An Economic Analysis of Intra-Industry Trade Between Thailand and Other APEC Countries, 1990-1999

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Abstract

Recent economic liberalisation, macroeconomic policy, and global trade reforms have significantly reshaped trade between developed and developing countries. This article examined the impact of recent policy reforms on intra-industry trade (IIT) between Thailand and Asia Pacific Economic Co-operation (APEC) countries focusing on the pattern of IIT across countries and within industries. IIT was measured based on the Grubel and Lloyd Index for 1980-1999 using 3-digit Standard International Trade Classifications (SITC) data. The results suggested that Malaysia and Singapore were the major trading partners of Thailand, followed by the Philippines, Taiwan and Indonesia. However, adjusting for trade imbalance, Hong-Kong, Korea and Mexico became the major trading partners. The results also showed that within manufactures, certain resource-based labour intensive manufactures and low "technology" manufactures occupy large shares of the total trade.

Keywords: Thailand, Grubel-Lloyd Index, APEC, liberalisation, Intra-industry trade

Introduction

Recent liberalisation and macroeconomic policy reform in developed and developing countries are aimed at achieving a multitude of objectives, including economic growth. Over the last four decades traditional international trade theory has asserted that countries would export and import products of different industries on the basis of their comparative or absolute advantage; each country exports the goods matched to its factor endowment, technology, and climate while importing the goods least suited to its national characteristics. However this theory is being challenged by the emergence of new trading patterns. Although the theory of comparative advantage explains the possibility that a country may be more efficient in the production of both goods but still benefit from maintaining mutually beneficial trade (Ruffin, 1999), some recent studies (Guell and Richards, 1998; Ruffin, 1999) have questioned the usefulness of the comparative advantage paradigm in explaining the new patterns of trade in which countries both export and import within the same industrial category. Furthermore, the traditional trade theory fails to explain how trade impacts on the income distribution within the country (Ruffin, 1999). Recent developments have renewed interest among international trade economists in measuring intra-industry trade among trading blocs. The focus of this paper is on the new pattern of trade, referred to in the international trade literature as the intra-industry trade (IIT), which deals with a country's trade in merchandise in the same industry category.

In the past ten years profound macroeconomic and trade policy reform in Thailand has contributed to increased growth within the economy with increases in per capita income and higher export earnings. It is believed that regional grouping can cause trading blocs to discriminate against non-members and could lead to increased competition across national borders (Lloyd, 2000). Two unresolved issues with Thailand's trade are whether intra-industry trade (IIT) exists and if it does, what are the factors shaping that trade Despite the many uncertainties and qualifiers inherent in making an assessment of Thailand's intra-industry trade, such an exercise, using careful study and analysis, can provide strategic intelligence and key insights for trade policy formulation. The insights are derived largely from knowledge of trade between Thailand and its major trading partners.

Few studies have examined IIT within the Asia Pacific region, and the analysis of trade between Thailand and other APEC countries is limited. This study makes a contribution to the topic in two ways. First, it utilises time-series data to examine differences in intra-industry trade intensity in the context of country and industry analysis between pre- and post-APEC era. Second, it expands the number of countries in the study to include all APEC countries rather than a sample of only 5-11 countries in the period beyond 1990. However, as with most previous studies this study uses the Grubel and Lloyd index.

This paper addresses the first of these problems, namely whether intra-industry trade exists, by measuring intra-industry trade between Thailand and other Asia-Pacific Economic Co-operation (APEC) countries. The rest of this paper is organised as follows: Section 2 provides an overview of recent developments in the measurement of intra-industry trade. Section 3 presents the methodological framework used in the analysis. Section 4 reports and discusses the intra-industry trade estimates. Finally, Section 5 sums up the main conclusions of the study and suggests areas for future research.

Historical Background

Government trade policies are linked to trade outcomes and macroeconomic performance of the economy. For Thailand, reference to the period up to 1996 and the period post-1997 crisis can assess this proposition. Thailand has actively pursued policies designed to promote trade expansion, beginning in 1954 with the Industrial Promotion Committee (IPC). Since then, Thai trade policy reform has progressed, via a series of National Economic and Social Development (NESDB) plans, from an emphasis on import substitution to export promotion. Import substitution dominated policy settings until 1972. In this phase, certain industries with growth potential were targeted, namely the paper, chemical-fertiliser, iron and steel, automobile assembly, cement, gunny bag and textile industries. As a consequence, Thailand's manufacturing sector grew rapidly to more than 10 percent of GDP due to domestic demand growth and the expanded export activity.

Export promotion emerged as a new policy focus with the Third Plan in 1972. Trade strategy stressed the promotion of export-oriented firms and decentralisation of investment activities away from Bangkok. This policy was to be continued as the main policy over the Fourth to the Seventh Plans. For example,

export-processing zones were established in the Fourth Plan (1977-81), small-scale industries were encouraged in the Fifth Plan (1982-91), and agro-based industries and diversification of manufactured products and export markets were featured in the Sixth and the Seventh Plans (1992-96). By 1995, Thai trade had increased by 20 percent due to these exported-oriented policies (Suphachalasai, 1995).

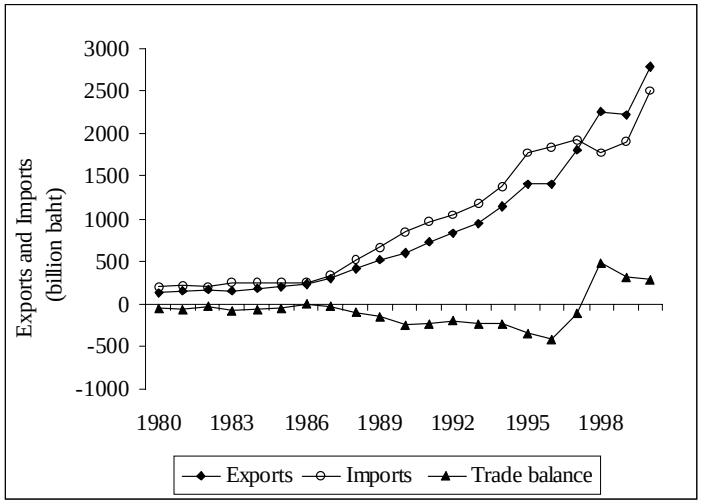

Figure 1 Exports and imports of Thailand, 1980-2000
Source: Bank of Thailand, Quarterly Bulletin, BoT (2003).

The impacts of the industrial restructuring and trade policy reforms were manifested in the external sector. The volume of total trade increased from 321.8 billion baht in 1980 to 474.7 billion baht in 1986 and by 1996 the total trade had accelerated to 3,244.9 billion baht. Thai exports grew at an average annual rate of 10.3 percent between 1980-86 and at an annual average rate of 20.1 percent between 1986-96. At the same time, Thai imports were growing at average annual rates of 4.7 percent and 23.3 percent for the two periods in question (Figure 1). This resulted in a net export deficit of 420.7 billion baht in 1996.

Most of Thailand's exports are manufactured products. The portion of manufactures in total exports has grown from 75.5 percent in 1990 to 85.5 per cent in 2000 (BoT, 2000). At the same time, the agriculture sector decreased in export significance from 17.7 percent in 1990 to 7.1 percent in 2000. Thus in 2000 the export share of manufactured products ranked ahead of the agricultural product share with all other products accounting for 7.3 percent of exports (Table 1).

Table 1 Thailand's total value of exports sectors, 1990-2000

Sectors	1990	1993	1996	1999	2000
Manufactured	437,210	752,557	1,151,365	1,865,705	2,371,869
	(75.50)	(80.41)	(81.54)	(84.27)	(85.50)
Agricultural	102,972	110,695	107,131	184,947	197,117
	(17.78)	(11.83)	(11.84)	(8.35)	(7.10)
Fishery	29,337	55,689	63,511	78,851	91,744
	(5.06)	(5.95)	(4.50)	(3.56)	(3.30)
Mineral	4,724	5,750	10,404	13,886	31,425
	(0.81)	(0.61)	(0.74)	(0.62)	(1.13)
Other	4,750	11,171	19,700	70,576	81,671
	(0.82)	(1.19)	(1.40)	(3.19)	(2.94)
Total export	578,993	935,862	1,412,111	2,213,965	2,773,826
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Calculated from BoT (2000).
Note: Value in parenthesis are percentage

The boom in manufacturing exports and the surge in private investment, especially foreign direct investment in the export-oriented manufacturing sector, have driven the impressive economic performance of Thailand over the decade up to 1996. Thailand grew at a rate of 10 percent per annum through 1990 and between 8.1-8.8 percent over 1992-95 (Table 2). The unemployment rate was at 1-2 percent per annum and the exchange rate was at around 25 baht per US dollar. However, the inflation rate was at 5-6 percent per annum and the current account was in deficit.

The Asian crisis of 1997 precipitated a dramatic change in government policies towards trade and macroeconomic management. In 1997, the Thai government adopted a policy of protectionism with increases in excise taxes and hikes in customs duties on a range of luxury products. To reduce demand for imported products, the government promoted a strategy of buying Thai goods. The government also put in place fiscal policy reforms, including reduced public spending and continued financial restructuring, aimed at stimulating slow domestic demand and lowering the current account deficit. Other strategies included the provision of liquidity for major sectors of the economy, such as the agricultural export sector, and safety net provision to minimise the impact of the financial crisis on the poor.

Table 2 The key indicators of Thailand's economy, 1990-2000

Indicator	1990	1993	1996	1998	1999	2000
Population (Mill)	55.8	58.0	60.0	61.2	61.8	62.4
Labour Force (Mill)	31.8	32.8	32.8	33.4	33.2	33.9
Growth rate GDP (%)	10.0	8.4	5.9	-10.8	4.2	4.4
Current account (% GDP)	-7.1	-6.1	-7.9	12.7	10.2	7.6
Inflation rate (% Δ)	5.6	5.0	5.9	8.1	0.3	1.6
Unemployment (%)	2.2	1.5	1.1	3.4	3	2.4
Exchange rate (B/US)	25.4	25.3	25.3	41.4	37.8	40.1

Source: MoF (2002); BoT (2002).

The growth rate of GDP plummeted to -10.8 percent in 1998 before recovering to 4.4 percent in 2000. This has been accompanied by a sustained doubling in the unemployment rate and a surge in the inflation rate that spiked at 8.1 percent in 1998. The currency depreciated significantly so that by the end of 2000 the exchange rate was 40.1 baht per US$, about 49 percent lower than its pre-crisis level of 25.3 baht per US$ at the end of 1996 (see Table 2). However, there has been a turnaround in the current account balance from deficit in 1997 to surplus in 1998-2000. The current account surplus stood at 7.6 percent of GDP in 2000. The trade balance has also improved with a surplus of 473.3 billion baht in 1998 and 306.8 billion baht in 1999 (Figure 1). Exports have grown at an average annual rate of 17 percent between 1996 and 2000 and imports have grown at the slower average annual rate of 1.6 percent.

Finally, it is worth noting that Thailand joined APEC in 1990 because it was seen as a significant regional organisation that could impact Thailand's goals of achieving trade liberalisation and opening markets and thus promoting sustained growth and structural change in the Pacific region. These expectations have been realised with APEC serving as a major market for Thai exports and imports. Among APEC member countries, the USA is the largest market for Thai exports with an average export share of 24.4 percent over 1990-2000, followed by Japan at 16.3, Singapore at 15.9, Hong Kong at 8.3, Malaysia at 5.3 and Taiwan at 4.5.

Japan is the main source of Thailand's imports, accounting for 38.5 percent in the same period. The second largest supplier of imports is USA with an average share of 17.3 percent. Imports from Singapore constituted 8.5 percent and Taiwan, Malaysia and Korea together supplied roughly 6 percent of Thailand's imports in the same period.

A Theoretical Model

Previous Theoretical literature

International trade theory has slowly evolved in an effort to better understand and explain the patterns and determinants of trade. The theory of absolute advantage postulated that a country would gain from international trade by exporting the products in which it had an absolute cost advantage and importing those in which it had an absolute cost disadvantage. However, this theory is unable

to explain the situation in which the country has an absolute advantage in both products. The theory of comparative advantage addresses this trade phenomenon by arguing that a country can benefit from international trade by exporting the products in which it has a relative cost advantage and importing the products in which it has a relative disadvantage. The Heckscher-Ohlin theorem draws out the strong links between difference in costs of production and differences in factor endowments that underpin incentives to trade between nations. However, this theory is unable to explain the new pattern of trade in which countries both import and export the same commodities (IEE, 1997).

IIT has come to prominence over the past three decades. This new trade theory has its foundations in product differentiation, economies of scale, and imperfect competition of markets (Helpman, 1981; Krugman, 1981, 1980, 1979; Lancaster, 1980). Empirical studies have centred on the patterns and determinants of IIT for most western countries, especially western European countries. There are only a few studies that relate to developing countries. For example, in the case of Asia there are studies by Min, (1992), Thorpe (1993), Duc (1994), Menon (1996) and Hu and Ma (1999).

Min (1992) investigates the measurement and determinants of IIT using the G-L index for 101 manufacturing industries, 3-digit SITC for 11 countries over the period 1965 and 1990. The countries are grouped into Asian developing countries (China, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand) and developed countries (UK and USA). Min calculates IIT indices. The results show that the share of IIT in total trade with developed countries dramatically increased (more than 30 percent) for Malaysia, Singapore, Taiwan, Philippines, Korea and Thailand. Hong Kong, China, and Indonesia have IIT indexes that increased at a steady rate. Thus, IIT level is not dependent on just the developed countries, but it also depends on the characteristics of developing countries including income per capita, consumption ratio in total real GDP, and openness of the economy. Thorpe (1993) studies the nature and extent of IIT of three ASEAN nations: Malaysia, the Philippines and Singapore over 1970-89. The study focuses on country and industry levels. Examination of intra-ASEAN trade shows that Singapore played an important role among member countries due to its position as entrepot port and as the most developed country within this group. The levels of bilateral IIT suggest that members of ASEAN have become increasingly integrated, not only with one another but with countries outside the region.

Duc (1994) investigates the determinants of IIT among 11 Asia-Pacific region countries: China, Hong Kong, Indonesia, Japan, Malaysia, Philippines, Taiwan, Singapore, Korea, Thailand and USA from 1980 to 1990 by combining cross section and time series observations. The study finds that similarities in capital endowment and economic size are important sources of bilateral IIT. Menon (1996) considers the ASEAN free trade area using data for manufacturing industries at 3 digit level of SITC 5-8 covering 130 industries. The country sample consists of five ASEAN nations: Singapore, Thailand, Malaysia, Indonesia and Philippines. Menon shows that IIT growth in intra-ASEAN trade growth has been

significant in all ASEAN countries between 1981-91. More than 75 percent of the growth in Thailand's intra-ASEAN trade between 1986 and 1991 was a result of IIT growth, while in Malaysia and Singapore the percentage was above 60 percent. For Indonesia and the Philippines, IIT growth accounted for almost half and one third of the growth in intra-ASEAN trade. The study confirms that not only is IIT increasing rapidly in trade amongst the developing countries of ASEAN, but that IIT has become more significant in trade within these countries than it is in trade with developed countries.

Hu and Ma (1999) analyse country-specific and industry-specific hypotheses concerning trade between China and 45 trading partner countries in 1995. The study integrates cross section and time series analysis. Specific attention to vertical analysis identified human capital intensity as a major variable in creating quality product differentiation. Product differentiation and economies of scale determine the level of horizontal IIT. The study concludes that IIT is an important component of China's trade but that China's IIT varies across trading partners and across industries.

Mathematical Specification

The seminal works of Grubel and Lloyd (1978, 1975) formalised the measurement of IIT. The Grubel-Lloyd (here after referred to as the G-L) Index has attracted criticism from, for example, Aquino (1978) who claimed that the G-L index fails to adequately account for trade imbalance, thereby biasing the estimates. Aquino argues that "… one cannot possibly maintain that the overall imbalance has not an imbalancing effect on the single commodities' trade flows and then recognise that the imbalancing effects appear at the highest level of industry aggregation" (p.280). Aquino was later criticised by Greenaway and Milner (1983, 1981) as lacking sound theoretical basis. Although there is an extensive debate on what constitutes a best measure, it is generally accepted, in international trade circles, that the G-L Index provides a good measure of IIT. For a review of recent developments see Vona (1991). Since then, there have been a number of applications of the G-L index in the study of trade among trading blocs and between countries. A vast literature has developed in the measurement of IIT (Ballasa, 1966; Grubel & Lloyd, 1971, 1975; Aquino, 1975). This study adopts the Grubel and Lloyd's (1975) Index (the G-L Index) to measure intra-industry trade between Thailand and other APEC countries. The basic G-L Index is denoted as:

$$B_{ij} = \frac{(X_{ij} + M_{ij}) - \left|X_{ij} - M_{ij}\right|}{(X_{ij} + M_{ij})} * 100 \qquad (1)$$

where X_{ij} is the value of exports of commodity i to country j ; M_{ij} is the value of imports of commodity i from country j, and where i = 1, 2, 3,….n, where n is the number of commodities traded and j is the country trading with Thailand. The value of B_{ij} ranges between 0 to 100, with high value of B_{ij} indicating that exports

are matched by the value of imports within the commodity. If $B_{ij}=0$, then either exports or imports or both are equal to zero which implies that there is no IIT in that commodity.

The basic G-L Index can be modified to provide a measure of IIT across all commodities. The unadjusted weighted average, B_a , is given as:

$$B_a = \frac{\sum_i^n (X_i + M_i) - \sum_i^n |X_i - M_i|}{\sum_i^n (X_i + M_i)} * 100 \qquad (2)$$

where B_a = unadjusted weighted average IIT and the variables are as defined above.

The value of B_a falls in the range 0 to 100 with higher values representing higher levels of IIT for all commodities. The index can be further adjusted to reflect the relative size of the over all trade imbalance between trading partners. The adjusted weighted average of the G-L Index is:

$$C_j = \frac{\sum_i^n (X_i + M_i) - \sum_i^n |X_i - M_i|}{\sum_i^n (X_i + M_i) - \left| \sum_i^n X_i - \sum_i M_i \right|} * 100 \qquad (3)$$

where C_j=adjusted weighted average IIT and the other variables are as defined above.

Data Sources and Description

The data used in the analysis was obtained from United Nation's COMTRADE database (CDROM 1990-95 and 1996-99). For the period 1980-89 obtained from the National Statistical Office (NSO) in Thailand and the International Economic Data Bank (IEDB) of the Australian National University (ANU).Within the literature there is some dispute as to the appropriate degree of data disaggregation. Sharma (2000) notes that some earlier studies have indicated that IIT would not exist at the finest level of disaggregation (Pomfret, 1978; Lipsey, 1976; Finger, 1995). It arises, they argue, from an improper aggregation of trade data and may be attributed to a statistical phenomenon. However, recent empirical evidence (Bergstrand, 1983) demonstrates that disaggregation does not cause IIT to disappear. Further, Menon and Dixon (1996) argue against using too fine or too broad a disaggregation or aggregation. Consequently, in this study, we use data on manufactured exports and imports, between Thailand and other APEC nations, at the 3-digit Standard International Trade Classification (SITC) for the period 1980-99.

Apart from the issue of the appropriate level of disaggregation, there remains the question of the appropriate data grouping. In determining IIT, there is an innate appeal to the regrouping of data because it could potentially provide further insight into industries within the manufacturing sector. However, Greenaway and Milner (1983) notes that by summing across groups an aggregation bias could potentially arise from the 'opposite sign effect' (i.e. sub-groups imbalances with different signs are aggregated), and from the 'weighting effect' (i.e. sub-groups with different factor ratios) (Gray and Martin, 1980). In addition categorical aggregation may occur when industrial categories are mis-classified, i.e. activities with different production functions are erroneously grouped together (Greenaway and Milner, 1983). Therefore, this study accepts the SITC classification that aggregates manufacturing industries into four main groups, namely: SITC5- chemicals and related products; SITC6- manufactured goods classified by chief material; SITC7- machinery and transport equipment; SITC8- miscellaneous manufactured goods.

The APEC countries are divided into four main groups based on geographical location as follows:

Group 1: China, Hong Kong, Taiwan, Japan, Korea, and Russia
Group 2: Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam
Group 3: Australia, New Zealand, and Papua New Guinea
Group 4: Canada, United Stated, Mexico, Peru, and Chile

Times series and cross section analysis are applied to the 99 observations from 20 member countries of APEC between 1980-99.

Results

Country Analysis

Table 3 reports the estimated unadjusted G-L (B_a) index, for group 1, the unadjusted G-L index, Ba, rises over two decades for China, Japan, Korea and Taiwan, but falls for Hong Kong. Japan and Taiwan exhibit a consistent increase in IIT over the period that occurs independent of APEC membership though Taiwan's pattern suggests a mild acceleration in IIT post-APEC. Japan is an interesting case because the IIT index was quite low throughout the 1980s and stood at 19 percent in 1990. Against this low starting base, the IIT had increased significantly to 44.5 percent by 1999. Hong Kong begins the period with the highest IIT in the group, reflecting its role in entrepot trade.

However, by 1999, Hong Kong's IIT with Thailand had fallen to 11.7. The turnaround in Hong Kong's performance can be attributed to the steep drop in the export and economic growth rates associated with structural change in Hong Kong from a manufacturing to services oriented economy, alongside problems of increasing labour and land costs. Moreover, political uncertainty surrounding Hong Kong's re-unification with China in 1997 led to a fall in the share of manufacturing in GDP.

Table 3 The unadjusted G-L index (B_a) of Thailand and other APEC countries, 1980-1999

Country	1980	1985	1990	1995	1999	Pre-APEC	Post-APEC
				Group 1			
CHN	16.90	25.38	20.43	35.06	47.10	26.89	35.26
HKG	50.01	35.01	35.22	25.82	19.27	38.19	25.88
JPN	8.09	13.92	19.00	26.56	38.06	11.84	31.00
KOR	25.52	23.44	28.13	27.15	43.79	24.40	32.38
TWN	15.64	22.44	25.51	47.16	51.43	19.94	42.40
RUS	*Na*	*Na*	3.43	9.57	0.00	*Na*	9.32
Avg1	22.66	24.19	20.72	28.83	37.37	23.34	29.27
Avg1a	23.23	24.04	25.66	32.35	39.93	24.25	33.39
				Group 2			
BRN	*Na*	*Na*	*Na*	12.04	75.77	*Na*	24.21
IDN	37.87	13.31	24.14	32.65	58.34	19.37	35.92
MYS	47.09	47.85	53.83	75.48	73.17	52.64	69.22
PHL	32.49	40.32	44.81	23.80	55.80	33.14	42.93
SGP	59.90	43.35	57.10	62.10	54.09	48.73	59.80
VIT	*Na*	*Na*	8.67	4.69	7.94	15.51	9.18
Avg2	44.34	36.21	37.71	35.13	54.18	37.43	42.80
Avg2b	44.34	36.21	44.97	48.51	60.35	38.47	51.97
				Group 3			
AUS	26.34	19.36	23.23	32.77	18.46	21.65	26.80
NZL	8.53	21.07	22.10	23.94	11.07	18.92	22.49
PNG	*Na*	*Na*	43.48	21.09	8.79	66.67	32.50
Avg3	17.44	20.22	29.60	25.93	12.77	22.03	27.14
Avg3c	17.44	20.22	22.67	28.36	14.77	20.28	25.74
				Group 4			
CAN	7.22	7.72	7.00	22.17	16.78	9.26	16.94
MEX	7.14	0.74	12.29	14.18	20.09	16.82	14.66
USA	19.33	31.14	31.01	42.06	33.01	31.14	34.67
CHL	*Na*	*Na*	56.67	21.60	14.10	20.55	22.36
PER	*Na*	*Na*	*Na*	28.28	5.95	*Na*	29.91
Avg4	11.23	13.20	26.74	25.66	17.98	19.43	23.00
Avg4d	11.23	13.20	16.77	26.14	23.29	19.15	22.08

Notes: *na* denotes data not available for computation; *Avg1-4* denotes average IIT for group 1 to 4, *1a* denote excludes Russia, *2b* excludes Brunei and Vietnam; *3c* excludes Papua New Guinea, and *4d* excludes Peru and Chile.

Source: Calculated by author from the United Nations, *COMTRADE* database, UN (2002).

The expansion in IIT with Korea and Taiwan follows the adoption of the strategy of export-led industrialisation in the 1960s to stimulate development (Unakul, 1990) and the trade liberalisation strategy of the 1990s. The pattern of IIT with Korea has been relatively stable from 1986 to 1995 with some increase in the late 1990s. Taiwan has encouraged industrial restructuring to maintain its competitive advantage by offering tax incentives since the 1990s. To achieve freer trade, it manifested reduction of tariffs in 1986-92, along with the removal of import restrictions during 1992-95 (Liu, 2002).

China commenced its open-door economic policies in 1978 and complemented these with external-sector reform that aimed to facilitate exports of manufactured products in 1979 (Islam and Chowdhury, 1997). As a consequence,

China has moved its exports into more complex and high-technology production to supply the global market (UNIDO, 1995). Since 1998, IIT for Thailand with China has been increasing. China has registered as a major regional power of the North East Asia region (Bhongmakapat, 2003 and Hou et al., 1995).

For group 2, Thailand's IIT trade with Malaysia, Singapore, Philippines and Indonesia rises over the period. Malaysia and Singapore generally sustain the highest absolute levels of IIT with Thailand. The pattern of IIT with Malaysia is generally upward with an indication of acceleration post 1989 and a slight decline in response to the Asian crisis from 1997. Singapore's IIT profile, however, rose through the 1980s followed by a mild decline in the 1990s. Greatest volatility is present for IIT with the Philippines, while the sharpest increase over the decade rests with Indonesia after 1982. These nations have a long-standing trade relationship via ASEAN. In addition, the Malaysian, Philippines and Indonesian governments have embarked on ambitious trade liberalisation programs with industrialisation as the main vehicle for achieving growth. For example, in 1994 under the Borgor agreement of APEC, Malaysia proposed tariff cuts on 600 items, especially on consumer goods. The Philippines reduced tariffs on capital equipment from an average of 20-30 percent to 3-10 percent in 1994, and 5 percent in 2001, in response to the Uruguay Round and the AFTA agreements. Indonesia, in 1997, also reduced tariffs on 739 products, removed non-tariff barriers on 27 items and surcharges on 108 items covering raw material and intermediate goods used in the livestock industry, textile machinery and components, and agricultural machinery (Islam and Chowdhury, 1997).

For group 3 and 4, the IIT patterns for Australia and New Zealand share common characteristics. The average IIT for New Zealand, calculated over 1980-99, of 20.7 percent only ranks in front of the equivalent average for Canada and Mexico and the average IIT of 24.2 percent for Australia ranks ahead of New Zealand. For both nations, IIT is in decline by 1996 with no sign of recovery by 1999. Nevertheless, Australia and New Zealand believe that APEC offers a vehicle to enter Asia by establishing a potential inward-looking free trade area and a new kind of trading bloc (Faye, 1996). Realisation of this potential will depend on the extent to which differences in the level of economic development, culture and distance are impediments to trade with Thailand. IIT trade tends to be concentrated between countries, which are similar to each other and geographically close to each other. For instance, Australia and New Zealand have a robust relationship with each other under CER that dates from 1983 (Matthews, 1995).

With the USA, IIT is relatively stable over the twenty years with values in the 30 to 40 percent range. Despite the fact that the USA and Japan dominate Thai exports and imports, between 1992 and 1996 there is acceleration in IIT trade with the USA and a dip in IIT post 1997. Canada, on the other hand, has low IIT readings with slight acceleration in the early 1990s prior to a decline from 1997. One might conjecture that strong neighbourhood links between Mexico, Canada and the USA under NAFTA, established in 1993, are more important, at least for

Mexico and Canada, than trading relationships with Thailand via APEC. Thailand's IIT with the USA will be influenced by the latter's classification as a high income, high development economy with a factor endowment biased to human and capital intensity.

Figure 2 illustrates the IIT indices for each of the four groups over the period. The IIT for South East Asia exceeds that of any other groups. For both South East and North East Asia, there is a discernible upward trend that appears to pre-date APEC membership in 1990. Up until 1997, there is considerable volatility in the IIT pattern for both Oceania and the Americas with some sign of increasing IIT, post-APEC membership.

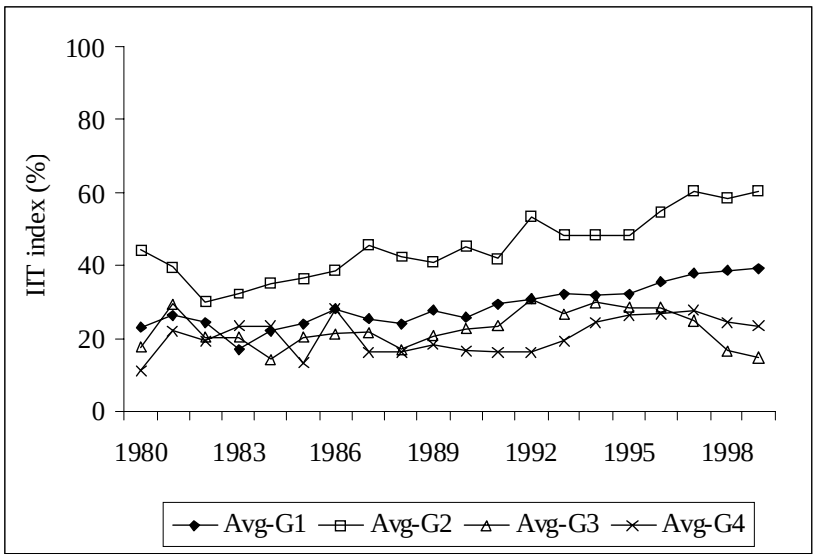

Figure 2 The unadjusted G-L index of Thailand trading with APEC classified by country grouping 1-4, 1980-1999

Note: Avg-G1 to Avg-G4 denote average IIT for groups 1-4

Source: Calculated by author from the United Nations, *COMTRADE database*, UN (2002).

Industry Analysis

Figure 3 reports the estimated G-L index in the manufacturing industry in Thailand. In the categorisation of Thailand's manufacturing industry, four main groupings have been analysed according to the technology intensity criterion in order to get a homogenous group of products (Somma, 1994). The average 1980-99 IIT index in the manufacturing sector is marginally higher in SITC5 and 7 show rapid increased over the twenty year period, while the IIT for SITC6 and 8 show more modest increases.

Table 4 presents the ten manufactured products, which recorded the highest average values of the IIT index in both periods. The results show that within manufactures, certain resource-based labour intensive manufactures and "low technology" manufactures occupy large shares of the total trade. Common to both periods are the resource-based labour intensive manufactures that include rubber articles (621-629), textile yarn, cotton (651-655), and the low skill/technology manufactures of non-ferrous base metals n.e.s. (689). Post-APEC, the medium and high skill/technology intensive manufactures are perfume and cosmetic (553), miscellaneous chemicals (599), materials of rubber (621), rubber articles (629), electric distribution machinery (723), telecommunications equipment (724), sound recorders, producer (891) and articles of plastic n.e.s. (893).

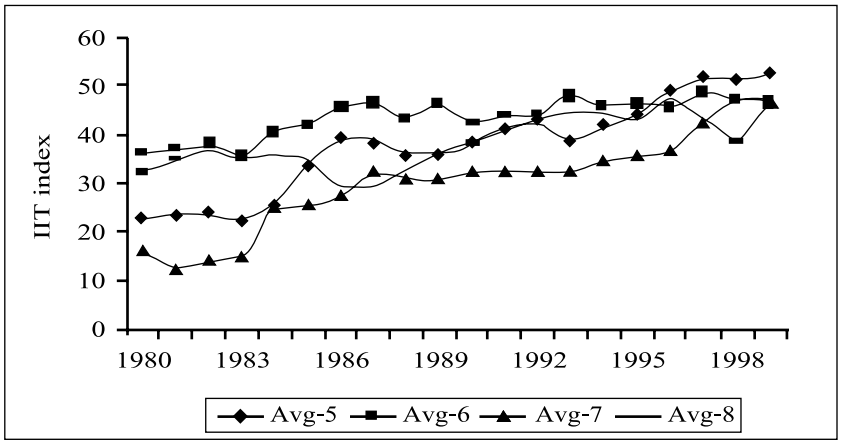

Figure 3 Thailand's IIT in manufacturing with APEC classified by average SITC 5-8, 1980-1999
Note: Avg-5 to Avg-8 denote average IIT for SITC-5 to 8
Source: Calculated by author from the United Nations, *COMTRADE database*, UN (2002).

Table 4 Top 20 products ranked according to average IIT (B_i) between Thailand and APEC countries, 1980-1989 and 1990-1999

Pre-APEC			Post-APEC		
Rank	**SITC**	**Commodities**	**Rank**	**SITC**	**Commodities**
1(19)	729 (89.9)	Electrical machinery n.e.s.	1	696 (93.0)	Cutlery
2(8)	629 (89.0)	Rubber articles n.e.s.	2	891 (92.7)	Sound recorders, producer
3(23)	651 (87.0)	Textile yarn and thread	3	599 (88.8)	Chemicals n.e.s
4(3)	599 (85.8)	Chemicals n.e.s.	4	723 (88.6)	Electric distributing machinery
5(36)	655 (85.7)	Special textile, etc products	5	652 (88.4)	Cotton fabrics, woven
6(6)	893 (84.0)	Articles of plastic n.e.s.	6	893 (88.0)	Articles of plastic, n.e.s.
7(5)	652 (79.5)	Cotton fabrics, woven	7	612 (87.3)	Leather, etc manufactures
8(41)	812 (77.3)	Plumbing, heating, lighting equipment	8	629 (86.6)	Rubber articles n.e.s.
9(13)	621 (74.9)	Materials of rubber	9	553 (86.2)	Perfume, cosmetics
10(18)	689 (72.7)	Non ferrous base metals n.e.s.	10	664 (84.8)	Glass

Notes: The figures appearing in parentheses in column 1, 2 and 5 are rank of IITpost-APEC, the value of IIT pre-APEC and value of IIT post-APEC, respectively. n.e.s. denotes not elsewhere specified.

Source: Calculated by author from the United Nations, COMTRADE database, UN (2002).

Conclusion

This paper was to estimate IIT between Thailand and other APEC countries using Grubel and Lloyd indices. The extended time frame is split into pre-APEC (1980-89) and post-APEC (1990-99) and is used to examine the differences in the level and growth of IIT on a country and product basis. The results reveal that the IIT of Thailand in manufactures has increased since 1990, regardless of whether IIT is measured by the unadjusted or adjusted G-L Index. Malaysia, Singapore and the Philippines in South East Asia and countries in North East Asia, namely Hong Kong, Taiwan and Korea, have sustained IIT indices at above 50 over the period. In contrast, Oceania and the Americas have low and/or relatively flat IIT profiles.

On the product basis, IIT has increased in all SITC 5-8 product groups from 1980-89 to 1990-99. The product SITC-6 has consistently reported high IIT indices in pre-APEC, but falls slightly behind SITC-5 in the post-APEC period. The industries with high IIT in post-APEC are cutlery (696), sound recorders, producer (891), chemicals n.e.s. (599) cotton fabrics woven (652), article of plastic n.e.s. (893), leather manufactures (612), perfume, cosmetics (553), glass (664) and electric distribution machinery (723).

Future research will establish the extent to which IIT between these nations can be explained by similarities in Gross Domestic Product, per capita

income, geographic proximity and industry characteristics such as factor intensities and propensity to economies of scale.

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