

ASEAN – A Move Towards Positive Integration

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Abstract

The paper studies growth of Association of South East Asian Nations (ASEAN), especially after 1990s. The focus is also on the economic integration which distinguishes between negative integration (removing barriers to integrate, such as internal tariffs) and positive integration (creating union-wide markets and institutions by positive actions) of ASEAN. The main element of the paper is intra-industry trade for the year of 2000 and 2006 of 10 nations of ASEAN. The paper computed most traded thirty commodities with Harmonised System (HS) with two digit commodity classifications by using Grubel - Lloyd index which results in an increment in growth, trade, investments and subsequently raising standards of living of ASEAN member countries and other emerging and developing countries in Asia due to positive integration. This aspect should be highlighted to strengthen development of Asia in future.

Key words : ASEAN, Regionalism, Intra-industry trade, Tariff lines

Introduction

The pattern of world trade is changing with respect to production and consumption. Today developing and emerging countries in East Asia are the major supplier as well as buyers in the world. The change in pattern of trade is due to growing regional economic integration between the countries, and the growth of intra-regional trade which encourages countries to adopt trade liberalization policies to reap the benefits of specialization and economies of scale within industries. This changing trend is transforming the world trading system in which countries are in benefit from Regionalism rather than waiting for continuous negotiations in Multilateralism. In this regard, the growth of South East Asian countries is enormous. As per World Trade Organization (WTO, 2012) statistics, one third of the final goods are exported to the world from this ASEAN+6 (ASEAN, China, Japan, South Korea, India, Australia and New Zealand) region.

ASEAN established in 1967, by the five original member countries, the Philippines, Indonesia, Malaysia, Singapore and Thailand. ASEAN was extended in 1984 to include Brunei Darussalam, in 1995 to include Vietnam, in 1997 to include both Laos PDR and Myanmar and 1999 to include Cambodia. Even starting in 1967, ASEAN had very sluggish growth till 1990s, the actual growth of ASEAN was realised in 1990s, when many East and South East Asian countries (including India, China, South Korea, Australia and New Zealand) understood the importance of Preferential Trading Arrangements (PTAs) and wanted to be a part of ASEAN as a trading bloc with outward looking orientation. Therefore major PTAs and Free Trade Areas (FTAs) have developed after 1990s in East and South East Asia, when trade became the engine of growth. Countries started formulating their trade policies on the basis of Regional benefits than multilateral benefits. Moreover results had come in terms of continuous tariff reductions, growth of intra-industry trade, and free flow of factors of production and foreign direct investment (FDI) in the region.

The paper explores how ASEAN has taken number of initiatives to be close enough to achieve economic integration in the region since 1990. Das (2009) realised the importance of trade on the basis of PTAs/FTAs and growth of intra-regional trade in South Asian regional cooperation. To understand the intensity of the economic integration, the paper studies the tariff structure provided under Most Favoured Nation (MFN) and adhering to all those tariff lines by using applied tariff rates by ASEAN countries from the year of 2002 to 2006 in primary products, manufactured products and all products. The Paper has also considered the share of tariff lines with respect to specific rates which are attached to physical quantity in the primary products, manufactured products and all products. The result shows that every member country of ASEAN has understood the significance of WTO (MFN) and has done the implementation truthfully but still these countries have not received much benefit from MFN and therefore ASEAN moved towards its own region by providing equal opportunity and economic gains and the results were seen in terms of significant growth in trade among ASEAN.

At the end of the paper, it explores intra-industry trade for the year of 2000 and 2006. The paper has considered limited time period from 2000 and 2006 the reason being, the last country joining ASEAN was Cambodia in 1999. And after 2006-07, US financial crisis has affected growth, trade and investments in Asian markets to a great extent. This would require different method of analysis so; this paper focuses only till 2006. Siddiqui (2009) discussed the impact of the US financial crisis on the Asian stock markets, largely on China and India. Kawai (2009) discussed the impact of US financial crisis on the Asian and Pacific regions, particularly on their exports. Most of the countries like China, Japan, Korea, Singapore, Indonesia, Thailand, Malaysia and Hong Kong have been largely hit in terms of growth, exports and investments. The paper computed most traded thirty commodities with Harmonised System (HS) with 2 digit commodity classifications by using Grubel - Lloyd index, which measures the intra-industry trade between ASEAN countries. The results clearly indicate that ASEAN has high intra-industry trade in Automotive products, clothing, electronic data processing and office equipment, food, non ferrous metals, ores and other minerals, other food products, raw materials and textiles. In general, the less developed countries export mostly basic commodities, like clothing and food products, while the higher developed countries export lots of electronic components and consumer electronics.

ASEAN has understood the importance of complementarities within countries and reaping advantages by continuous reduction in tariffs, growing intra-industry trade and rising growth rates of the ten member nations. The impact of this bloc is also visible on the ASEAN+6 (ASEAN, China, Japan, South Korea, India, Australia and New Zealand) in terms of growth, trade and economic gains.

Research Methodology

This paper has used secondary sources of data for the analysis. As a country reduces their tariff lines for member nations, opportunities of intra-industry trade also increases. Chang discussed the patterns and determinants of intra-industry trade which studies vertical intra-industry trade and how it is different from horizontal intra-industry trade. This paper has considered Grubel – Lloyd index to measure intra-industry trade. Intra-industry trade flows are conventionally defined as the two-way exchange of goods within standard industrial classifications. The extent of intra-industry trade is commonly measured by Grubel-Lloyd indexes based on commodity group transactions. Thus, for any particular product class i , an index of the extent of intra-industry trade in the product class i between countries A and B is given by the following ratio:

Where, $IIT_{i,AB}$ is the Intra-Industry Trade of commodity classification i in between the two countries or trading partners A and B, X_i is the exports of commodity classification i from Where, $IIT_{i,AB}$ is the

$$IIT_{i,AB} = \left[\frac{\{(X_i + M_i) - (X_i + M_i)\}}{X_i + M_i} \right] * 100 \quad (1)$$

Intra-Industry Trade of commodity classification i in between the two countries or trading partners A and B, X_i is the exports of commodity classification i from country A to country B and M_i is the imports of commodity classification i from country A to country B.

This index takes the minimum value of zero when there are no products in the same class that are both imported and exported, and the maximum value of 100 when all trade is intra-industry (in this case X_i is equal to M_i). The indices reported in the paper have been computed according to equation (1) for each pair of trading partners of ASEAN (Association of Southeast Asian Nations), for each two digit Harmonized system product classes.

Growth of ASEAN as a BLOC

Kumar (2002), there is a growing recognition of the importance of ASEAN in pan - Asian level especially when the US and EU has been growing at a low rate in the medium term. In 1977 the Agreement on ASEAN Preferential Trading Arrangement (PTA) was introduced, this programme of action is to implement regional economic co-operation with the objective of encouraging closer regional collaboration through an expansion of intra-regional trade, the PTA was implemented through cutting trade restrictions mainly tariffs. Thereafter ASEAN has adopted a vision 2020 of ASEAN Economic Community (AEC) in which member countries are fully integrated with respect to goods, services and factors of production across the region. Table 1 in the end represents the significant change in intra-ASEAN trade in terms of exports and imports from the year 1980 to the year 2000. The recent statistics on intra-ASEAN trade has accounted for 26 percent in 2010. The statistics also shows that Japan (10%), China (11%) and India (3%) are also leading trading partners of ASEAN.

Table 2 in the end represents the historical overview of the ASEAN relations and agreements, which clearly signify the deeper integration in ASEAN by announcing ASEAN Economic Community (AEC) which will be implemented by 2015; it will augment the relations by providing single market and production base, competitive economic region, equitable economic development and integration into the global economy. ASEAN has signed FTAs with China, India, and South Korea, which indicates deeper integration amongst Asian (East, North and South) countries especially after recession of 2007 and euro zone crisis.

Pattern of Tariff Structure in Ten Countries of ASEAN

ASEAN since 1992 is taking number of initiatives to achieve economic integration in the region. The market led process is encouraging ASEAN bloc in which the Multinational National Companies (MNCs) are growing within the region by means of reducing the tariffs and providing liberalised industrial policy in trade and investment. The institution led process is driving towards closer economic integration by reducing tariffs from 40 percent to 0 - 5 percent and non tariff barriers for intra-regional trade because of ASEAN Free Trade Area (AFTA). AFTA created an environment where MNCs are free to choose cross border bases and carry out their economic activities by taking gains from the factor price differences. ASEAN is also facilitating the sub-regional economic zones (SREZs); the main aim of SREZs is to attract the investment in contiguous areas by combining their competitive advantages, economies of scale and reaping benefits of economic complementarities in the region.

Most ASEAN countries have improved their trade performance in recent years and exports have been growing very fast. In most countries of ASEAN, exports have been growing faster than the imports thus

improving the trade balance. The sectors that have been performing well in trading are among the likely winners of an FTA. Only Cambodia has an overall trade deficit which has been deepening. The trading patterns are, predictably very different, the Brunei Darussalam have highly concentrated trade portfolios whereas Indonesia and Vietnam have more sectors with high export levels and a more balanced mix of export products. In general, the less developed countries export mostly basic commodities, like clothing and food products, while the higher developed countries export lots of electronic components and consumer electronics.

Countries in ASEAN have drastically reduced tariff lines with respect to primary products, manufactured products and all products. The paper analysed the tariff rates in primary products, manufactured products and all products provided by the World Bank, by using simple mean, most favoured nation tariff rate, which is the unweighted average of most favored nation rates for all products subject to tariffs calculated for all traded goods. Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups. The paper also used weighted mean applied tariff rates, which is the average of effectively applied rates weighted by the product import shares corresponding to each partner country.

Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups and import weights. To the extent possible, specific rates have been converted to their ad valorem equivalent rates and have been included in the calculation of weighted mean tariffs. Import weights were calculated using the United Nations Statistics Division's Commodity Trade (UNCOMTRADE) database. Effectively applied tariff rates at the six- and eight-digit product level are averaged for products in each commodity group. When the effectively applied rate is unavailable, the most favored nation rate is used instead. Table 3, Table 4 and Table 5 in the end represent primary products, manufactured products and all products. These tables clearly show the comparison of MFN and tariff rates applied by the respective ten countries of ASEAN.

Table 3 in the end represents the comparison of tariff rates of primary products under MFN clause and effectively applied rates weighted by the product import shares corresponding to each partner country. It clearly indicates that all ten countries of ASEAN adhere to all the rates strictly and open their respective countries to have greater market access in primary products under MFN clause. Vietnam and Cambodia are less open in terms of primary products because of low income countries in ASEAN and the economies are more dependent on agriculture and allied activities. And Singapore being into the high income countries in ASEAN has more exports in petroleum products, food, chemicals, textile and electronic components and therefore lower tariff lines in the primary products.

Table 4 in the end represents the comparison of tariff rates of manufactured products by most favored nation and effectively applied rates weighted by the product import shares corresponding to each partner country. The table represents two things, one is, as compared to primary products the manufactured products have less tariff rates and secondly Singapore has 0% tariff rate as per MFN and applied tariffs. Therefore Singapore has the highest Gross Domestic Product (GDP), per capita income and investment as compared to any other country in ASEAN. By providing low average tariffs under MFN clause, it specifies the growing demand of manufactured products in the world and how countries are reaping the benefits of specialization and intra-industry trade.

Table 5 in the end represents the comparison of tariff rates of all products by most favoured nation and effectively applied rates weighted by the product import shares corresponding to each partner

country. As per MFN clause all ten countries have implemented the applied rates and reduced the tariff rates for all products. Again Singapore has 0% tariff rates in all products signifying the importance of Singapore in ASEAN.

Table 6 in the end represents the share of tariff lines with specific rates which is the share of lines in the tariff schedule that are set on a per unit basis or that combine ad valorem and per unit rates. It shows the extent to which countries use tariffs based on physical quantities or other, non-ad valorem measures. It indicates two things, Firstly, the shift in pattern of world trade from primary products to manufactured products and mostly every country of ASEAN has 0 percent tariff lines on the physical quantities, Secondly it suggests more scope for intra-industry trade in manufactured products rather than the primary products. In the year of 2006, Indonesia and Thailand had 0.1 and 0.6 percent tariff lines on the physical quantities except any other country in ASEAN, it represents the disadvantage of market access, in which these two countries have competitive and comparative advantages.

Results and Analysis

Table 7 in the end, shows the intra-industry trade in ASEAN between the year of 2000 and the year of 2006, which has been collected from the UN Commodity trade (UNCOMTRADE). The paper has identified 30 most traded commodities in which intra-industry trade has taken place between the ASEAN countries and results have shown that the commodities (commodities considered on the basis of above 5 percent change in intra-industry trade) in which intra-industry trade has increased were automotive products, clothing, electronic data processing and office equipment, food, non ferrous metals, ores and other minerals, other food products, raw materials and textiles. The above commodities indicate the growth of manufactured products in the world and the impact of 0 percent tariff lines on the manufactured products. Table 7 also represents that almost every commodity has maximum level of intra-industry trade above 90 percent in ASEAN except few commodities like other transport equipment (67.48%), iron and steel (76.12%) and pharmaceuticals (79.85%).

The share of tariff lines with specific rates in manufactured products, clearly states that every ten countries of ASEAN promote intra-industry trade which reduced the tariff lines from higher rates to 0% or 0.1% in manufactured products, it clearly shows the growth of intra-industry trade in automotive industry, electronic data processing and office equipment, clothing, non-ferrous metals, ores and other minerals and textiles (Refer table 6). All ten countries in ASEAN reduced the share of tariff lines in manufactured products except Thailand; the reason is trade diversion in automotive industry and electronic data processing and office equipment especially from China and India. Therefore the tariff lines increased marginally from 0.3 to 0.6% in Thailand. The figure 1 of intra-industry trade within ASEAN has been formulated from the table 7.

After looking at the tables in the end (Table – 3, 4, 5, and 6), Singapore more or less goes with the ASEAN pattern because of the fact that it belongs to the high income countries of ASEAN . The highest growth rate in trade flows is found in the differentiated commodity set, which shows that Singapore's average share of intra-ASEAN trade in total trade is relatively high. Singapore's average share in trade is in computer or machinery and electrical equipments. The increase in trade flows may be because of the lowering of tariff rates; where imports from the World are manufactured and hence, value added, and re-exported to other ASEAN countries. But it might also be the other way round, where another ASEAN country exports commodities to Singapore, which then re exports those commodities. Singapore is gaining more from the establishment of ASEAN, since it enjoys a more advanced industrial production than the other member countries and can now take advantage of a greater market access,

giving it a “competitive advantage” in scale-intensive and differentiated commodities.

Conclusions

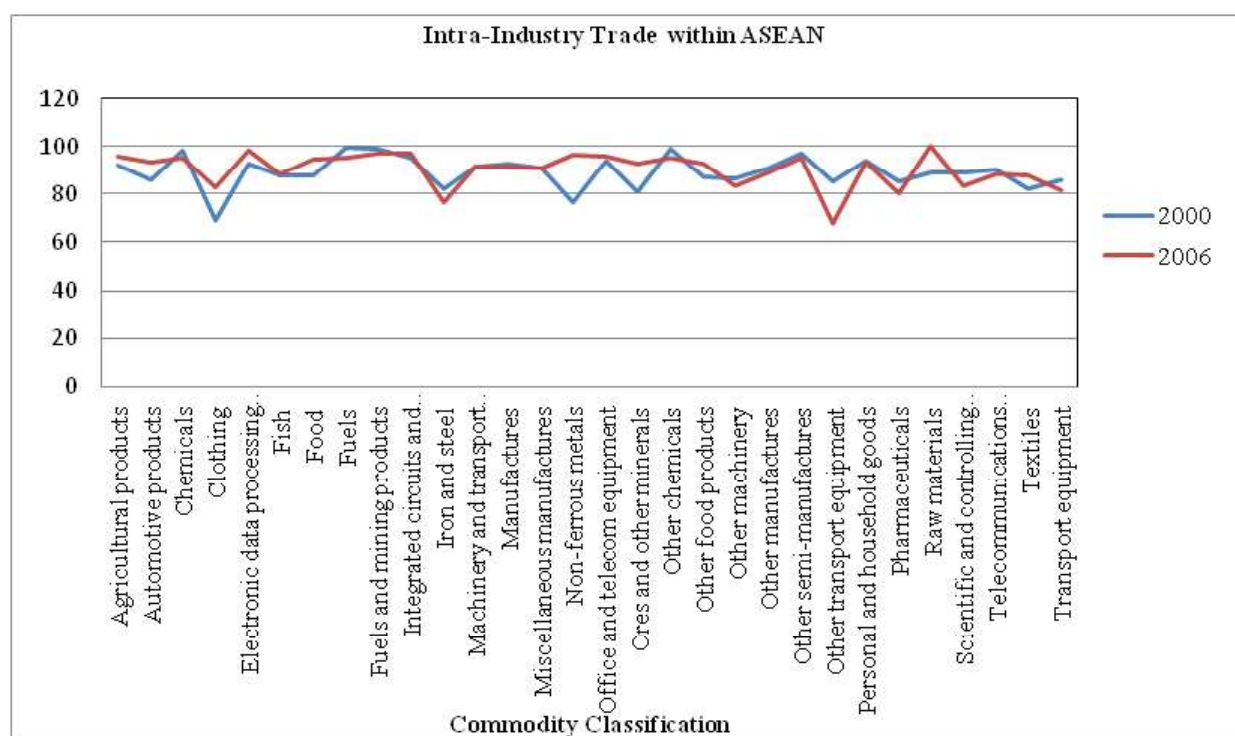
The manufactured products are showing positive growth in ASEAN which in turn increases the GDP, income, employment, encourages FDI and capital flows in the country by a multiplier effect. The growth in manufactured products motivates countries of ASEAN to open up the gates with more positive integration with tax harmonisation and liberal industrial policies which will increase the standard of living of many low income and middle income countries of ASEAN. ASEAN has to come on a common platform to become a stronger regional community by avoiding few problems like firstly, the wide disparity in countries of ASEAN in terms of growth, per capita income, and resources. Therefore ASEAN still has to make some policies with regard to the uniform policy of market access and FTAs. Secondly the domestic policies of each member nations also should be opened for priority sectors like agriculture, textile and wood industry, because these constraints are not supporting the growth of ASEAN member countries. Thirdly, Many FTAs developed between the ASEAN member countries and it became difficult to find out which to follow and which to avoid. Similarly it should be noted that the developments after US crisis and global recession like situation caused disturbances in positive integration process.

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Figure 1. Intra-Industry trade within ASEAN



Source – Computed from the Table 7

Table 1. Intra ASEAN trade as share (%) of total ASEAN trade

	1980	1985	1990	1996	1997	1998	1999	2000
Exports	17.7	18.5	18.92	24.6	24.0	21.0	21.4	22.7
Imports	14.3	17.1	15.1	18.2	18.9	20.8	21.7	24.4

Source – Direction of Trade statistics, IMF

Table 2. Historical overview of ASEAN relations and agreements

Year	Overview
1967	ASEAN is formed by the Philippines, Indonesia, Malaysia, Singapore and Thailand.
1977	Agreement on ASEAN Preferential Trading Arrangement
1984	Brunei Darussalam joins ASEAN
1992	Agreement on the ASEAN Free Trade Area
1992	Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area
1992	Framework Agreements on Enhancing ASEAN Economic Cooperation
1995	Vietnam joins ASEAN
1997	Lao PDR and Myanmar join ASEAN
1999	Cambodia joins ASEAN
2007	Cebu declaration on the Acceleration of the establishment of an ASEAN Community by 2015 signed
2008	Entry into force of the ASEAN Charter as a foundation for achieving the ASEAN Community by providing legal status and institutional framework for ASEAN
2009	AFTA-CEPT became ATIGA (ASEAN trade in Goods agreement)
2009	Adoption of Cha-am Hua Hin Declaration for the 2009-2015 Roadmap for the ASEAN Community
By 2015	ASEAN Economic Community to fully implemented

Source: ASEAN secretariat

Table 3. Comparison of tariff rate, most favoured nation, weighted mean, primary products (%) with tariff rate, applied, weighted mean, primary products (%)

Sl. No.	ASEAN (10 Countries)	Tariff rate, Most favoured nation, weighted mean, primary products (%)					Tariff rate, applied, weighted mean, primary products (%)				
		2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
1	Philippines	6	5	5.3	5.9	5.9	6	5	4.7	5.3	5.3
2	Indonesia	4.3	3.7	4.5	4.6	4.6	4.1	3.1	3.6	3.3	3.3
3	Malaysia	2.4	2.5		2.2	2.7	2.1	2		2.2	2.4
4	Singapore	0.2	0.2	0	0.1	0	0.2	0.1	0	0.1	0
5	Thailand		5.6		2.7	2.5		4.7		2.3	2.1
6	Brunei Darussalam	4.8	13.8	25.5	7.8	8.1	4.8	13.9	25.5	7.9	8.1
7	Vietnam	19.5	17.4	15.6	16	11.6	19.2	16.7	14.9	14.6	10.3
8	Lao PDR			17.3	17.8	17.8			15.1	13.5	11.7
9	Myanmar	5.5	5	4.9	5.5	5.5	5.4	4.9	4.6	4.8	4.2
10	Cambodia	15	15.6		11.3		15	15.6		11.2	

Source – World Bank

Table 4. Comparison of tariff rate, most favoured nation, weighted mean, manufactured products (%) with tariff rate, applied, weighted mean, primary products (%)

Sl. No.	ASEAN (10 Countries)	Tariff rate, Most favoured nation, weighted mean, manufactured products (%)					Tariff rate, applied, weighted mean, manufactured products (%)				
		2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
1	Philippines	2.1	2	3.1	3.3	3.3	2.1	2	2.7	2.8	2.8
2	Indonesia	6.3	5.7	6.5	6.5	6.5	5.9	4.3	5	4.7	4.6
3	Malaysia	5.1	5.1		4.8	4.5	4.6	4.5		4.9	3.7
4	Singapore	0	0	0	0	0	0	0	0	0	0
5	Thailand		11.1		6.6	6.5		9.4		5.9	5.8
6	Brunei Darussalam	10.7	12.5	7	6.6	6.6	10.3	12	5.6	5.1	5
7	Vietnam	15.5	14	14.2	14.3	12.4	15	12.9	13.2	12.8	10.8
8	Lao PDR			11	12.3	12.3			9.8	8.9	8
9	Myanmar	4.7	4.1	4	4.1	4.1	4.6	3.9	3.8	3.8	3.7
10	Cambodia	16.8	16.9		10.9		16.6	16.7		10.6	

Source – World Bank

Table 5. Comparison of tariff rate, most favoured nation, weighted mean, all products (%) with tariff rate, applied, weighted mean, primary products (%)

Sl. No.	ASEAN (10 Countries)	Tariff rate, Most favoured nation, weighted mean, all products (%)					Tariff rate, applied, weighted mean, all products (%)				
		2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
1	Philippines	2.9	2.6	3.5	3.8	3.8	2.9	2.6	3.1	3.3	3.2
2	Indonesia	5.8	5.2	6.1	6.1	6.1	5.5	4	4.7	4.4	4.3
3	Malaysia	4.7	4.7		4.3	4.1	4.2	4.1		4.3	3.4
4	Singapore	0	0	0	0	0	0	0	0	0	0
5	Thailand		9.7		5.4	5.2		8.2		4.8	4.6
6	Brunei Darussalam	9.8	12.8	10	6.8	6.9	9.5	12.4	8.9	5.7	5.6
7	Vietnam	16.3	14.7	14.5	14.7	11.7	15.9	13.7	13.6	13.2	10.2
8	Lao PDR			12.9	14.2	14.1			11.4	10.5	9.3
9	Myanmar	4.9	4.3	4.3	4.5	4.5	4.8	4.1	4	4.1	3.9
10	Cambodia	16.3	16.5		10.9		16.2	16.3		10.7	

Source – World Bank

Table 6. Share of tariff lines with specific rates in primary products, manufactured products and all products

Sl. No.	Countries (10 countries of ASEAN)	Share of tariff lines with specific rates, primary products (%)					Share of tariff lines with specific rates, manufactured products (%)					Share of tariff lines with specific rates, all products (%)				
		2002	2003	2004	2005	2006	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
1	Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Indonesia	0.2	0.8	1.1	1.8	1.8	0	0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3
3	Malaysia	2.3	2.4		2	5.5	0.3	0.1	0	0	0	1	0.9		0.7	0.8
4	Singapore	1.8	1.4	0	0.7	0.8	0	0	0	0	0.3	0.2	0.2	0	0.1	0.1
5	Thailand		4.3		4.6	4.8		0.3		0.5		0.8		1.1	1.1	1.1
6	Brunei Darussalam	7.2	6.3	9	9.3	11	0.2	0.1	0	0	1.7	1.4	1.2	1.2	1.5	1.5
7	Vietnam	0	0	1.4	0	0	0.2	0	0	0	0.2	0	0.2	0	0	0
8	Lao PDR			0	0.3	0.3			0	0				0	0	0
9	Myanmar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Cambodia	0.1	0.1		0		0	0			0.1	0.1		0		

Source – World Bank

Table 7. Intra – Industry Trade of ASEAN for the year of 2000 and 2006

Sl. No.	Commodity Classification	IIT in 2000	IIT in 2006	Change
1	Agricultural products	91.96	95.78	3.82
2	Automotive products	85.94	93.06	7.12
3	Chemicals	98.21	94.58	-3.63
4	Clothing	68.89	82.51	13.62
5	Electronic data processing & office equipment	92.75	98.31	5.56
6	Fish	87.76	87.99	0.23
7	Food	87.63	94.54	6.91
8	Fuels	99.76	95.11	-4.65
9	Fuels and mining products	98.85	96.58	-2.27
10	Integrated circuits and electronic components	95.4	96.58	1.18
11	Iron and steel	82.26	76.12	-6.14
12	Machinery and transport equipment	91.84	90.95	-0.89
13	Manufactures	92.84	91.24	-1.6
14	Miscellaneous manufactures	90.63	90.31	-0.32
15	Non-ferrous metals	76.27	96.03	19.76
16	Office and telecom equipment	93.82	95.59	1.77
17	Ores and other minerals	81.11	92.09	10.98
18	Other chemicals	98.88	95.14	-3.74
19	Other food products	86.93	92.62	5.69
20	Other machinery	86.75	83.19	-3.56
21	Other manufactures	90.77	88.89	-1.88
22	Other semi-manufactures	97.24	94.64	-2.6
23	Other transport equipment	85.34	67.48	-17.86
24	Personal and household goods	93.98	93.09	-0.89
25	Pharmaceuticals	85.22	79.85	-5.37
26	Raw materials	89.29	99.87	10.58
27	Scientific and controlling instruments	89.1	83.34	-5.76
28	Telecommunications equipment	90.17	87.81	-2.36
29	Textiles	82.31	87.44	5.13
30	Transport equipment	85.62	81.36	-4.26
31	Total merchandise	93.34	95.2	1.86

Source: Computed on the basis of Grubel Lloyd index by using the equation (1)