) |
|-----------------|-----|-----|-----|-----|
| log(ALD)        | 9.538*** |       |     |     |
|                 | (2.927)  |       |     |     |
| log(AMS)        |         | 8.262*** |       |     |
|                 |         | (2.332)  |       |     |
| log(LDD)        |         |         | 4.857*** |     |
|                 |         |         | (1.650)  |     |
| log(MSD)        |         |         |         | 9.586*** |
|                 |         |         |         | (2.925)  |
| constant        | 27.183*** | -0.905 | 26.526*** | 21.610** |
|                 | (8.073)  | (15.308) | (9.139)  | (9.708)  |
| R squared       | 32.55   | 36.32  | 28.26  | 32.81  |
|     | (1)    | (2)    | (3)    | (4)    |
|-----|--------|--------|--------|--------|
| Prob. F | 0.004  | 0.002  | 0.008  | 0.003  |
| No. of observations | 24     | 24     | 24     | 24     |

**OLS Regressions**

| log(ALD) | 6.447*** |
|----------|----------|
|          | (1.879)  |

| log(AMS) | 5.712*** |
|----------|----------|
|          | (1.471)  |

| log(LDD) | 3.750*** |
|----------|----------|
|          | (0.990)  |

| log(MSD) | 6.430*** |
|----------|----------|
|          | (1.885)  |

| constant | 31.787*** | 11.969 | 28.781*** | 28.183*** |
|----------|----------|--------|-----------|-----------|
|          | (5.183)  | (9.652)| (5.484)   | (6.258)   |

| R squared | 34.85 | 40.68 | 39.49 | 34.59 |
|-----------|-------|-------|-------|-------|
| Prob. F   | 0.002 | 0.000 | 0.001 | 0.003 |
| No. of observations | 24     | 24     | 24     | 24     |

Standard errors are in parentheses

* Significant at 10%

** Significant at 5%

*** Significant at 1%
Table 5. Determinants of IIT between ASEAN and Australia (1990-2013)

| Probit Regressions | High IITB (≥40) | (1) | (2) | (3) | (4) |
|--------------------|----------------|-----|-----|-----|-----|
| ALD                | -0.262         | (0.166) |
| AMS                | -0.003*        | (0.002) |
| LDD                | -0.003         | (0.002) |
| MSD                | -0.170         | (0.113) |
| constant           | 2.969          | 1.651 | 0.350 | 3.399 |
|                    | (1.894)        | (1.078) | (0.507) | (2.235) |
| R squared          | 34.19          | 28.79 | 11.70 | 36.48 |
| LR test            | 10.45          | 8.80 | 3.58 | 11.15 |
| No. of observations| 24             | 24 | 24 | 24 |

| Probit Regressions | High IITC (≥50) | (1) | (2) | (3) | (4) |
|--------------------|----------------|-----|-----|-----|-----|
| ALD                | 0.688*         | (0.374) |
| AMS                | 0.011**        |       |
|                | (1)       | (2)       | (3)       | (4)       |
|----------------|-----------|-----------|-----------|-----------|
| **Probit Regressions** |           |           |           |           |
| ALD            | 0.080**   |           |           |           |
|                | (0.036)   |           |           |           |
| AMS            |           | 0.001**   |           |           |
|                |           | (0.001)   |           |           |
| LDD            |           |           | 0.003**   |           |
|                |           |           | (0.001)   |           |
| MSD            |           |           |           | 0.046**   |
|                |           |           |           | (0.021)   |
| constant       | -1.199*   | 0.982*    | 7.250     | 1.213     |

**High IITQ (≥50)**

|                | (0.005)   | 0.006*    | (0.003)   |           |
|----------------|-----------|-----------|-----------|-----------|
| MSD            |           | 0.424*    |           |           |
|                |           | (0.224)   |           |           |
| constant       | -7.438*   | -5.112*   | -0.895    | -8.072*   |
|                | (4.082)   | (2.629)   | (0.726)   | (4.306)   |
| R squared      | 45.76     | 49.16     | 26.21     | 46.77     |
| LR test        | 13.26     | 14.24     | 7.59      | 13.55     |
| No. of observations | 24       | 24       | 24         | 24        |
R squared | 17.21 | 17.51 | 13.64 | 17.45
---|---|---|---|---
LR test | 5.70 | 5.80 | 4.52 | 5.78
No. of observations | 24 | 24 | 24 | 24

Standard errors are in parentheses

* Significant at 10%

** Significant at 5%

*** Significant at 1%

6. Conclusion

Our results show that inter-industry and intra-industry trade between ASEAN and Australia and ASEAN and New Zealand exist simultaneously across sectors, with inter-industry trade being dominant compared to intra-industry trade. In other words, the countries/regions involved have a comparative advantage in exporting in particular sectors or industries and not in specific products within industries or sectors. Australia has a comparative advantage in exporting crude materials and mineral fuels, resulting in a large trade deficit for ASEAN and leading to low levels of IIT between ASEAN and Australia.

Similarly, New Zealand has a comparative advantage in exporting food and live animals and crude materials to ASEAN. By contrast, there is a consistently high IIT trade in machinery and transport equipment between ASEAN and Australia and also between ASEAN and New Zealand. IIT between ASEAN and New Zealand strengthened in beverage, tobacco and mineral fuels, and so did IIT between Australia and ASEAN, increasing from 40 to 60 per cent. The greatest number of high IIT is in the machinery and transport equipment sectors.

Marginal intra-industry trade results indicate a high degree of bilateral trade in food and beverages and manufacturing between Australia and ASEAN. These results demonstrate that export and import sectors changed by more or less the same amount, suggesting the small adjustment costs of trade. In addition, intra-industry trade between ASEAN and New Zealand strengthened in beverage and tobacco, and mineral fuels. SITC 6 (Manufactured goods) and 7 (Machinery and transport equipment) had a large number of high IIT sectors between ASEAN and New Zealand in 2014. Marginal intra-industry trade results further suggest that bilateral trade in SITC food and live animals and chemicals between ASEAN and New Zealand tend to high intra-industry trade. The likelihood of experiencing a high IIT decreases as the average level of development and average market size between the countries increases.
After increasing significantly during 2000-2010, the IIT index between ASEAN and Australia weakened from 2010 to 2014, for reasons that still need to be examined. Since 2010 happened to be the year when AANZFTA became operational, this raises the issue of whether the weakening was due to AANZFTA. If so, this would be a paradoxical result, since AANZFTA was precisely aimed at promoting trade, both inter and intra-industry, amongst the three trade partners.

The results of our regression analysis on the determinants of intra-industry trade provide some support to the thesis that increase in IIT comes naturally with development. As a country’s level of income goes up and its standard of living rise, its citizens will demand and consume more differentiated products, leading to higher levels of intra-industry trade.

ASEAN member-countries have been growing rapidly during the past decades, with their citizens enjoying higher per capita incomes and standards of living. If these trends continue, it is reasonable to expect that, despite occasional recent reversals, trade in general and intra-industry trade in particular will continue to expand.

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**Appendix A**

A1: Grubel-Lloyd Index

The Grubel-Lloyd Index (1975) single industry intra-industry equation is:

\[
IITB_i = \frac{\left( X_i + M_i \right) - |X_i - M_i|}{X_i} \times 100
\]  

(1)

where \( X_i \) and \( M_i \) are exports and imports of industry \( i \) of a country.

For aggregated industry or product group, the index will be a weighted average of \( IITB_i \), the weight being the share of each industry in the country’s total trade. The summary Grubel-Lloyd index is:

\[
IITB = \frac{\sum_{i=1}^{n} \left( X_i + M_i \right) - \sum_{i=1}^{n} |X_i - M_i|}{\sum_{i=1}^{n} (X_i + M_i)} \times 100
\]

(2)

Where, \( IITBi \) is the weighted average of the value of \( IITB_i \) across industries \( i = 1 \ldots n \), and \( n \) is the number of industries in the sample. \( IITB_i \) is an accurate measure if there is balanced bilateral trade. However, as discussed above, when the total trade is unbalanced, the index will be biased downward, so the imbalance needs to be adjusted, and the modified formula is:
\[ IITC = \frac{\sum_{i=1}^{n} (X_i + M_i) - \sum_{i=1}^{n} |X_i - M_i|}{\sum_{i=1}^{n} (X_i + M_i) - \sum_{i=1}^{n} X_i - \sum_{i=1}^{n} M_i} \times 100 \] (3)

**A2: Aquino Adjusted Index**

To avoid the imbalance bias, Aquino (1978) suggested another modification in the industry level. The ‘theoretical values’ of exports and imports can be estimated by the formulas:

\[ X_i^e = X_i \frac{1}{2} \sum_{i=1}^{n} (X_i + M_i) \quad M_i^e = M_i \frac{1}{2} \sum_{i=1}^{n} M_i \] (4)

By replacing the actual exports and imports with the above values in the Grubel-Lloyd equation, Aquino adjusted index \((IITQ_i)\) can be written as:

\[ IITQ = \frac{\sum_{i=1}^{n} (X_i^e + M_i^e) - \sum_{i=1}^{n} |X_i^e - M_i^e|}{\sum_{i=1}^{n} (X_i^e + M_i^e)} \times 100 \] (5)

**Appendix B**

**B1a. ASEAN trade with Australia in SITC 1-digit commodities: 1995-2013 (US$ Millions)**

| Year | SITC 0 | SITC 1 | SITC 2 | SITC 3 | SITC 4 | SITC 5 | SITC 6 | SITC 7 | SITC 8 | SITC 9 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1995 | 450    | 7      | 209    | 897    | 100    | 322    | 734    | 2,164  | 709    | 123    |
| 1996 | 465    | 7      | 174    | 1,245  | 82     | 376    | 781    | 2,561  | 668    | 67     |
| 1997 | 484    | 7      | 144    | 1,374  | 83     | 411    | 757    | 2,789  | 748    | 348    |
| 1998 | 431    | 5      | 125    | 1,092  | 91     | 446    | 757    | 2,998  | 1,010  | 621    |
| 1999 | 506    | 5      | 147    | 2,060  | 80     | 542    | 998    | 3,501  | 955    | 261    |
| 2000 | 466    | 6      | 181    | 3,026  | 65     | 616    | 979    | 3,954  | 1,000  | 279    |
| 2001 | 447    | 8      | 142    | 3,085  | 52     | 604    | 895    | 3,175  | 930    | 567    |
| 2002 | 493    | 23     | 168    | 3,517  | 71     | 691    | 956    | 3,548  | 1,014  | 605    |
| 2003 | 637    | 19     | 198    | 4,278  | 80     | 817    | 1,109  | 4,127  | 1,514  | 668    |
| 2004 | 709    | 35     | 200    | 6,771  | 100    | 947    | 1,507  | 5,473  | 1,609  | 707    |
| 2005 | 829    | 50     | 200    | 9,811  | 100    | 1,082  | 1,708  | 6,313  | 1,468  | 843    |
| 2006 | 915    | 69     | 257    | 11,233 | 127    | 1,248  | 2,054  | 7,493  | 1,665  | 1,916  |
| 2007 | 1,083  | 89     | 310    | 13,141 | 163    | 1,513  | 2,289  | 9,149  | 1,832  | 2,056  |
| 2008 | 1,334  | 100    | 315    | 17,377 | 249    | 1,811  | 3,037  | 9,762  | 2,087  | 3,007  |
| 2009 | 1,286  | 109    | 240    | 10,285 | 186    | 1,415  | 3,629  | 8,714  | 1,959  | 3,645  |
| 2010 | 1,504  | 156    | 293    | 13,700 | 219    | 2,006  | 3,267  | 11,260 | 2,479  | 2,917  |
| Year | Exports (US$ Millions) | Imports (US$ Millions) | Total (US$ Millions) |
|------|------------------------|------------------------|----------------------|
| 1990 | 4,099                  | 2,280                  | 6,379                |
| 1991 | 4,700                  | 2,951                  | 7,651                |
| 1992 | 5,575                  | 3,365                  | 8,940                |
| 1993 | 5,294                  | 3,377                  | 8,671                |
| 1994 | 6,373                  | 4,075                  | 10,447               |
| 1995 | 7,663                  | 4,989                  | 12,652               |
| 1996 | 8,028                  | 5,977                  | 14,005               |
| 1997 | 8,475                  | 6,623                  | 15,097               |
| 1998 | 5,349                  | 7,249                  | 12,597               |
| 1999 | 6,417                  | 9,013                  | 15,430               |
| 2000 | 8,729                  | 9,524                  | 18,252               |
| 2001 | 7,916                  | 9,037                  | 16,953               |
| 2002 | 7,905                  | 10,453                 | 18,358               |
| 2003 | 7,849                  | 13,145                 | 20,994               |
| 2004 | 10,058                 | 17,005                 | 27,063               |
| 2005 | 12,032                 | 21,397                 | 33,429               |
| 2006 | 14,126                 | 25,617                 | 39,743               |
| 2007 | 15,000                 | 30,626                 | 45,626               |
| 2008 | 19,210                 | 40,449                 | 59,660               |
| 2009 | 15,252                 | 31,079                 | 46,331               |
| 2010 | 19,381                 | 36,630                 | 56,011               |
| 2011 | 27,514                 | 42,862                 | 70,376               |
| 2012 | 26,383                 | 46,889                 | 73,272               |
| 2013 | 21,947                 | 42,561                 | 64,508               |

Source: UNCTAD Stat Database, 2015, Author's calculations.

B2a. Australia trade with ASEAN: 1990-2013 (US$ Millions)

| Year | Exports (US$ Millions) | Imports (US$ Millions) | Total (US$ Millions) |
|------|------------------------|------------------------|----------------------|
| 1990 | 545                    | 368                    | 913                  |
| 1991 | 659                    | 314                    | 973                  |
| 1992 | 786                    | 462                    | 1,247                |
| 1993 | 723                    | 438                    | 1,161                |
| 1994 | 817                    | 565                    | 1,382                |
| 1995 | 1,050                  | 837                    | 1,888                |
| 1996 | 1,170                  | 886                    | 2,056                |
| 1997 | 1,239                  | 819                    | 2,058                |
| 1998 | 811                    | 764                    | 1,574                |
| 1999 | 911                    | 1,035                  | 1,946                |
| 2000 | 1,133                  | 994                    | 2,127                |
| 2001 | 1,260                  | 1,151                  | 2,411                |
| 2002 | 1,107                  | 1,275                  | 2,382                |
| 2003 | 1,291                  | 1,571                  | 2,862                |
| 2004 | 1,525                  | 2,243                  | 3,769                |
| 2005 | 1,663                  | 2,874                  | 4,537                |
| 2006 | 1,909                  | 3,553                  | 5,462                |
| 2007 | 2,737                  | 4,181                  | 6,918                |
| 2008 | 3,324                  | 5,354                  | 8,679                |
| 2009 | 2,584                  | 3,360                  | 5,944                |
| 2010 | 3,102                  | 4,369                  | 7,472                |
| 2011 | 3,527                  | 5,195                  | 8,722                |
| 2012 | 3,509                  | 6,304                  | 9,813                |
| 2013 | 3,905                  | 6,377                  | 10,282               |

Source: UNCTAD Stat Database, 2015, Author's calculations.

B3. NZ total trade with ASEAN in SITC 1-digit commodities: 1995-2013 (in US$ Millions)
### B4. ASEAN Total Trade with the Rest of the World in SITC 1-digit Commodities: 1995-2013 (in US$ Millions)

| Year | SITC 0 | SITC 1 | SITC 2 | SITC 3 | SITC 4 | SITC 5 | SITC 6 | SITC 7 | SITC 8 | SITC 9 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1995 | 28,798 | 3,432  | 21,925 | 36,935 | 6,977  | 35,485 | 69,372 | 253,712| 54,702 | 20,649 |
| 1996 | 30,048 | 3,918  | 21,615 | 45,709 | 6,624  | 35,305 | 69,995 | 279,655| 58,110 | 9,401  |
| 1997 | 30,041 | 4,175  | 19,700 | 47,437 | 7,416  | 36,464 | 68,318 | 288,318| 57,547 | 16,324 |
| 1998 | 26,696 | 3,476  | 15,574 | 35,616 | 7,408  | 31,057 | 51,895 | 246,889| 50,432 | 16,658 |
| 1999 | 27,677 | 2,725  | 16,226 | 44,259 | 6,829  | 35,369 | 57,747 | 266,437| 56,661 | 9,707  |
| 2000 | 28,693 | 2,458  | 18,866 | 64,127 | 5,552  | 40,759 | 64,392 | 322,157| 65,051 | 12,246 |
| 2001 | 29,451 | 2,328  | 16,824 | 58,470 | 5,034  | 38,921 | 59,926 | 284,750| 61,870 | 12,695 |
| 2002 | 30,503 | 2,311  | 17,909 | 58,060 | 7,442  | 42,354 | 63,242 | 299,430| 62,866 | 13,146 |
| 2003 | 32,090 | 2,342  | 20,631 | 69,688 | 9,512  | 51,320 | 67,491 | 325,594| 68,955 | 14,395 |
| 2004 | 36,485 | 2,702  | 25,676 | 93,942 | 11,454 | 64,014 | 86,049 | 395,030| 81,208 | 16,658 |
| 2005 | 40,850 | 3,113  | 30,288 | 127,272| 11,613 | 73,956 | 101,605| 439,823| 87,835 | 21,252 |
| 2006 | 46,606 | 3,425  | 39,484 | 152,217| 13,394 | 84,968 | 116,964| 501,301| 99,593 | 28,624 |
| 2007 | 55,963 | 4,186  | 45,924 | 168,093| 21,246 | 96,902 | 140,082| 542,580| 110,403| 36,117 |
| 2008 | 71,547 | 5,015  | 52,429 | 252,798| 32,032 | 108,897| 160,741| 557,314| 122,519| 75,908 |
| 2009 | 66,761 | 4,791  | 39,152 | 169,942| 23,795 | 95,578 | 123,440| 483,269| 111,267| 41,957 |
| 2010 | 78,507 | 5,531  | 61,213 | 231,161| 31,812 | 128,912| 163,234| 602,858| 138,289| 64,416 |
| 2011 | 98,620 | 7,203  | 82,596 | 328,125| 42,800 | 164,907| 198,670| 641,682| 162,822| 85,039 |
| 2012 | 100,956| 7,988  | 69,760 | 332,468| 39,480 | 168,498| 202,172| 701,565| 172,242| 67,899 |
| 2013 | 108,038| 8,645  | 71,619 | 328,227| 36,247 | 167,237| 219,194| 706,063| 185,800| 65,348 |

Source: UNCTAD Stat Database, 2015. Author’s calculations.

### B5. Australia total trades with the rest of the world in SITC 1-digit commodities: 1995-2013 (in US$ Millions)

#### SITC

| Year | SITC 0 | SITC 1 | SITC 2 | SITC 3 | SITC 4 | SITC 5 | SITC 6 | SITC 7 | SITC 8 | SITC 9 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1995 | 11,871 | 805    | 11,778 | 11,760 | 383    | 8,478  | 15,667 | 33,771 | 9,975  | 5,521  |
| 1996 | 14,667 | 978    | 12,513 | 14,022 | 400    | 9,404  | 15,694 | 36,630 | 10,859 | 5,957  |
| 1997 | 15,127 | 1,064  | 13,462 | 14,829 | 401    | 9,298  | 15,906 | 37,089 | 11,376 | 5,629  |
| 1998 | 11,802 | 1,095  | 11,890 | 12,189 | 410    | 9,024  | 14,714 | 34,566 | 11,209 | 9,265  |
| 1999 | 12,718 | 1,338  | 11,388 | 13,147 | 393    | 9,982  | 15,139 | 37,866 | 11,668 | 5,939  |
| 2000 | 13,332 | 1,484  | 12,940 | 18,823 | 339    | 10,311 | 16,058 | 38,785 | 11,947 | 7,508  |
| 2001 | 13,402 | 1,610  | 12,648 | 18,304 | 308    | 10,206 | 14,531 | 34,153 | 11,165 | 7,911  |
| Year | SITC 0 | SITC 1 | SITC 2 | SITC 3 | SITC 4 | SITC 5 | SITC 6 | SITC 7 | SITC 8 | SITC 9 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1995 | 6,465  | 204    | 2,978  | 962    | 175    | 2,872  | 4,241  | 7,063  | 2,378  | 366    |
| 1996 | 7,156  | 228    | 2,873  | 1,251  | 164    | 2,906  | 4,265  | 7,340  | 2,514  | 383    |
| 1997 | 7,051  | 256    | 2,613  | 1,248  | 157    | 2,926  | 4,142  | 7,243  | 2,655  | 311    |
| 1998 | 6,231  | 241    | 2,025  | 999    | 146    | 2,218  | 3,171  | 6,104  | 2,043  | 244    |
| 1999 | 6,364  | 282    | 2,069  | 1,149  | 136    | 2,666  | 3,765  | 7,463  | 2,542  | 355    |
| 2000 | 6,441  | 319    | 2,293  | 1,828  | 119    | 2,883  | 3,749  | 6,876  | 2,440  | 255    |
| 2001 | 7,185  | 322    | 2,144  | 1,680  | 112    | 3,001  | 3,578  | 6,386  | 2,399  | 229    |
| 2002 | 7,468  | 377    | 2,314  | 1,742  | 135    | 3,008  | 3,944  | 7,405  | 2,717  | 316    |
| 2003 | 8,673  | 482    | 2,502  | 2,047  | 152    | 3,391  | 4,675  | 9,441  | 3,406  | 315    |
| 2004 | 10,809 | 627    | 2,971  | 2,825  | 186    | 3,962  | 5,826  | 11,728 | 4,196  | 407    |
| 2005 | 11,873 | 734    | 2,961  | 3,724  | 167    | 4,230  | 6,149  | 13,164 | 4,410  | 549    |
| 2006 | 12,063 | 814    | 3,120  | 4,517  | 171    | 4,138  | 6,268  | 12,580 | 4,538  | 625    |
| 2007 | 14,775 | 1,066  | 3,535  | 5,636  | 236    | 4,926  | 7,199  | 14,355 | 5,323  | 771    |
| 2008 | 16,995 | 1,164  | 3,993  | 8,175  | 338    | 5,685  | 7,278  | 14,419 | 5,492  | 1,407  |
| 2009 | 14,465 | 1,085  | 3,005  | 4,912  | 225    | 4,402  | 5,285  | 10,974 | 4,838  | 1,308  |
| 2010 | 17,955 | 1,330  | 4,130  | 6,078  | 266    | 4,896  | 6,513  | 12,541 | 5,548  | 1,832  |
| 2011 | 22,118 | 1,534  | 5,104  | 8,179  | 346    | 5,821  | 7,495  | 14,820 | 6,142  | 2,185  |
| 2012 | 22,088 | 1,697  | 5,145  | 8,534  | 361    | 6,117  | 7,264  | 15,680 | 6,516  | 2,146  |
| 2013 | 24,124 | 1,758  | 5,785  | 8,017  | 342    | 6,147  | 7,242  | 16,297 | 6,629  | 2,085  |

Source: UNCTAD Stat Database, 2015. Author's calculations.

B7. ASEAN-Australia intra industry trade by industry: 3-digit SITC (high category) in 2014

| SITC | Description                                      | IITBi | SITC | Description                                      | IITBi |
|------|--------------------------------------------------|-------|------|--------------------------------------------------|-------|
| 001  | Live Animals Other Than Animals Of Division 03   | 66.04 | 061  | Sugars, Molasses, And Honey                       | 97.88 |
| 043  | Barley, Unmilled                                | 69.86 | 072  | Cocoa                                           | 92.90 |
| 059  | Fruit Juices (Incl. Grape Must) And Vegetable Juices |        | 93.45 |                                                  |
| 111 | Nonalcoholic Beverages, N.E.S. | 50.05 |
| 222 | Oil Seeds And Oleaginous Fruits | 79.93 273 |
| 269 | Worn Clothing And Other Worn Textile Articles; Rags | 65.35 |
| 333 | Petroleum Oils And Oils From Bituminous Minerals, Crude | 58.79 |
| 421 | Fixed Vegetable Fats And Oils, Soft, Crude, Refined Or Fractionated | 67.04 431 |
| 513 | Carboxylic Acids And Anhydrides | 51.38 541 |
| 515 | Organo-Inorganic Compounds, Heterocyclic Compounds, Nucleic Acids And Their Salts | 65.55 581 |
| 523 | Metallic Salts And Peroxysalts Of Inorganic Acids | 97.99 592 |
| 524 | Inorganic Chemicals, N.E.S.; Organic And Inorganic Compounds Of Precious Metals Synthetic Organic Coloring Matter And Color Lakes And Preparations Based Thereon | 96.22 593 61.64 598 |
| 531 | Cork Manufactures | 84.52 675 |
| 534 | Veneers, Plywood, Particle Board, And Other Wood, Worked, N.E.S. | 95.36 694 |
| 563 | Woven Fabrics Of Manmade Textile Materials | 93.08 695 |
| 567 | Knitted Or Crocheted Fabrics | 94.03 |
| 567 | Pearls, Precious And Semiprecious Stones, Unworked Or Worked | 61.36 |
| 711 | Steam Or Other Vapor Generating Boilers Thereof | 82.00 747 |
| 718 | Power Generating Machinery And Parts Thereof, N.E.S. | 58.98 748 |
| 723 | Civil Engineering And Contractors’ Plant And Equipment | 97.80 749 |
| 80.10 | Stone, Sand And Gravel |
| 69.86 | Animal Or Vegetable Fats And Oils Processed; Waxes And Inedible Mixtures Medicinal And Pharmaceutical Products, Other Than Medicaments (Of Group 542) |
| 66.06 | Tubes, Pipes And Hoses Of Plastics |
| 76.38 | Starches, Inulin And Wheat Gluten; Albuminoidal Substances; Glues |
| 74.63 | Explosives And Pyrotechnic Products |
| 87.15 | Miscellaneous Chemical Products, N.E.S. |
| 65.63 | Alloy Steel Flat-Rolled Products |
| 97.57 | Nails, Screws, Nuts, Bolts, Rivets And Similar Articles, Of Iron, Steel, Copper Or Aluminum Tools For Use In The Hand Or In Machines |
| 73.05 | Nonelectric Parts And Accessories Of Machinery, N.E.S. |
| SITC | Description | ITBI | SITC | Description | ITBI |
|------|-------------|------|------|-------------|------|
| 001  | Live Animals Other Than Animals Of Division 03   | 0.54 | 047  | Cereal Meals And Flours, N.E.S.   | 0.54 |
| 011  | Meat Of Bovine Animals, Fresh, Chilled Or Frozen | 0.54 | 054  | Vegetables; Roots, Tubers And Other Edible Vegetable Products, N.E.S. | 0.81 |
| 072  | Cocoa | 0.81 |   |   |   |
| 111  | Nonalcoholic Beverages, N.E.S. | 0.65 |   |   |   |
| 269  | Worn Clothing And Other Worn Textile Articles; Rags | 0.61 | 292  | Crude Vegetable Materials, N.E.S. | 0.72 |
| 273  | Stone, Sand And Gravel | 0.91 |   |   |   |
| 335  | Residual Petroleum Products, N.E.S. And Related Materials Fixed Vegetable Fats And Oils, N.E.S. | 0.79 |   |   |   |
| 421  | Soft, Crude, Refined Or Fractionated | 0.53 |   |   |   |

Source United Nations Comtrade Database, 2015, Author's calculations.
| Page | Description                                                                 | 2018, Vol. 8, No. 4 | 2018, Vol. 8, No. 4 |
|------|-----------------------------------------------------------------------------|---------------------|---------------------|
| 533  | Pigments, Paints, Varnishes And Related Materials                           | 0.86 598            | Miscellaneous Chemical Products, N.E.S. 0.98 |
| 581  | Tubes, Pipes And Hoses Of Plastics Materials Of Rubber, Including Pastes, Plates, Sheets, Rods, Thread, Tubes, Etc. | 0.96                | Iron And Steel Tubes, Pipes And Hollow Profiles, Fittings 0.76 For Tubes And Pipes Silver, Platinum And Other Platinum Group Metals 0.51 |
| 621  | Articles Of Rubber, N.E.S.                                                  | 0.57 679            | Metal Structures And Parts, N.E.S., Of Iron, Steel Or Aluminum 0.59 |
| 661  | Wood Manufactures, N.E.S.                                                  | 0.70 681            | Nails, Screws, Nuts, Bolts, Rivets And Similar Articles, Of Iron, Steel, Copper Or Aluminum 0.91 |
| 673  | Wood Lime, Cement, And Fabricated Construction Materials, Except Glass And Clay Materials Iron Or Nonalloy Steel Flat-Rolled Products, Not Clad, Plated Or Coated Iron And Nonalloy Steel Flat-Rolled Products, Clad, Plated Or Coated | 0.92 684 | Manufactures Of Base Metal, N.E.S. 0.95 |
| 714  | Engines And Motors, Nonelectric                                            | 0.73 691            | Nonelectrical Machinery, Tools And Mechanical Apparatus Taps, Cocks, Valves And Similar Appliances For Pipes 0.77 |
| 718  | Power Generating Machinery And Parts Thereof, N.E.S.                        | 0.82 694            | Transmission Shafts And Cranks 0.55 |
| 723  | Civil Engineering And Contractors' Plant And Equipment                      | 0.75 699            | Telecommunications Equipment 0.72 |
| 724  | Textile And Leather Machinery, And Parts Thereof, N.E.S.                   | 0.88 748            | Electric Power Machinery 0.75 |
| 726  | Printing And Bookbinding Machinery, And Parts Thereof                      | 0.58 772            | Electrical Apparatus For Switching Or Protecting Electrical Circuits 0.95 |
| 727  | Food-Processing Machines (Excluding Domestic)                               | 0.56 776            | Thermionic, Cold Cathode Or Photocathode Valve 0.55 |
| 728  | Machinery And Equipment Specialized For Particular Industries               | 0.56 776            | Ships, Boats And Floating Structures 0.92 |
| 731  | Machine Tools Working By Removing Metal Or Other Material                   | 0.56 793            | Instruments And Appliances 0.99 |
| 813  | Lighting Fixtures And Fittings, N.E.S.                                      | 0.87 872            | |

http://ijafr.macrothink.org
| Year | IITB | IITC | IITQ | ALD | AMS | LDD | MSD |
|------|------|------|------|-----|-----|-----|-----|
| 1990 | 38.6 | 42.6 | 40.7 | 9.5 | 324.0 | 26.1 | 17.3 |
| 1991 | 41.8 | 45.6 | 43.6 | 9.9 | 352.7 | 54.1 | 17.9 |
| 1992 | 39.7 | 41.1 | 42.3 | 9.8 | 377.1 | 103.6 | 17.5 |
| 1993 | 41.1 | 43.7 | 41.5 | 9.4 | 397.1 | 170.2 | 16.5 |
| 1994 | 40.4 | 40.9 | 43.3 | 9.7 | 438.4 | 231.0 | 16.7 |
| 1995 | 40.5 | 41.2 | 43.2 | 11.0 | 507.2 | 278.4 | 18.8 |
| 1996 | 46.3 | 50.6 | 49.6 | 11.8 | 560.3 | 317.8 | 20.2 |
| 1997 | 41.5 | 44.8 | 44.7 | 12.5 | 558.5 | 245.7 | 22.0 |
| 1998 | 37.1 | 51.3 | 44.6 | 11.2 | 434.0 | 69.3 | 20.3 |
| 1999 | 34.0 | 51.8 | 45.6 | 10.9 | 466.5 | 155.7 | 19.3 |
| 2000 | 40.0 | 58.0 | 53.2 | 11.5 | 506.5 | 183.1 | 20.4 |
| 2001 | 42.5 | 57.1 | 54.3 | 10.4 | 476.8 | 196.7 | 18.2 |
| 2002 | 38.4 | 58.5 | 54.7 | 10.7 | 517.4 | 246.2 | 18.7 |
| 2003 | 37.1 | 61.8 | 51.9 | 12.5 | 592.1 | 251.3 | 21.9 |
| 2004 | 31.5 | 56.6 | 52.6 | 16.1 | 709.3 | 192.9 | 28.8 |
| 2005 | 34.6 | 58.2 | 53.2 | 17.9 | 798.4 | 210.1 | 32.1 |
| 2006 | 35.3 | 60.0 | 55.9 | 19.1 | 914.7 | 335.0 | 33.9 |
| 2007 | 33.6 | 59.9 | 55.1 | 21.8 | 1,072.6 | 438.3 | 38.4 |
| 2008 | 36.1 | 62.0 | 54.1 | 26.3 | 1,274.1 | 438.1 | 46.7 |
| 2009 | 35.9 | 64.2 | 53.4 | 22.8 | 1,204.7 | 556.7 | 39.8 |
| 2010 | 35.1 | 62.4 | 52.1 | 27.7 | 1,490.6 | 698.7 | 48.3 |
| 2011 | 32.7 | 52.1 | 49.9 | 33.1 | 1,759.8 | 743.5 | 58.1 |
| 2012 | 32.6 | 59.2 | 52.7 | 35.9 | 1,896.1 | 723.4 | 63.3 |
| 2013 | 28.1 | 51.5 | 51.7 | 35.9 | 1,943.3 | 765.9 | 63.2 |

Source: UN Comtrade Database; World Development Indicators, the World Bank, 2015, Author's calculation.

Note: IITB: Grubel-Lloyd IIT index

IITC: Grubel-Lloyd Trade imbalance Adjusted IIT index

IITQ: Aquino; Trade imbalance Adjusted IIT index

ALD (Average Level of Development) and LDD (Level of Development Differential) are measured in US$ thousands;

AMS (Average Market Size) and MSD (Market Size Difference) are measured in US$ millions.
Note

Note 1. The countries listed in the Organization for Economic Co-operation and Development.

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