

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

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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 et 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; ALD_{jk} , AMS_{jk} , LDD_{jk} and MSD_{jk} , 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:

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

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 Brulhart 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.

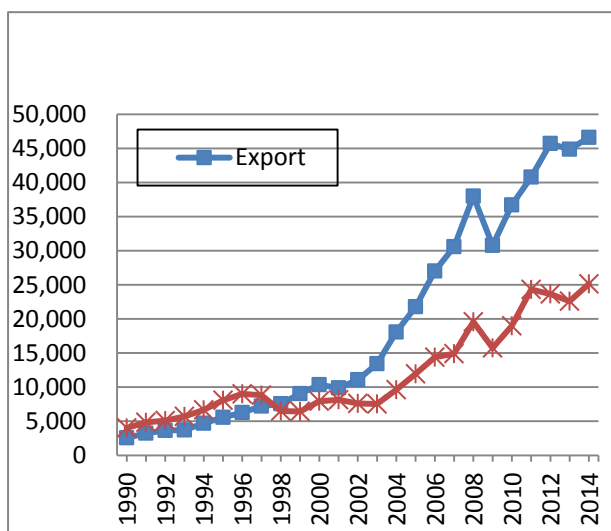


Figure 1a. ASEAN trade with Australia over time: 1990-2014 (in US\$ Millions)

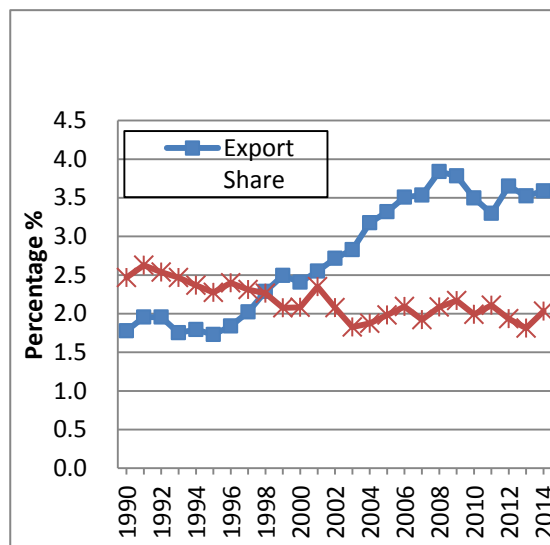


Figure 1b. Share of ASEAN-AUS trades in ASEAN total trades: 1990-2014

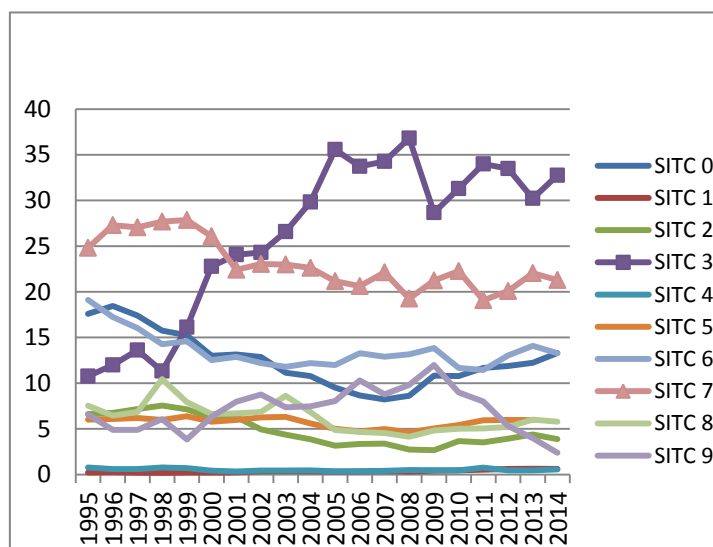


Figure 1c. Share of Australia in ASEAN-Australia total trade by sectors: 1995-2014

Figure 1. ASEAN’s total trade with Australia

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

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].

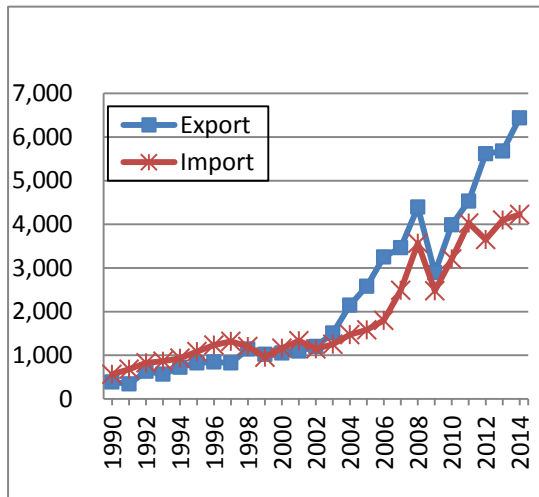


Figure 2a. ASEAN-NZ trade over time: 1990-2014 (in US\$ Millions)

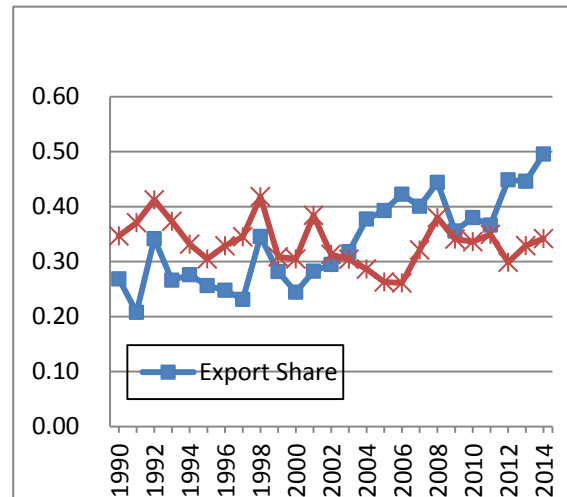


Figure 2b. Share of ASEAN-NZ trades in ASEAN total trades: 1990-2014

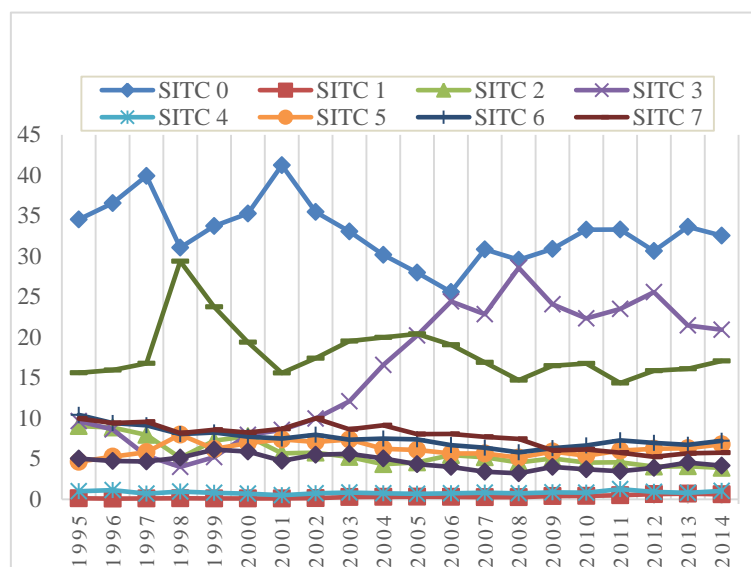


Figure 2c. Share of NZ in ASEAN-NZ total trade by sectors

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.

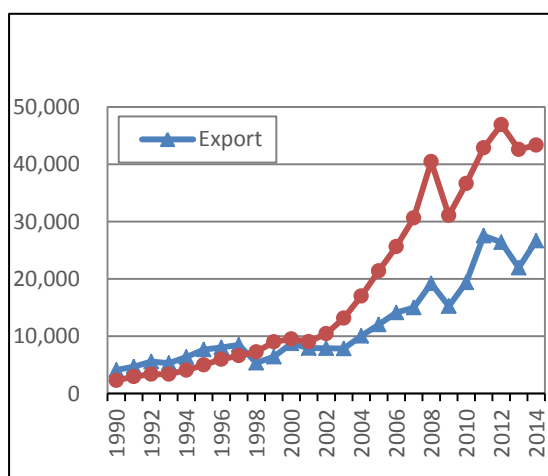


Figure 3a. Australia's trade with ASEAN:
1990-2014 (in US\$ Millions)

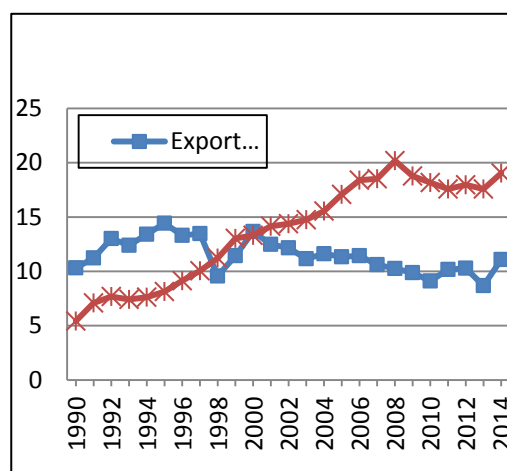


Figure 3b. Share of AUS-ASEAN trades
in AUS total trades: 1990-2014

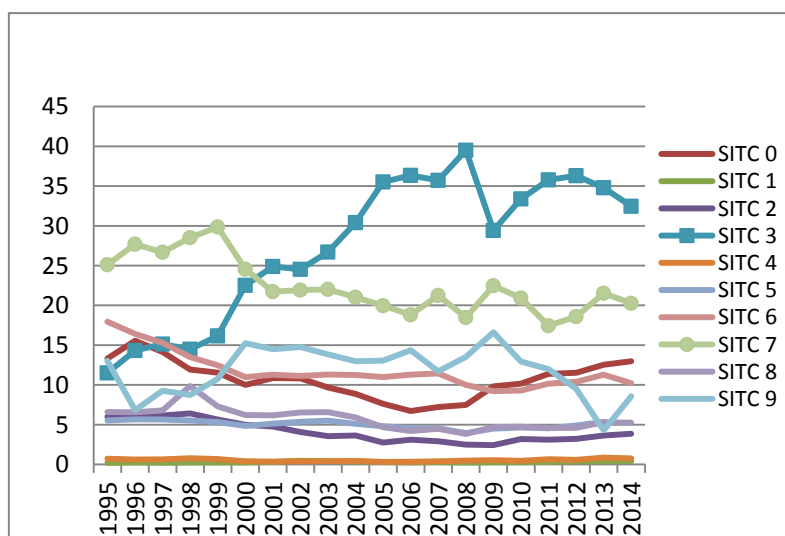


Figure 3c. Share of AUS by sectors in ASEAN-AUS total trade: 1995-2014

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].

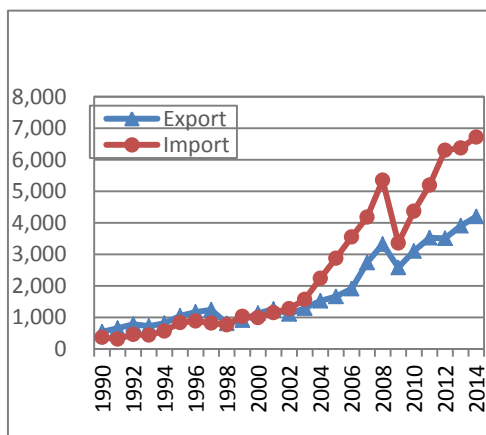


Figure 4a. NZ trade with ASEAN: 1990-2014 (in US\$ Millions)

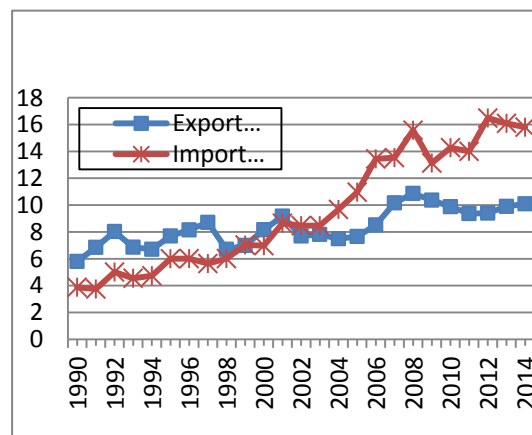


Figure 4b. Share of NZ-ASEAN trades in AUS total trades: 1990-2014

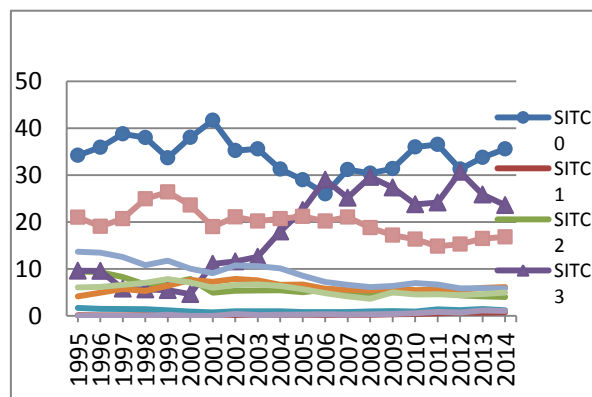


Figure 4c. Share of NZ by sectors in ASEAN-NZ total trade

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.

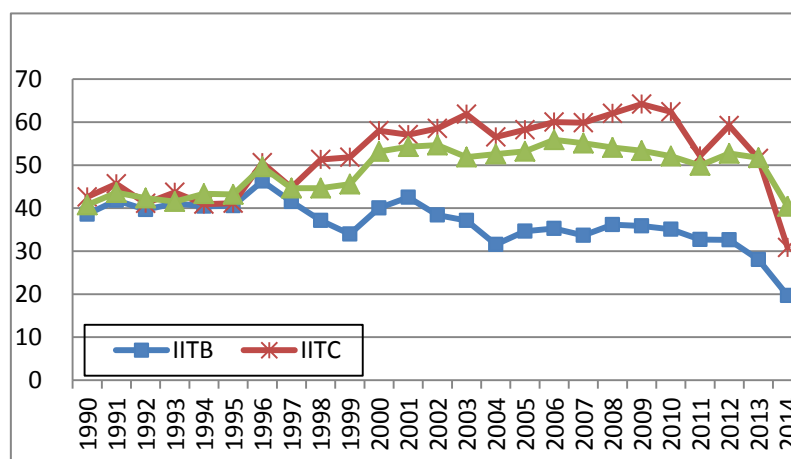


Figure 5. Intra-industry trade between 1990 and 2014 between ASEAN and Australia

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

4	Animal & Vegetable Oils and fats	25.23	76.28	50.43
5	Chemicals	35.51	49.68	37.65
6	Manufactured Goods Classified chiefly by materials	24.65	25.19	24.43
7	Machinery & Transport equipment	20.96	94.19	43.87
8	Miscellaneous Manufactured Articles	25.57	99.51	54.62
9	Commodities & Transactions not classified	77.15	99.94	93.83

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

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 1d. ASEAN-Australia IIT by industry 3-digit summary values 1990 (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 Brühlhart (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

6	Manufactured Goods Classified chiefly by materials	40.53	54.65	37.67
7	Machinery & Transport equipment	17.66	74.39	42.26
8	Miscellaneous Manufactured Articles	22.71	79.16	51.93
9	Commodities & Transactions not classified	54.97	99.00	100.00

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	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 2d. ASEAN-NZ IIT by industry 3-digit summary values 1990 (percent)

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

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 Brulhart 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:

$$IIT = \alpha + \beta \log ALD + \varepsilon$$

$$IIT = \alpha + \beta \log AMS + \varepsilon$$

$$IIT = \alpha + \beta \log LDD + \varepsilon$$

$$IIT = \alpha + \beta \log MSD + \varepsilon$$

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	<u>IITB</u>			
	(1)	(2)	(3)	(4)
log(ALD)	-6.784***			
	(1.270)			
log(AMS)		-5.307***		
		(1.101)		
log(LDD)			-2.214**	

			(0.940)	
log(MSD)			-6.889***	(1.248)
constant	55.729***	71.981***	49.402***	59.924***
	(3.504)	(7.226)	(5.209)	(4.143)
R squared	56.45	51.36	20.13	58.06
Prob. F	0.000	0.0001	0.028	0.000
No. of observations	24	24	24	24
	<u>IITC</u>			
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

Prob. F	0.004	0.002	0.008	0.003
No. of observations	24	24	24	24
<u>IITQ</u>				
OLS Regressions	(1)	(2)	(3)	(4)
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*** (5.183)	11.969 (9.652)	28.781*** (5.484)	28.183*** (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	<u>High IITB (≥ 40)</u>			
	(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	<u>High IITC (≥ 50)</u>			
	(1)	(2)	(3)	(4)
ALD	0.688*			
	(0.374)			
AMS		0.011**		

	(0.005)			
LDD	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
	<u>High IITQ (≥50)</u>			
Probit Regressions	(1)	(2)	(3)	(4)
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

	(0.633)	(0.545)	(0.459)	(0.636)
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:

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

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:

$$IITB = \overline{IITB}_i = \frac{\sum_{i=1}^n (X_i + M_i) - \sum_{i=1}^n |X_i - M_i|}{\sum_{i=1}^n (X_i + M_i)} \times 100 \quad (2)$$

Where, $IITB_i$ is the weighted average of the value of $IITB_i$ across industries $i = 1 \dots n$, 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:

$$IITC = \frac{\sum_{i=1}^n (X_i + M_i) - \sum_{i=1}^n |X_i - M_i|}{\sum_{i=1}^n (X_i + M_i) - \left| \sum_{i=1}^n X_i - \sum_{i=1}^n M_i \right|} \times 100 \quad (3)$$

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 :

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

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:

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

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

2011	1,862	209	349	17,881	308	2,783	3,203	10,975	2,967	1,750
2012	1,894	283	341	18,445	253	2,998	4,086	12,223	3,153	2,265
2013	2,395	295	337	17,218	222	2,772	4,592	12,916	3,591	924

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

B2a. Australia trade with ASEAN:

1990-2013 (US\$ Millions)

Year	Exports	Imports	Total
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

B2b. NZ trades with ASEAN:

1990-2013 (US\$ Millions)

Year	Exports	Imports	Total
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)

Year	SITC 0	SITC 1	SITC 2	SITC 3	SITC 4	SITC 5	SITC 6	SITC 7	SITC 8	SITC 9
1995	647	2	179	182	32	78	259	397	115	0
1996	740	2	192	197	31	102	277	393	127	0
1997	800	2	171	119	30	118	259	427	137	0
1998	600	2	105	89	22	84	171	394	111	0
1999	657	2	134	107	23	125	230	515	153	5
2000	813	4	168	99	19	163	215	505	152	0
2001	1,010	4	120	269	18	175	221	460	145	0
2002	843	5	128	277	23	188	257	504	157	9
2003	1,020	6	155	360	28	217	304	580	193	5

2004	1,181	8	206	679	38	250	382	781	241	9
2005	1,317	10	229	1,024	37	303	389	962	258	12
2006	1,420	11	305	1,587	43	317	395	1,104	264	19
2007	2,160	17	344	1,744	56	384	457	1,457	289	18
2008	2,641	20	393	2,573	82	471	533	1,632	317	28
2009	1,870	19	300	1,629	60	352	380	1,024	299	23
2010	2,696	30	375	1,781	68	410	522	1,224	343	42
2011	3,197	45	424	2,114	120	491	584	1,297	404	75
2012	3,080	69	428	3,021	118	542	577	1,503	434	68
2013	3,418	69	420	2,617	146	604	596	1,667	469	115

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

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	202,127	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)

Year	SITC									
	SITC 0	SITC 1	2	SITC 3	SITC 4	SITC 5	SITC 6	SITC 7	SITC 8	SITC 9
1,995	11,871	805	11,778	11,760	383	8,478	15,667	33,771	9,975	5,521
1,996	14,667	978	12,513	14,022	400	9,404	15,694	36,630	10,859	5,957
1,997	15,127	1,064	13,462	14,829	401	9,298	15,906	37,089	11,376	5,629
1,998	11,802	1,095	11,890	12,189	410	9,024	14,714	34,566	11,209	9,265
1,999	12,718	1,338	11,388	13,147	393	9,982	15,139	37,866	11,668	5,593
2,000	13,332	1,484	12,940	18,823	339	10,311	16,058	38,785	11,947	7,508
2,001	13,402	1,610	12,648	18,304	308	10,206	14,531	34,153	11,165	7,911

2,002	14,107	1,951	12,349	18,514	357	10,671	15,827	39,577	12,431	8,750
2,003	14,020	2,336	13,616	20,477	444	12,950	17,741	46,718	14,760	12,007
2,004	18,865	2,863	17,520	27,086	549	15,858	21,115	55,895	17,854	12,592
2,005	18,677	3,048	23,556	40,304	523	18,450	23,677	62,667	19,614	14,156
2,006	19,938	3,236	30,501	47,156	620	19,195	27,720	66,253	21,015	20,339
2,007	20,426	3,877	35,947	51,823	796	23,117	33,010	76,980	24,462	24,341
2,008	25,393	3,741	48,786	89,964	1,053	26,933	36,456	87,593	28,065	30,452
2,009	23,808	3,418	40,920	65,507	834	23,400	27,952	69,998	25,634	31,236
2,010	26,475	3,705	68,516	85,676	958	27,333	34,201	85,021	28,867	34,693
2,011	34,533	4,156	99,227	115,331	1,252	32,739	42,155	99,801	34,267	40,169
2,012	35,982	4,299	89,380	115,222	1,154	33,582	41,224	112,928	35,164	37,772
2,013	36,427	4,374	98,739	105,888	1,153	30,362	39,659	101,649	34,916	31,470

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

B6. NZ 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	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	Stone, Sand And Gravel	80.10
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	Animal Or Vegetable Fats And Oils Processed; Waxes And Inedible Mixtures	69.86
513	Carboxylic Acids And Anhydrides	51.38	541	Medicinal And Pharmaceutical Products, Other Than Medicaments (Of Group 542)	66.06
515	Organo-Inorganic Compounds, Heterocyclic Compounds, Nucleic Acids And Their Salts	65.55	581	Tubes, Pipes And Hoses Of Plastics	66.53
523	Metallic Salts And Peroxysalts Of Inorganic Acids	97.99	592	Starches, Inulin And Wheat Gluten; Albuminoidal Substances; Glues	76.38
524	Inorganic Chemicals, N.E.S.; Organic And Inorganic Compounds Of Precious Metals	96.22	593	Explosives And Pyrotechnic Products	74.63
531	Synthetic Organic Coloring Matter And Color Lakes And Preparations Based Thereon	61.64	598	Miscellaneous Chemical Products, N.E.S.	87.15
633	Cork Manufactures	84.52	675	Alloy Steel Flat-Rolled Products	65.63
634	Veneers, Plywood, Particle Board, And Other Wood, Worked, N.E.S.	95.36	694	Nails, Screws, Nuts, Bolts, Rivets And Similar Articles, Of Iron, Steel, Copper Or Aluminum	97.57
653	Woven Fabrics Of Manmade Textile Materials	93.08	695	Tools For Use In The Hand Or In Machines	67.08
655	Knitted Or Crocheted Fabrics	94.03			
667	Pearls, Precious And Semiprecious Stones, Unworked Or Worked	61.36			
711	Steam Or Other Vapor Generating Boilers Thereof	82.00	747	Taps, Cocks, Valves And Similar Appliances For Pipes	64.52
718	Power Generating Machinery And Parts Thereof, N.E.S.	58.98	748	Transmission Shafts And Cranks	78.99
723	Civil Engineering And Contractors' Plant And Equipment	97.80	749	Nonelectric Parts And Accessories Of Machinery, N.E.S.	73.05

725	Paper Mill And Pulp Mill Machinery, Paper Cutting Machines	51.93	772	Electrical Apparatus For Switching Or Protecting Electrical Circuits	59.48
726	Printing And Bookbinding Machinery, And Parts Thereof	66.81	774	Electro-Diagnostic Apparatus For Medical, Surgical, Dental	97.42
727	Food-Processing Machines (Excluding Domestic)	83.21	776	Thermionic, Cold Cathode Or Photocathode Valve	89.09
728	Machinery And Equipment Specialized For Particular Industries	50.03	783	Road Motor Vehicles, N.E.S.	55.27
742	Pumps For Liquids	91.90	791	Railway Vehicles	51.52
744	Mechanical Handling Equipment, And Parts Thereof, N.E.S.	79.58	793	Ships, Boats And Floating Structures	64.52
745	Nonelectrical Machinery, Tools And Mechanical Apparatus	56.31			
874	Measuring, Checking, Analysing And Controlling Instruments And Apparatus, N.E.S.	88.83	894	Baby Carriages, Toys, Games And Sporting Goods	69.74
891	Arms And Ammunition	55.12	898	Musical Instruments	82.53
892	Printed Matter	70.68	899	Miscellaneous Manufactured Articles, N.E.S.	64.50
961	Coin (Other Than Gold Coin), Not Being Legal Tender	62.66			

Source United Nations Comtrade Database, 2015, Author's calculations.

B8. ASEAN-New Zealand 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	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	0.79			
421	Fixed Vegetable Fats And Oils, Soft, Crude, Refined Or Fractionated	0.53			

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	0.96			
621	Materials Of Rubber, Including Pastes, Plates, Sheets, Rods, Thread, Tubes, Etc.	0.57	679	Iron And Steel Tubes, Pipes And Hollow Profiles, Fittings For Tubes And Pipes	0.76
629	Articles Of Rubber, N.E.S.	0.70	681	Silver, Platinum And Other Platinum Group Metals	0.51
635	Wood Manufactures, N.E.S.	0.92	684	Aluminum	0.95
661	Lime, Cement, And Fabricated Construction Materials, Except Glass And Clay Materials	0.73	691	Metal Structures And Parts, N.E.S., Of Iron, Steel Or Aluminum	0.59
673	Iron Or Nonalloy Steel Flat-Rolled Products, Not Clad, Plated Or Coated	0.82	694	Nails, Screws, Nuts, Bolts, Rivets And Similar Articles, Of Iron, Steel, Copper Or Aluminum	0.91
674	Iron And Nonalloy Steel Flat-Rolled Products, Clad, Plated Or Coated	0.75	699	Manufactures Of Base Metal, N.E.S.	0.95
714	Engines And Motors, Nonelectric	0.65	745	Nonelectrical Machinery, Tools And Mechanical Apparatus	0.54
718	Power Generating Machinery And Parts Thereof, N.E.S.	0.53	747	Taps, Cocks, Valves And Similar Appliances For Pipes	0.77
723	Civil Engineering And Contractors' Plant And Equipment	0.88	748	Transmission Shafts And Cranks	0.55
724	Textile And Leather Machinery, And Parts Thereof, N.E.S.	0.70	764	Telecommunications Equipment	0.72
726	Printing And Bookbinding Machinery, And Parts Thereof	0.70	771	Electric Power Machinery	0.75
727	Food-Processing Machines (Excluding Domestic)	0.58	772	Electrical Apparatus For Switching Or Protecting Electrical Circuits	0.95
728	Machinery And Equipment Specialized For Particular Industries	0.56	776	Thermionic, Cold Cathode Or Photocathode Valve	0.55
731	Machine Tools Working By Removing Metal Or Other Material	0.56	793	Ships, Boats And Floating Structures	0.92
813	Lighting Fixtures And Fittings, N.E.S.	0.87	872	Instruments And Appliances	0.99

871	Optical Instruments Apparatus, N.E.S.	And	1.00	892	Printed Matter	0.56
971	Gold, Nonmonetary		0.43			

Source: United Nations Comtrade Database, 2015. Author's calculations.

B9. Determinants of IIT between ASEAN and Australia: 1990-2013

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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