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ABSTRACT

The 1990s saw East Asia becoming more integrated as trade barriers fell, trade intensity and intra-industry trade increased, and production networks formed. This greater integration has resulted in changing patterns of trade specialization in the region, as different economies adjust. Some economies (especially resource-rich economies) maintain their top trade-specialty products, while others move towards higher-productivity manufacturing goods. Nonetheless, we observe in all East Asian countries in our study a trend towards specializing in products with higher sophistication and technological intensity. Meanwhile, our examination of the product specialization mobility and our empirical analysis suggest no indication of East Asian countries being in a "low-productivity specialization trap" which would disable them from shifting their specialization towards higher-productivity and higher-value goods.

Keywords: *trade specialization, regional integration, East Asia*

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Integration and Specialization in East Asia

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Introduction

Over the last three decades East Asian economies have experienced a rapid integration. According to Ng and Yeats (2003), between 1975 and 2001 East Asia's share of global exports increased by more than three fold. During the same period, intra-region exports grew even faster. The intra-region exports as a share of world exports rose from one percent in 1975 to six percent in 2001. The rapid integration was partly driven by unilateral liberalization undertaken by countries in the region. As noted by Baldwin (2006), those countries liberalized their economies in order to attract foreign direct investment (FDI) in which, in turn, would create jobs. Hence, the unilateral economic liberalization undertaken by those countries might be seen as a part of their economic development strategy.

In addition, the regional integration was also driven by the hollowing out phenomenon experienced first by Japan and later on by Korea and Taiwan. Companies from those countries moved their production facilities to countries in East and Southeast Asia where wages were lower and set up factory Asia, to use Baldwin (2006) terminology. It is immediately clear that regionalism, which is a byword for formal economic integration, did not play any role in the early years of the regional integration process. In fact, the region did not have any single regionalism until early 1990s, i.e., until the ASEAN Free Trade Arrangement (AFTA) was launched.

A related question arises: As the region's economies increasingly integrated, have they become more or less specialized as a result? This is an empirical question and,

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hence, should be addressed accordingly. The classic trade theory suggests that when a country starts trading with other countries, its economy tends to specialize in product or products where it has comparative advantages. However, specialization is not the only possibility that arises from an economic integration. Krugman (1979, 1981) developed a model where trade is driven by economies of scale. The model essentially argues that trade occurs even between countries with identical tastes, technology and factor endowments because consumers have a taste for a variety of differentiated products. The model also shows that as countries become more similar, the trade between them becoming more intra industry in nature.

Some of the recent empirical studies done for other regions provide an inconclusive guide as to which model is likely to prevail in East Asia. Imbs and Wacziarg (2003) argue that specialization depends on level of development of the country; low income countries tend to diversify their production to reduce risk associated with idiosyncratic (sector-specific) shocks. Specifically, they show, using cross country data, that sectoral concentration follows a U-shaped pattern. That is, countries first diversify their economic activities across sectors but beyond a certain point they start specializing again. Meanwhile, a study by Beine and Coulombe (2004) who study the implication of economic integration between Canada and the US finds that the long run implication of the integration is that of a greater industrial diversification on the part of the Canadian economies.

However, Martincus and Sanguinetti (2005) who study the implication of MERCOSUR, the South American FTA, on three member countries, i.e., Argentina, Brazil and Uruguay, and Chile find that, on the one hand, there is a tendency toward increasing specialization in the case of Argentina and Brazil while, on the other hand, a tendency toward increasing diversification in the case of Uruguay and Chile. That is, the bigger countries among them (Argentina and Brazil) tend to specialize, while the smaller ones (Chile and Uruguay) tend to diversify. One possible explanation is that smaller countries are driven toward intra-industry trade by economies of scale. That is companies in the smaller countries are unable to take advantage of the prevailing economies of scale

on their own and, hence, have engage in intra-industry trade with companies from other countries. This explanation is in line with Krugman model.

The aim of this study is to investigate the pattern of trade prevailed in East Asia since early 1990s. In particular, it investigates the dynamics of economic integration over the period under consideration. Unless otherwise mentioned, we limit our analysis to eight East Asian economies, namely the ASEAN5 economies (Indonesia, Malaysia, Philippines, Singapore, Thailand) plus China, Japan and Korea – referred hereafter as East Asian 8 (EA8). Using a set of specialization indicators, this study also examines the pattern of specializations that emerged during the period. One important question that the study wants to address is: has the specialization changed over time and if it has to which directions. Lastly, the study also examines the interrelationship between economic integration and specialization. In particular, it wants to know whether or not the observed increasing integration in East Asia led countries in the region towards increased or decreased specialization.

The rest of the paper is organized as follows. The next section, describes a brief history of integration in East Asia. Section 3 summarizes some of the characteristics of economic integration that might affect patterns of specialization in East Asia. Section 4 looks at specialization in East Asia, while Section 5 tries to establish relationship between the region's economic integration and specialization or the lack of it. Section 6 provides conclusion and possible policy implications of the findings.

Regional integration in East Asia: A Brief History

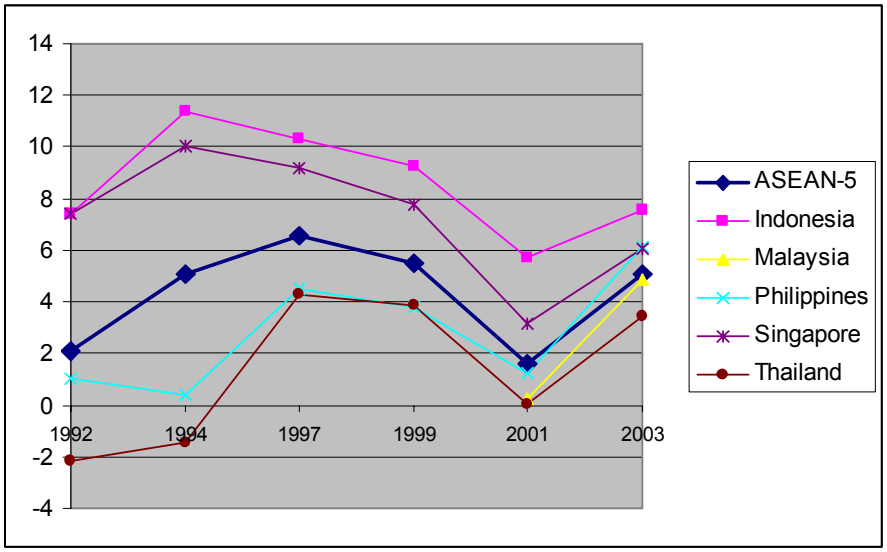
Economic regionalism is a somewhat new phenomenon in East Asia. During the period of aggressive trade liberalizations in the 1980s and 1990s, ideas to form a tighter regional economic integration in the region were not enthusiastically embraced. Indeed, the idea of East Asian Economic Caucus (EAEC) promoted by the then Prime Minister Mahathir of Malaysia in early 1990s withered away because it failed to garner the necessary support, in particular, from major economies in the region such as Japan and Singapore.

One of the first concrete efforts towards regionalism was the ASEAN Free Trade Agreement (AFTA). Formed in 1992, AFTA was an attempt to deepen economic cooperation after the success of the Association of South-East Asian Nations (ASEAN) in maintaining political stability in the region. The plan was to allow preferential tariffs for trade between ASEAN members through the Common Effective Preferential Tariff (CEPT) scheme. Under the scheme, tariffs for most trade within ASEAN would be lowered to 0-5% in the next ten years.

However, despite AFTA, it appeared that even ASEAN countries did not see regionalism as the principal way forward. Even before AFTA, many of them had undertaken unilateral tariff reductions as part of the shift in their development strategy towards export orientation. In 1994, members of AFTA, along with other East Asian countries, adopted the Bogor Declaration – with its principle of "open regionalism" – in the Asia-Pacific Economic Cooperation (APEC) summit. "Open regionalism", though never explicitly defined, principally aims at to ensuring that regional trade arrangements did not become stumbling blocks for global liberalizations (Bergsten, 1997). Or, in the words of the Bogor Declaration, with this principle APEC was to achieve free and open trade and investment in Asia-Pacific "in a GATT-consistent manner" – essentially emphasizing multilateralism.

Hence, along with AFTA, individual ASEAN member countries aggressively (and selectively) lowered their tariff barriers unilaterally and non-preferentially. Figure 1 below plots the margin of preference (MOP) – i.e., the difference between the (unweighted) averages of MFN and CEPT tariffs – from 1992 to 2003. The trend between 1994, at the start of APEC, to 2001 was that of falling MOPs, to start increasing only in 2003, at AFTA's agreed deadline of implementation. Falling MOPs suggests that trade liberalization along the multilateralist path tended to move slightly faster than that along the regionalist path, at least until 2002.

Figure 1. Margin of Preference (MoP) Amongst ASEAN-5, 1992-2003



Source: UNCTAD Trains

Meanwhile, the change in the development strategies of East Asian countries also created an opening for investment liberalization. The 1980s (for Malaysia and Thailand) and 1990s (for Indonesia, the Philippines, and China) marked a shift from a "dual-track" development policy of export-orientation and import-substitution to putting more emphasis on export orientation in East Asia's developing economies. As a consequence, these developing countries took a more liberal stance with regards to foreign direct investment (FDI) policies, from the previous selective acceptance policy (to limit competition with "strategic industries" at home) to, basically, an "accept everybody" policy (Kimura and Ando, 2005). This shift coincided with the increased activities of outward investments by the region's more developed economies – i.e., by Japanese firms in the 1980s, and Korean firms in the 1990s.

This favorable sentiment towards a multilateral approach to trade liberalization in the Asia-Pacific region began to change by the end of the century. The failure of APEC's Early Voluntary Sector Liberalization (EVSL) as well as the 1999 WTO Seattle Ministerial meeting cast doubts to the multilateral approach (Scollay, 2003). Even the US, by early 2003, began propounding a strategy of "competitive liberalization" that perceived global, regional, and bilateral trade as complements of each other (Soesastro,

2003). Putting this strategy into practice, the US signed a bilateral trade agreement with Singapore in 2003. Given its pivotal role in the global trading arena, the US's embrace of FTAs set an example for others in the Asia-Pacific region.

In East Asia, two factors triggered changing attitudes with regards to regionalism. First, the 1997 economic crisis triggered a sense of economic solidarity in the region, partly due to widespread disappointment of what was perceived as the slow response of developed countries in preventing a prolonged economic crisis. Some countries in East Asia that had not previously embraced the use of preferential agreements began experimenting with bilateral trade agreements (BTA) and FTAs. In 1998, early talks on the Japan-Korea FTA were initiated – a significant development considering the political relationship of the two countries. Various other talks involving an East Asian country followed (Table 1 below). In Southeast Asia, discussions to bring integration within ASEAN a step further intensified, culminating in the 2003 ASEAN Concord II which declared the intention to achieve an ASEAN Economic Community (AEC) by 2020.

Table 1. PTAs Involving Asia-Pacific Countries (June 2005)

PTAs established (year of signing the agreement, year into force)

RTAs	BTAs
AFTA (ASEAN Free Trade Area, 1992, 1993)	Australia-New Zealand (1983, 1983)
SAPTA (SAARC Preferential Trading Arrangement, 1993, 1995)	India-Sri Lanka (1998, 2000)
PICTA (Pacific Island Countries Trade Agreement, 2001, 2001)	New Zealand-Singapore (2000, 2001)
TPSEPA (Trans-Pacific Strategic Economic Partnership Agreement, 2005, 2006)	Japan-Singapore (2002, 2002)
	Australia-Singapore (2003, 2003)
	Singapore-United States (2003, 2004)
	Chile-Korea (2003, 2004)
	China-Macao SAR (2003, 2004)
	China-Hong Kong SAR (2003, 2004)
	China-Thailand (2004, 2004)
	India-Thailand (2004, 2004)
	Australia-Thailand (2004, 2005)
	Australia-United States (2004, 2005)
	Japan-Mexico (2004, 2005)
	New Zealand-Thailand (2005, 2005)
	Pakistan-Sri Lanka (2005, 2005)

PTAs under negotiation (framework agreement has been signed)

RTAs	BTAs	
ACCEC (ASEAN-China Comprehensive Economic Cooperation)	Australia-China	Japan-Thailand
AFTA-CER CEP(AFTA-CER Closer Economic Partnership)	Australia-Japan	Korea-Mexico
AICEP (ASEAN-India Comprehensive Economic Partnership)	Australia-Malaysia	Korea-Singapore
AJCEC (ASEAN-Japan Comprehensive Economic Cooperation)	Canada-Singapore	Malaysia-Pakistan
AKCCP (ASEAN-Korea Comprehensive Cooperation Partnership)	China-India	Malaysia-New Zealand
BIMSTEC (Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan, Nepal Economic Cooperation)	China-New Zealand	Mexico-Singapore
SAFTA (South Asian Free Trade Area)	Hong Kong SAR-New Zealand	Panama-Singapore
	India-Singapore	Peru-Thailand
	Indonesia-Japan	Peru-Singapore
	Japan-Korea	Singapore-Sri Lanka
	Japan-Malaysia	Thailand-United States
	Japan-Philippine	

PTAs under discussion (framework agreement has not been signed)

RTAs	BTAs
ASEAN+3 (ASEAN-China-Japan-Korea)	Australia-Chile
ASEAN-United States EAI (Enterprise for ASEAN Initiative)	Canada-Korea
	Chile-Japan
	India-Malaysia
	Korea-Malaysia

Source: Feridhanusetyawan (2005)

The second factor is the increased engagement of China in global trade. Fresh from successful accession to the WTO, China is interested in opening access to various economies' markets while obtaining inputs for its industries. On the one hand, FTA is a strategic device for China given its bargaining position. On the other hand, China's willingness to engage in FTAs initiated further FTA offers, both from those in East Asia

who do not want to be left behind in terms access into the Chinese market, as well as those who do not want to lose its dominant position in the region to China.

Characteristics of East Asian Integration

Tariffs rates

In terms of tariffs, liberalization in East Asia was mainly driven by non-preferential tariff liberalization. This is exemplified by the AFTA experience below. Southeast Asia's experiment in regionalism through AFTA resulted in rapid reduction in tariffs between ASEAN member countries. Table 2 below demonstrates this for ASEAN-5 countries. Taking simple averages of tariffs, intra-regional tariffs in ASEAN5 fell from 13.2% to 5.7%.

Table 2. Tariffs in ASEAN, 1992-2002

Partner Name	Simple average				Weighted average			
	MFN		CEPT		MFN		CEPT	
	1992	2002	1992	2002	1992	2002	1992	2002
ASEAN-5	15.33	7.11	13.22	5.72	10.12	2.69	9.30	5.52
Indonesia	21.77	11.32	14.38	5.87	15.3	6.92	11.87	5.46
Malaysia	11.17	5.92		5.37	5.75	1.52		5.3
Philippines	13.41	7.04	12.38	5.95	7.79	1.84	3.01	5.88
Singapore	19.73	9.22	12.33	5.84	13.94	3.98	9.81	5.46
Thailand	11.92	4.94	14.06	5.7	7.79	2.62	7.01	6.07

Source: UNCTAD Trains, accessed through WITS

However, taking the simple average of MFN tariffs, we saw a similarly rapid decline in ASEAN5, from 15.3% to 7.1%. Meanwhile, in 2002, the weighted preferential tariffs were higher than that of MFN tariffs – for ASEAN5 overall and for individual member countries except for Indonesia. This suggests that the import values of products whose CEPT tariffs are lower than MFN tariffs are not significant relative to total imports, which somewhat substantiate findings that CEPT tariffs have been underutilized. (Tongzon, 2003; Baldwin, 2006). Hence, by way of tariff reductions, East Asia's experiment in regionalism was not particularly successful in lowering tariff rates preferentially.

Trade intensity

Despite the dominance of non-preferential tariff reductions, AFTA has resulted in more intense intra-regional trade. To verify, we use a commonly used indicator of trade intensity index. The trade intensity (TI) index compares the share of a country's exports to a destination country relative to its total exports to the share of the world's exports to that same destination country to the world's total exports.[2] An index of more (or less) than unity can be interpreted as having exports above (or below) those expected to that destination country given world trade to that country. An increase in the index to country *j* across time suggests that *j* has become a more important export destination for country *i*.[3]

Table 3 below presents the TI index for EA8 economies. The table confirms the hypothesis of increasing trade integration in ASEAN in the previous decade and a half. In general, trade within the ASEAN5 countries (shaded in Table 3) can be characterized as being intense, as for most cases (except for the Philippines-Indonesia export), the index was larger than unity. Between 1991 and 2001, trade intensity from ASEAN-5 countries to each other increased for most cases, with significant increases. In the few cases where a significant decline in intensity was observed (e.g., Malaysia's export's to Singapore), intensity remained high even after the decline. Intra-ASEAN trade was intense, and in the 1991-2001 period intensified for most ASEAN-5 countries.

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[2] The formula for TI takes the following form:

$$T_{ij} = \frac{x_{ij} / X_{it}}{x_{wj} / X_{wt}}$$

where x_{ij} is country *i*'s export to destination country *j;* X_{it} is country *i*'s total export; x_{wj} is the world's export to destination country *j,* X_{wt} is the total world export (Ng and Yeats, 2003).

[3] Ng and Yeats (2003) suggests an improvement to this indicator by performing a distance-adjusted trade intensity index. Although this exercise did change the magnitude for some TI indices, it did not significantly change the conclusion regarding the dynamic trend of trade integration in East Asia.

Table 3. Trade Intensity in East Asia, 1991-2001

	China		Japan		Korea, Rep.		Indonesia		Malaysia		Philippines		Singapore		Thailand	
Reporter	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001
China			2.62	3.32	1.57	2.52	1.19	2.14	0.77	1	1	0.96	1.67	1.29	1.11	1.04
Japan	1.54	2.16			3.28	3.34	3.17	3.27	2.53	2.25	2.36	3.16	2.26	2	3.21	3.52
Korea, Rep.	0.78	3.39	3.14	2.17			3.32	4.41	1.51	1.45	2.63	2.68	2.21	1.59	1.98	1.44
Indonesia	2.29	1.1	6.77	4.56	3.44	3.6			1.23	2.62	1.62	2.31	4.63	5.51	0.98	2.08
Malaysia	1.04	1.21	2.87	2.62	2.27	1.79	2.59	3.53			2.7	2.32	13.8	9.89	3.4	4.51
Philippines	0.81	0.69	3.65	3.09	1.32	1.74	0.84	0.83	1.45	2.87			1.53	4.25	2.66	5.01
Singapore	0.82	1.25	1.57	1.52	1.22	2.1			15.6	14.8	3.14	4.04			6.71	5.28
Thailand	0.66	1.26	3.3	3.06	0.83	1.04	1.34	4.33	2.51	3.5	1.04	2.86	4.87	4.54		

Source: UN Comtrade, authors' own calculation.

However, the TI index also suggests increasing trade integration beyond ASEAN. China has increasingly become a favorite export destination: export intensity from EA8 countries bar Indonesia and the Philippines increased significantly, exceeding unity for most economies except for the Philippines. At the same time, the intensity of China's exports to the region is slowly increasing. Marked changes were seen mostly for China's exports to the two developed economies in East Asia (and to Indonesia). The increased intensity of China's trade to Japan and Korea suggests its increasing significance as part of the production network of firms in the two economies (see below). As for export intensity to the rest of ASEAN5, the increase was slow – and, in the case of Malaysia and Philippines, has yet to exceed unity. Meanwhile, most of the eight countries in East Asia, except for Japan and Singapore, intensified imports from the region.

Intra-industry trade and production network

Another key feature of the changing trade pattern in East Asia is its increasing complexity, marked by the increased importance of intra-industry trade (IIT) and the emergence of production networks. IIT is often categorized into horizontal IIT (HIIT) and vertical IIT (VIIT). HIIT refers to the trade of products in the same category and of similar quality which are of different varieties. HIIT is seen to be driven by consumer preference and economies of scale (Thorpe and Zhang, 2005). Meanwhile, there are two alternative ways to define VIIT. One definition, based on the characteristics of goods, sees VIIT as trade of similar goods with differing quality, driven by comparative advantage (Greenaway, et. al. 1995). Alternatively, VIIT can also be defined as exchange

of similar products at different stages of production (Thorpe and Zhang, 2005). Here, increased VIIT in a region can indicate the emergence of production network.

Various studies on East Asia (e.g., Ando and Kimura, 2003; Fukao, Ishido, and Ito, 2003; Thorpe and Zhang, 2005; Ng and Yeats, 2003) have put forward evidence of the increased significance of intra-regional trade in East Asia. Using data for EA8 plus Hong Kong and Taiwan for the 1971-1996 period, Thorpe and Zhang (2005) point to the significant increase in IIT in the region, from 25% of all trade in the region in 1971, to 41.7% in 1985, and to slightly more than half in 1996. HIIT was the more dominant form of IIT in the region for the most part of the period.

Table 4. Inter- and intra-industry trade in the manufacturing sector in East Asia, 1986-1996

Year	IIT (%)	IT (%)	HIIT(%)	VIIT(%)
1986	41.71	58.29	24.23	17.48
1987	44.48	55.52	34.71	9.78
1988	45.35	54.65	35.71	9.63
1989	45.96	54.04	32.73	13.23
1990	46.76	53.24	30.39	16.36
1991	47.92	52.08	34.13	13.78
1992	44.51	55.49	27.65	16.86
1993	43.26	56.74	29.60	13.67
1994	43.98	56.02	34.61	9.37
1995	46.60	53.40	35.90	10.70
1996	50.43	49.57	20.62	29.81

Source: Reproduced from Thorpe and Zhang (2005).

At the same time, VIIT was also significant throughout the period. Here, Thorpe and Zhang (2005) define VIIT in the second sense of the word, namely in terms of the organization of production. In this sense, increasing VIIT would signal a greater exchange of intermediate products, perhaps suggesting an increase in fragmentation production within the region. An empirical analysis of parts and components trade in the East Asia suggests that fragmentation production, driven by FDIs, was a significant factor

in increasing VIIT in East Asia (Fukao, Ishido, and Ito, 2003; Athukorala and Yamashita, 2005).

Further evidence of increased fragmentation production can be seen in machinery and electronics sectors. In machinery, Ando and Kimura (2005) used micro data on corporate firms to describe the extent of production networks driven by Japanese firms in machinery parts and components production in East Asia. They estimated about one-third to a half of Japanese manufacturing exports to Asia were intermediate goods, mainly machinery parts and components. Fukao, Ishido and Ito (2003) suggest a strong positive correlation between Japan's VIIT with East Asia and the extent of investment activities by Japanese multi-national enterprises (MNEs) there. Similarly in electronics sector, the mapping-of-fragmentation exercise by Lall et. al. (2004) also points to the emergence of tight networks in East Asia, with Japan as an important, but not dominant, player.

Trade Specialization in East Asia

Specialization indicators

The concept of specialization is initially associated with the distribution of industrial activities. A country is said to be specialized in a product if the industries in the country produce a large share of that product. This specialization is determined by various factors, ranging from factor endowments (a la Heckscher-Ohlin) to international knowledge spillover (Young, 1991). Since specialization is determined by a country's production structure, the degree of specialization is supposed to be evaluated at the industry (or firm) level.

Motivated by the scarcity of country-level data on production structure (and the wide availability of trade data), various empirical studies have often used statistical indicators derived from the trade database to identify international specialization patterns. This approach, however, must be used with care. To measure international specialization of a particular country, the choice of appropriate indicators becomes crucial. Two aspects are important in choosing the indicators.

First, the chosen indicator must be able to measure specialization rather than trade performance. While specialization is closely associated with trade performance, one should be able to distinguish between the two. An indicator for international specialization should be able to reveal the country's comparative advantages (or disadvantages) in the different production sectors. The focus of comparison here is between the different products of the same country, rather than those of the rest of the world. Indicators to measure trade performance, on the other hand, focus more on comparing different countries in terms of their trade competitiveness.

Second, the choice of indicators must take into account a comprehensive assessment of the country's position in international trade. The distribution of comparative advantages across countries may differ from what its export-specialization measures reveal, relative to the level of import dependence. Hence, the indicator used should not only allow an analysis of a single flow of trade, but rather include the flow of both exports and imports. The theoretical basis for single flow indicators, such as the one used in the Revealed Comparative Advantage (RCA) index is rather implausible. Moreover, in the current context of increasing intra-industry trade in East Asia, the use of net-trade flow becomes more crucial. At a moderate level of product disaggregation, an evaluation of specialization based on single-flow indicators will lead to an incorrect conclusion when intra-industry trade is significant.

In this paper, we use an indicator proposed by Lafay (1992) to assess specialization. This indicator is based on evaluating normalized trade balance of the country *i* in a particular product *k* (z_{ik}). Normalized trade balance is measured as a ratio of the trade balance for the product to the total value of trade, i.e.:

$$z_{ik} = \frac{X_{ik} - M_{ik}}{X_{ik} + M_{ik}} \qquad (1)$$

where X_{ik} is the country's export on this particular product and M_{ik} is the import.

The normalized trade balance measures the country's performance in international trade for the given product. It can be shown easily that the indicator will rise if the export increases faster than the import, and vice versa. To measure specialization, the indicator is compared to the distribution of normalized trade balance of various products in the country. In practice, the specialization level of a particular product can be measured as the difference between its normalized trade balance, z_{ik}, and the overall trade balance of the country, Z_i. The Lafay index for this product can be calculated by taking into account its contribution to total trade of the country W_{ik}.

$$L_{ik} = (z_{ik} - Z_i) W_{ik} \qquad (2)$$

where:

$$Z_i = \frac{\sum_k (X_{ik} - M_{ik})}{\sum_k (X_{ik} + M_{ik})} \qquad W_{ik} = \frac{(X_{ik} + M_{ik})}{\sum_k (X_{ik} + M_{ik})}$$

This specialization index of a product k in country i is thus related to the deviation of the product normalized trade balance and the country's overall trade balance and its share of trade. This index maintain symmetry across all products in the country, and will add up to zero across products traded in a country ($\sum_k L_{ik} = 0$). A positive value for the index for product k, indicates a country's comparative advantage and high level of specialization on the associated product. A negative value, on the contrary, indicates a comparative disadvantage and low degree of specialization in that product.

Patterns of specialization

This section analyzes trade specialization characteristics of the EA8 countries. Data for the analysis is compiled from United Nations Comtrade Database, available through the World Integrated Trade System (WITS) from the World Bank. The data set is constructed over the period of 1990-2003 for all countries. The selection of time period in this study attempts to capture the integration process taking place in the region. As mentioned in the previous section, the period of 1990's witnessed the increasing of integration in the

region. The period of early 2000's, on the other hand, provides a more institutionalized basis of trade integration in the region.

The Lafay index for each countries are computed at a moderately disaggregate level of 3-digit SITC classification. It resulted on grouping of products into 233 items[4]. The index was constructed using nominal trade value, which introduced fluctuations that might affect trade patterns from factors such as the price effects and exchange rate fluctuations. To minimize problems associated with these fluctuations, we compute the indicators for 3 years average trade data for the period of 1990-1992 and 2001-2003[5]. The two points from the two time periods will provide the basis for our basic analysis of changing specialization patterns in the region.

All products in each country are ordered based on the calculated Lafay index for the two periods. Table 5 describes the top three items that each country specialized in. From the table, we observe changes in the specialization patterns of the EA8 countries. In general, there were increased specializations on various manufacturing products in the second period of observation relative to that in the first period.

Several EA8 countries, that include Korea, Malaysia and Singapore, managed to join Japan to attain high degree of specialization in various Group 7 (machinery and transport equipment) products. Other developing countries of the region have also shown increased specialization in other manufacturing products. However, some countries, including Indonesia and Thailand, maintained their specialization on primary products or natural-resource-based manufactured items, such as vegetable oils and rubber products.

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[4] To get better classification of products and correct measures of specialization, we excluded product groups under the header 9 (miscellaneous item not classified elsewhere) from the analysis. On average, these 233 items cover 96% of trade in the regions.

[5] Our basic analysis focuses on trade pattern of those countries with the rest of the world. For a further analysis, we will look at the trade pattern only to other countries in East Asia.

Table 5. Top 3 Specialized Items of East Asian Countries

1990-1992		2001-2003	
Indonesia: Top 3			
333	Petrol.oils,crude,& c.o.obtain.from	341	Gas,natural and manufactured
341	Gas,natural and manufactured	424	Other fixed vegetable oils,fluid or
634	Veneers,plywood,improved or rec…	634	Veneers,plywood,improved or rec…
China: Top 3			
845	Outer garments and other articles,k	752	Automatic data processing machine
843	Outer garments,women's, of textile...	894	Baby carriages,toys, games,sport
851	Footwear	845	Outer garments and other articles,k
Japan: Top 3			
781	Passenger motor cars,for transport	781	Passenger motor cars,for transport
764	Telecommunications eqpmnt, parts	784	Parts & accessories of 722--,781--,
784	Parts & accessories of 722--,781--,	776	Thermionic,cold & photo-cathode…
Korea: Top 3			
851	Footwear	781	Passenger motor cars, for transport
653	Fabrics,woven,of man-made fibres	764	Telecommunications eqpmnt, parts
793	Ships,boats and floating structures	793	Ships,boats and floating structures
Malaysia: Top 3			
333	Petrol.oils,crude,& c.o.obtain.from	752	Automatic data processing machine
424	Other fixed vegetable oils,fluid or	759	Parts of and accessories suitable f
247	Other wood in the rough or roughly	424	Other fixed vegetable oils,fluid or
Phillippines: Top 3			
424	Other fixed vegetable oils,fluid or	776	Thermionic,cold & photo-cathode
776	Thermionic,cold & photo-cathode val	752	Automatic data processing machine
845	Outer garments and other articles,k	843	Outer garments,women's,of textile f
Singapore: Top 3			
334	Petroleum products,refined	752	Automatic data processing machine
752	Automatic data processing machine	776	Thermionic,cold & photo-cathode
762	Radio-broadcast receivers	515	Organo-inorganic and heterocyclic c
Thailand: Top 3			
036	Crustaceans and mollusks,fresh,chil	759	Parts of and accessories suitable f
042	Rice	037	Fish,crustaceans and mollusks…
037	Fish,crustaceans and mollusks…	232	Natural rubber latex; nat.rubber &

Source: Calculated using UN Comtrade data, available from WITS

Japan, Korea and, to some extent, Malaysia exhibit a high level of specialization in the various machinery and transport equipments products. Japan and Korea have comparative advantages in the production of cars and their parts, and electronics and electronics components. Malaysia did not gain a high level of trade specialization car production despite its longtime national car program.[6] Instead, the country gained comparative advantage on electronic products such as automatic data processing (ADP) machines and parts (752, 759), as well as telecommunication and broadcasting equipments (761, 762, 764), which comprised 27% of the country's total exports in 2003.

Other countries in the region specialize in various manufacturing products. China reached highly specialization on various products under group 8 (miscellaneous manufacture articles), such as garments, footwear and furniture, besides gaining comparative advantage in various electronic products. Philippines exhibit specialization pattern on several electronic products and their parts. Specifically, export of one electronic product, namely thermionic and cathode tubes (776), took 40% of Philippines total export, making the countries very highly specialized in this item.

The pattern of trade specialization takes a little different shape for the case of Indonesia and Thailand. These countries maintained their comparative advantages on natural-resource-related products, both in raw and manufactured items, despite their high-level of specialization in other manufacturing products. Although several fisheries and agricultural products were among top 10 specialized items for Thailand – contributing to around 10% of its total exports – Thailand also showed a strong comparative advantage in cars, office machine and electronic products. Indonesia, on the other hand, did not show a high level of specialization on the machinery and transport equipment manufacuring, except for electronic parts (759), which contributed to 2% of total exports. Instead it gained specialization in natural-resource-intensive manufacturing products, including the production of vegetable oils, furniture and rubber products.

[6] Indeed, exports of cars (781 and 782) and parts (713) failed to grow significantly and instead were losing their export shares.

This pattern of trade specialization describes the evolution process in Southeast Asian countries' productive sectors. While some countries show substantial changes in their patterns of specialization, others took longer to change. The following section analyzes in detail this dynamics of specialization in East Asia.

Specialization dynamics

While the international trade theory provides solid explanation on factors affecting trade pattern of a country, the theoretical models do not provide clear prediction on trade specialization dynamics. The standard Heckscher-Ohlin model suggests that trade specialization patterns will change only if there are changes to trading countries' relative factor endowments. Current theoretical models of trade and growth suggest other factors that might shape specialization, including economies of scale and technological spillover (Helpman and Krugman, 1985). This strand of theory suggests that trade specialization patterns might change regardless of the initial comparative advantage.

Several new trade theories, however, suggest the possibility of a lock-in effect on trade specialization patterns, which is determined by countries' initial comparative advantage (Davis and Reeve 1997). As the specialization dynamics depends a lot on country-specific situations, Proudman and Redding (2000) conclude that the issue can only be resolved through empirical investigation.

This section presents an empirical evaluation on the dynamics of specialization of the EA8 countries. This is conducted by examining the two main aspects of the mobility of the Lafay index. The first aspect is the changes in the distribution of the indices from one period to the next. The distribution characteristics of the EA8 countries' Lafay indices reveal the extent of the "polarization" of industries in a particular country. It would provide an answer to the question of whether countries have become more specialized. The second aspect examines the mobility of the index value over the period.

The simplest way to look at the changes in the external shape of the specialization indices distribution is by examining the statistical characteristics of the index's distribution. Table 6 presents statistical indicators of indices distribution for each country. Maximum and minimum indicators measure the range of the distribution. Except for Indonesia and Singapore, the range of the distribution increased while the maximum values tended to decrease. The standard deviation of the distribution, a common measure of dispersion, declined for most countries. The standard deviation increased only for the Philippines and China.

Except for Indonesia, the share of the top five and top ten items also shows an increasing trend. For some cases, like Philippines, the net-trade share of the top five items to total trade increased threefold. This was the result of the country's heavily specialization on one item, namely thermionic and cathode tubes (776). Another indicator on the shape of distribution, the number of items in central point, showing the number of products with a Lafay index that is not significantly different from 0, mostly increased with the exception of Indonesia and Thailand.

Another way to look at the degree of polarization of specialization pattern of a country is to calculate an indicator of polarization. A possible measure of the degree of polarization is the weighted average of absolute deviation of normalized trade balance for each item and the overall trade balance (Iapadre, 2001). In practice, this index can be calculated by summing up the absolute value of the Lafay specialization index for individual countries[7]. The Additive Lafay index presented in Table 6 shows that the degree of polarization declined in all East Asian countries except, again, for the Philippines.

[7] Additive Lafay Index can be formulated as: $AL_i = \sum_k |z_{ik} - Z_{ik}| W_{ik}$

Table 6. Statistical Indicators of Specialization Index

	Indonesia		Malaysia		Phillippines		Singapore	
	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003
Max	7.50	4.67	5.22	3.28	2.48	7.19	5.77	4.37
Min	-2.52	-3.65	-1.66	-4.64	-5.94	-3.61	-5.04	-3.23
Standard Deviation	0.86	0.54	0.55	0.48	0.61	0.70	0.64	0.40
Share of Top 10	36.68	22.68	21.32	30.12	21.29	48.22	30.33	55.17
Share of Top 5	29.20	15.78	15.01	18.98	14.78	44.68	22.02	41.35
Number of Items in Center Points	116	109	120	137	116	146	162	166
Number of Positive Items	80	87	63	68	78	56	71	61
Additive Lafay Index	76.68	56.63	53.78	37.01	62.43	44.29	34.06	21.66
Correlation Coefficient	0.56		0.40		0.56		0.77	
Covariance	0.26		0.10		0.24		0.19	

	Thailand		CHN		JPN		KOR	
	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003
Max	2.30	1.47	2.30	2.39	5.98	6.47	2.54	4.10
Min	-2.15	-4.46	-2.30	-4.77	-6.43	-5.73	-5.20	-6.84
Standard Deviation	0.53	0.44	0.48	0.53	0.73	0.68	0.55	0.67
Share of Top 10	15.22	18.50	17.59	17.25	30.19	29.62	23.31	26.94
Share of Top 5	8.88	12.99	11.49	11.93	21.59	21.90	11.14	20.91
Number of Items in Center Points	105	103	86	111	108	114	109	141
Number of Positive Items	89	101	119	120	96	83	85	71
Additive Lafay Index	63.52	46.67	58.44	56.05	68.66	58.89	58.01	48.97
Correlation Coefficient	0.68		0.52		0.93		0.72	
Covariance	0.16		0.13		0.46		0.26	

Source: Calculated using UN Comtrade data available from WITS

These indicators tell us that the Lafay indices have become more concentrated towards the median value, as shown in the decrease of standard deviation and numbers of items in the centre point. They imply that countries of Southeast Asia tend to produce a greater variety of products. At the same time, other indicators like the share of top items and the maximum value of indices suggest that those same countries have put more emphasis on the production and trade of several items; i.e. increase specialization on several products.

From observing the shape of distribution, we can see how a country's specialization pattern has changed across time. However, it did not tell us much about the change in the level of specialization for individual items. It is possible for a given product to move from lower part of distribution to the upper part – that is, to become more of a country's specialty. This is the issue of mobility. A more recent approach to the study of trade dynamics evaluates this degree of mobility based on the study of intra-distribution dynamics using the Markov-chain theorem, frequently used in the study of growth and income convergence (Quah, 1993). This approach evaluates how the value of the indices changes over time.

The first stage of this approach involves the construction of a transition probability matrix for every country in our observation. This matrix describes the probability that a good that belongs to one part (or quartile) of the distribution spectrum (with regards to a country's specialization) might move to another over time. All observed items for each country are classified into four quartiles; each consisting of 58 or 59 products sorted based on their Lafay indices. We then constructed a matrix showing the probability of a product initially classified under a certain quartile at time 0 ($t_{0,}$ or the 1990-1992 period) to remain in the same quartile or to move to another at time 2 ($t_{1,}$ or the 2001-2003 period). Each cell (r,c) of the matrix represents the probability that a sector in the specialization quartile *r* at t_0 shifts to the specialization quartile c at t_1. For instance, the first row of the matrix presents the probability that a product starting in the first quartile of specialization (group 1) remain in the first quartile (1,1), or move to another.

Table 7. Probability Transition Matrices for EA8 Countries

Indonesia	Q1	Q2	Q3	Q4
Q1	0.746	0.102	0.034	0.119
Q2	0.169	0.661	0.119	0.051
Q3	0.034	0.190	0.655	0.121
Q4	0.085	0.034	0.186	0.695
Ergodic	0.274	0.241	0.242	0.242

Malaysia	Q1	Q2	Q3	Q4
Q1	0.810	0.138	0.000	0.052
Q2	0.155	0.603	0.138	0.103
Q3	0.000	0.136	0.712	0.153
Q4	0.034	0.121	0.155	0.690
Ergodic	0.249	0.249	0.253	0.249

Philippines	Q1	Q2	Q3	Q4
Q1	0.690	0.276	0.017	0.017
Q2	0.172	0.483	0.276	0.069
Q3	0.034	0.136	0.661	0.169
Q4	0.103	0.103	0.086	0.707
Ergodic	0.246	0.249	0.274	0.232

Thailand	Q1	Q2	Q3	Q4
Q1	0.690	0.155	0.034	0.121
Q2	0.224	0.569	0.086	0.121
Q3	0.051	0.254	0.627	0.068
Q4	0.034	0.017	0.259	0.690
Ergodic	0.249	0.249	0.253	0.249

Singapore	Q1	Q2	Q3	Q4
Q1	0.741	0.172	0.000	0.086
Q2	0.155	0.552	0.121	0.172
Q3	0.017	0.085	0.746	0.153
Q4	0.086	0.190	0.138	0.586
Ergodic	0.249	0.249	0.253	0.249

Japan	Q1	Q2	Q3	Q4
Q1	0.741	0.207	0.017	0.034
Q2	0.190	0.569	0.207	0.034
Q3	0.017	0.169	0.729	0.085
Q4	0.052	0.052	0.052	0.845
Ergodic	0.249	0.249	0.253	0.249

China	Q1	Q2	Q3	Q4
Q1	0.746	0.102	0.085	0.068
Q2	0.169	0.441	0.322	0.068
Q3	0.069	0.224	0.569	0.138
Q4	0.034	0.051	0.203	0.712
Ergodic	0.246	0.192	0.311	0.252

Korea	Q1	Q2	Q3	Q4
Q1	0.729	0.119	0.034	0.119
Q2	0.203	0.492	0.203	0.102
Q3	0.017	0.237	0.661	0.085
Q4	0.068	0.153	0.085	0.695
Ergodic	0.263	0.248	0.238	0.251

Source: Authors' own calculation

Table 7 presents a four-by-four estimated transition probability matrices for individual EA8 countries. A general observation suggests larger value for the diagonal elements. All probability matrices show the value of 70% or above for the first and last cells across the diagonal. Other cells in the diagonal of the matrix also have significant levels of probability, mostly at around 55% to 70%. This indicates that EA8 countries tend to maintain their comparative advantages and disadvantages. A country initially less specialized on a particular product remains to be unspecialized in those products in the second period.

The degree of mobility can be summarized using two indicators suggested by Shorrocks (1978). The first one (M1) measures the relative magnitude of the diagonal and off-diagonal terms of the matrices and can be perceived as the average of expected duration for an item to remain in a given cell. The second indicator (M2) evaluates the determinant of the matrices. That is:

$$M1 = \frac{n - trace(P)}{n - 1} \qquad M2 = 1 - \left|\det(P)\right|$$

Both indices can have values between 0 and 1, with higher values indicating greater mobility and zero indicating perfect immobility (a "lock-in" or "specialization trap"). Table 8 presents the value of M1 and M2 for the EA8 countries.

Table 8. Indices of Mobility

	M1	M2
China	0.51	0.92
Indonesia	0.41	0.81
Japan	0.37	0.79
Korea	0.47	0.88
Malaysia	0.39	0.80
Philippines	0.49	0.89
Singapore	0.46	0.86
Thailand	0.47	0.86

Source: Calculated using UN Comtrade data available from WITS

From this indicator we can see that China has changed its specialization pattern quite substantially during the period of observation; making it the most dynamic countries in the region. On the other hand, Malaysia and Japan do not show any significant transformation. It is quite understandable, as normally countries specializing on high-productivity goods tend to maintain its specialization, while countries in rapidly growing economies tend shift its specialization from lower productivity items to higher ones.

A more general observation, however, is that during the period of greater integration, the specialization pattern of EA8 countries was still showing significant dynamism. The mobility indices for all EA8 countries exhibit values that are much larger than zero. As such, none of the EA8 countries can be said to be stuck in some kind of a "specialization trap"

Technological intensity and productivity

An important question on the dynamics of trade specialization is whether the changes on productive sectors and pattern of trade have resulted in improved productivity. A vast number of literatures suggest that a trade pattern chosen by a country may affect productivity and welfare. Redding (1999) describes the situation as a trade-off faced by developing economies between choosing to specialize in products that are in line with its initial comparative advantage or to enter other sectors with potential welfare improvements. More recently, Hausmann, Hwang and Rodrik (2005) also show that a country's "choice of exports" affect its productivity growth.

To deal with such questions, we evaluate the dynamics of trade specialization in East Asia according the product's characteristics, including technological intensity and productivity level. The technological intensity classification is based on the product classifications of Hatzichronoglou (1997). We also calculate productivity level associated with the 233 items 3 digits SITC identified in our study.

To measure technology intensity of manufacturing sectors, Hatzichronoglou (1997) proposed a methodology that measure two determinants of the technological contents of an industry. The first determinant takes into account level of technology specific to the sector, measured by the ratio of R&D expenditure to the value added. The second determinant evaluates the technology embodied in the purchases of intermediate and capital goods. Manufacturing sectors are then classified into four categories: low, medium-low, medium-high and high technology intensity.

This classification is originally based on ISIC classifications version 2 for industrial sectors. As in this paper, measurements of specialization are based on trade data, a table of concordance relating ISIC and SITC product classification is employed to convert the original classification matching our needs. All traded products of EA8 countries are categorized based on this conversion, by adding new category of primary products for non-manufacturing items. Table 9 presents the Additive Lafay Index for items under the proposed classification.

Table 9. Specialization Index Based on Technology Intensity

	Indonesia		Malaysia		Phillippines		Singapore	
	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003
Primary Products	9.55	-0.87	8.76	-0.42	-2.67	-5.89	-5.26	-3.80
Low Technology Manufacture	13.94	11.57	4.93	4.20	11.00	2.52	-0.02	-0.65
Low-Medium Technology Manufacture	2.79	-1.01	-2.88	-0.60	0.14	-2.12	2.94	-0.25
Medium-High Technology Manufacture	-24.18	-12.31	-13.87	-11.64	-8.10	1.65	-4.67	1.00
High Technology Manufacture	-2.10	2.62	3.06	8.46	-0.38	3.84	7.01	3.69

	Thailand		Japan		Korea		China	
	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003	1990-1992	2001-2003
Primary Products	7.23	0.50	-19.37	-14.26	-11.87	-11.82	2.86	-3.82
Low Technology Manufacture	10.12	4.69	-4.05	-5.66	11.51	2.59	10.80	10.56
Low-Medium Technology Manufacture	-4.62	-2.33	-3.89	-1.55	3.22	1.20	2.13	2.94
Medium-High Technology Manufacture	-14.60	-5.68	20.86	20.98	-6.27	1.83	-14.71	-13.69
High Technology Manufacture	1.87	2.82	6.46	1.50	3.41	7.20	-1.09	5.01

The above table suggests that EA8 countries are moving upwards in terms of the technological contents of the products that they specialized in. All of the developing economies in EA8 saw significant increases in the specialization indices of high-technology manufacturing goods. At the same time, all countries have become less specialized in primary products and low-technology manufacturing products.

Another way to look at product characteristics is by looking at productivity associated to particular items. Lall, Weiss and Zhang (2005) propose a methodology to calculate "sophistication score", which measures productivity of particular item by taking into account the share of exporters' income. Similar approach is also suggested by Hausmann, Hwang and Rodrik (2005). This approach is quite simple to be replicated according to our needs, as it does not involve manipulation of detailed industrial data and conversion of different product and industrial classification.

Sophistication score for product k can be calculated using the following formula:

$$SC_k = \sum_i \frac{X_{ik}}{\sum_k X_{ik}} Y_i$$

It measures contribution of a particular product into a country's GDP, Y_i, using export share of that product, X_{ik}, in the country's total export. Adding up together sophistication score of the product for all countries in the world will give us sophistication score associated with the product. A product's sophistication score can be loosely associated with its productivity, although this association needs to be interpreted with caution.

We calculate sophistication scores for each 233 items of 3 digits SITC product classification on period 1 and period 2. While the estimated sophistication scores differ quite significantly for the two periods, position of each item does not change much. A large number of products associated to high productivity are manufacture products with some exception of petroleum and fishery products, while most primary products, agriculture and mining, are associated to low productivity. Appendix A presents the list of items ordered by their associated productivity for each period.

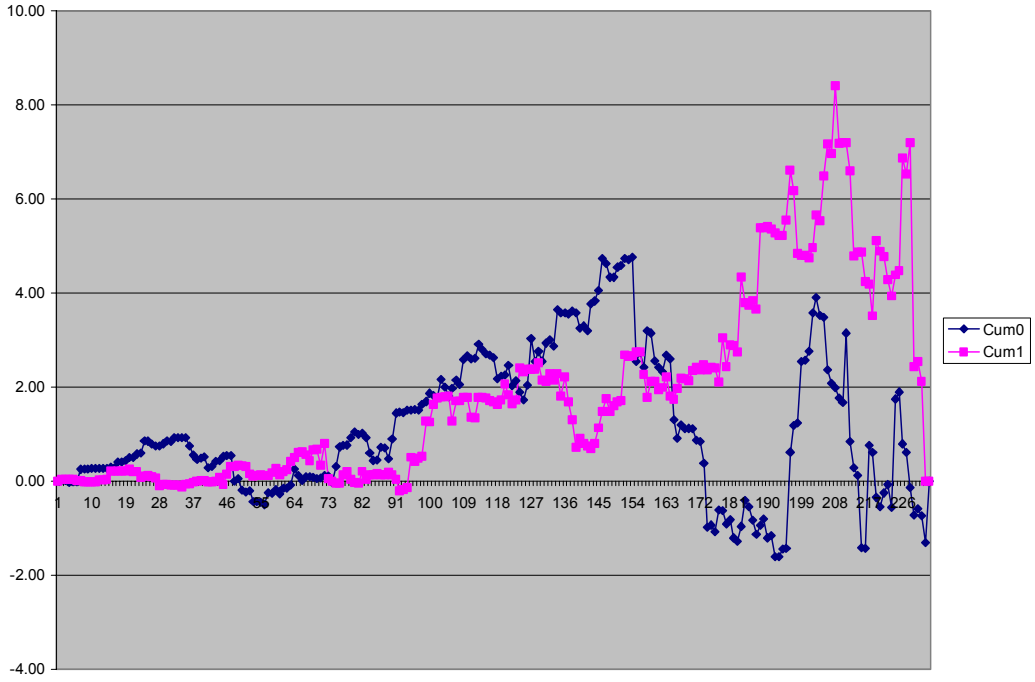
To show the dynamic of specialization for the EA8 countries, we follow an approach introduced by Zaghini (2003). The 233 product items in our sample are ordered according to their sophistication score from the least productive items to the most. A cumulative Lafay curve is then generated by adding up the value of Lafay index for each item following the specified order of sophistication score.

Figure 2a through 2h present cumulative curves of first and second period of observation for each country. The horizontal axis represents the items ordered following their sophistication score, while the vertical axis shows the related cumulative Lafay index. Since by definition, the sum of the index is zero, the curve starts at the value associated to lowest productive items and ends at zero. Different shapes of cumulative curve in the first and second period provides information whether the countries manage to gain comparative advantages in items associated with higher productivity.

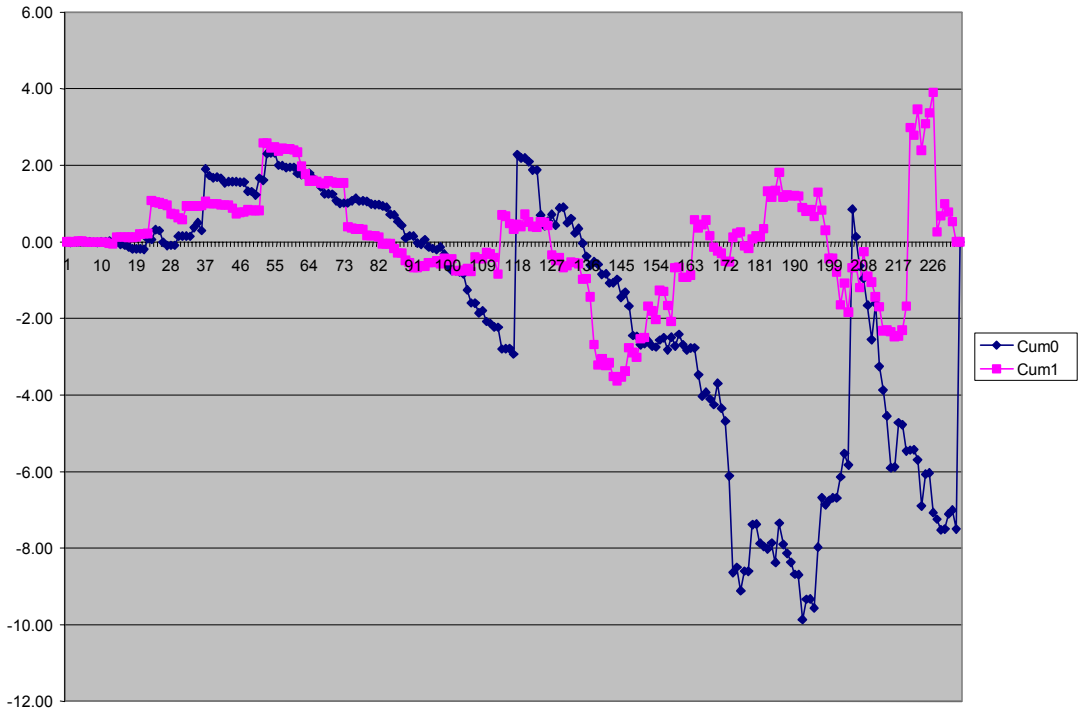
A heavier positive tail on the left side of the distribution suggests that the country is specializing in "less sophisticated" products, while a heavier positive tails on the right side suggest specialization in "more sophisticated" products. For most of EA8 developing countries, except for Thailand and the Philippines, the patterns were that of a shift to the right, implying that most developing economies in EA8 were actually moving upwards in terms of the quality of products they were specializing in. Meanwhile, Japan exhibited an interesting pattern: It used to specialize mostly in high-sophistication goods while importing medium-sophistication ones. By the second period, it seems to rely less on imports of medium-sophistication goods while maintaining its specialization in high-sophistication goods.

Figure 2. Product Specialization and Product Productivity in East Asia

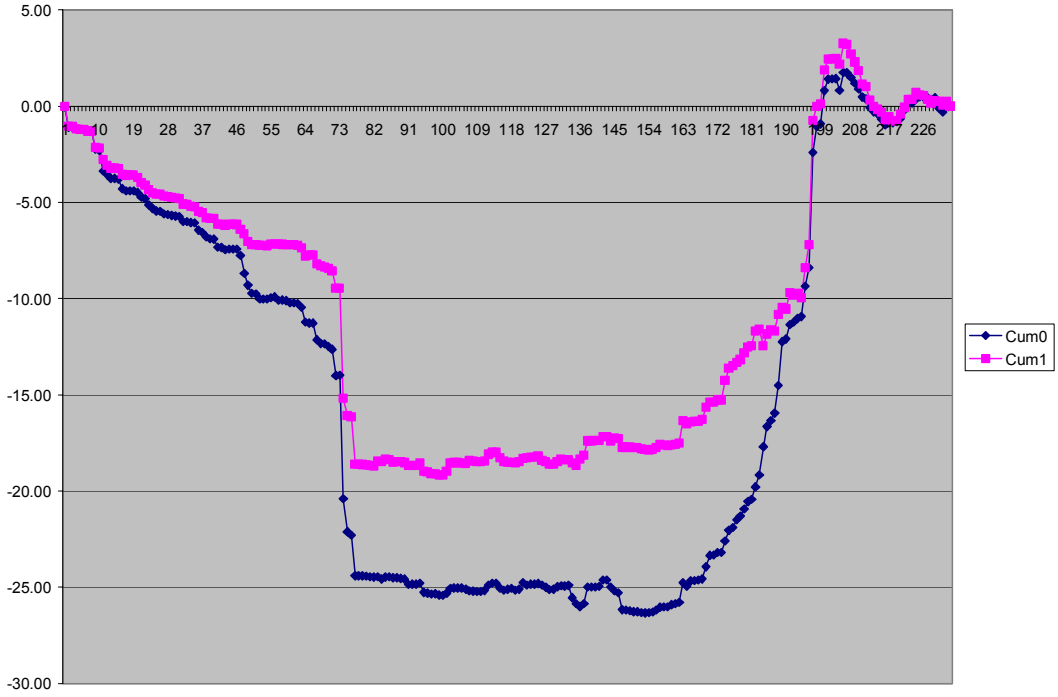
a. China



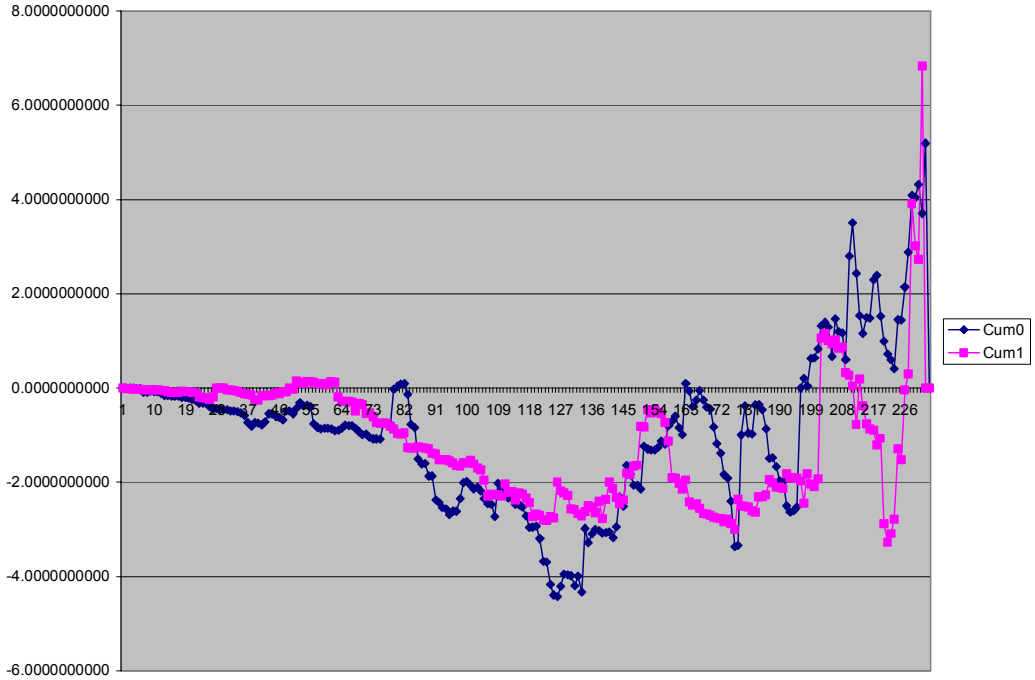
b. Indonesia



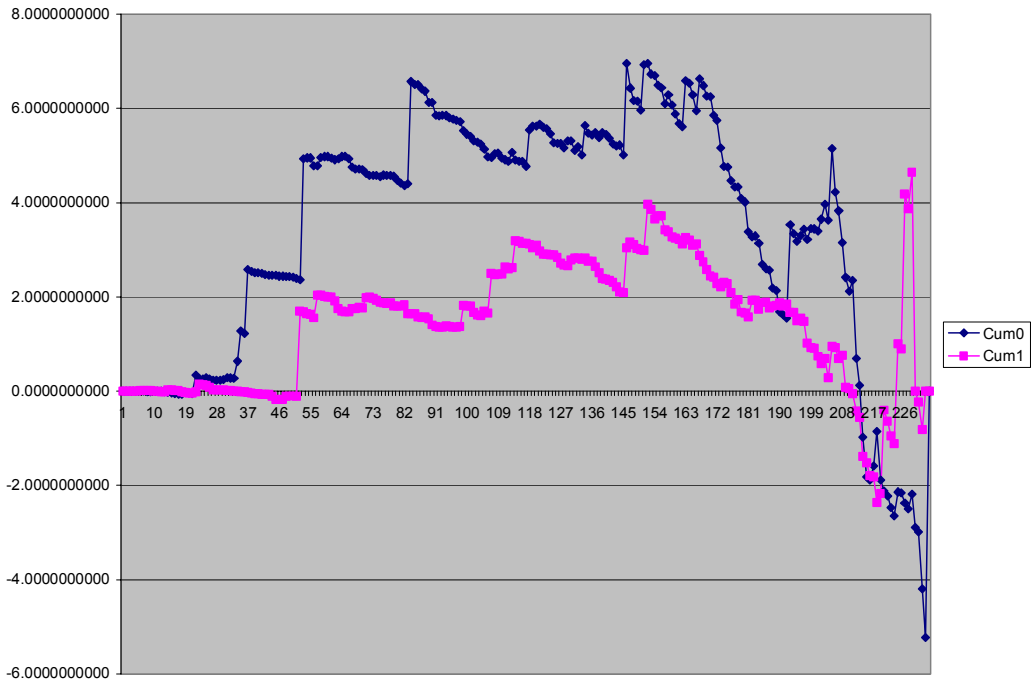
c. Japan



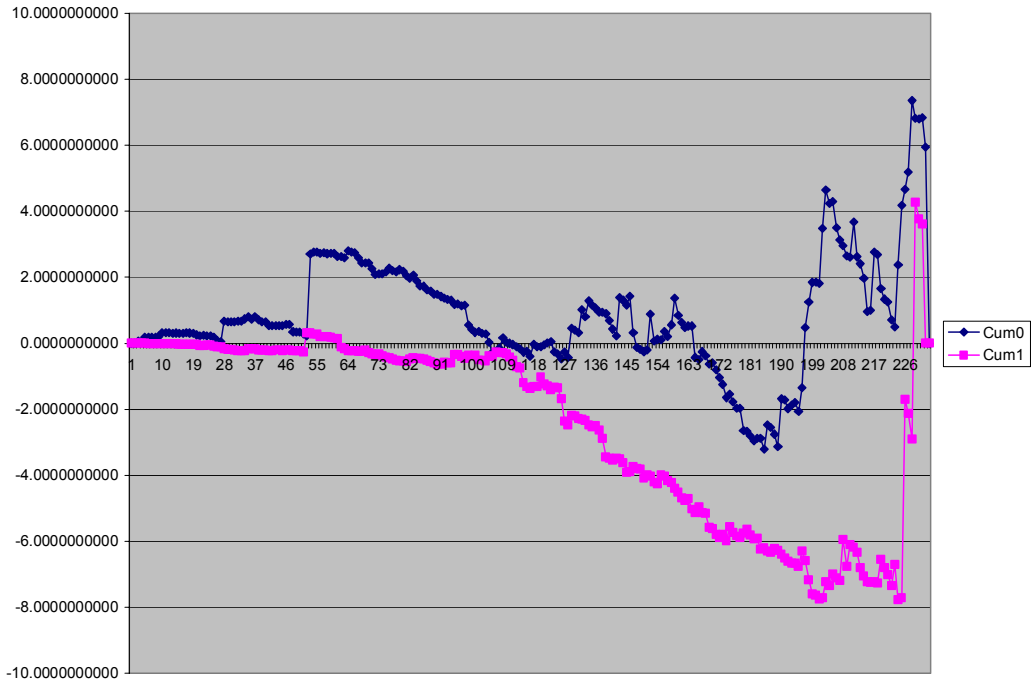
d. Korea



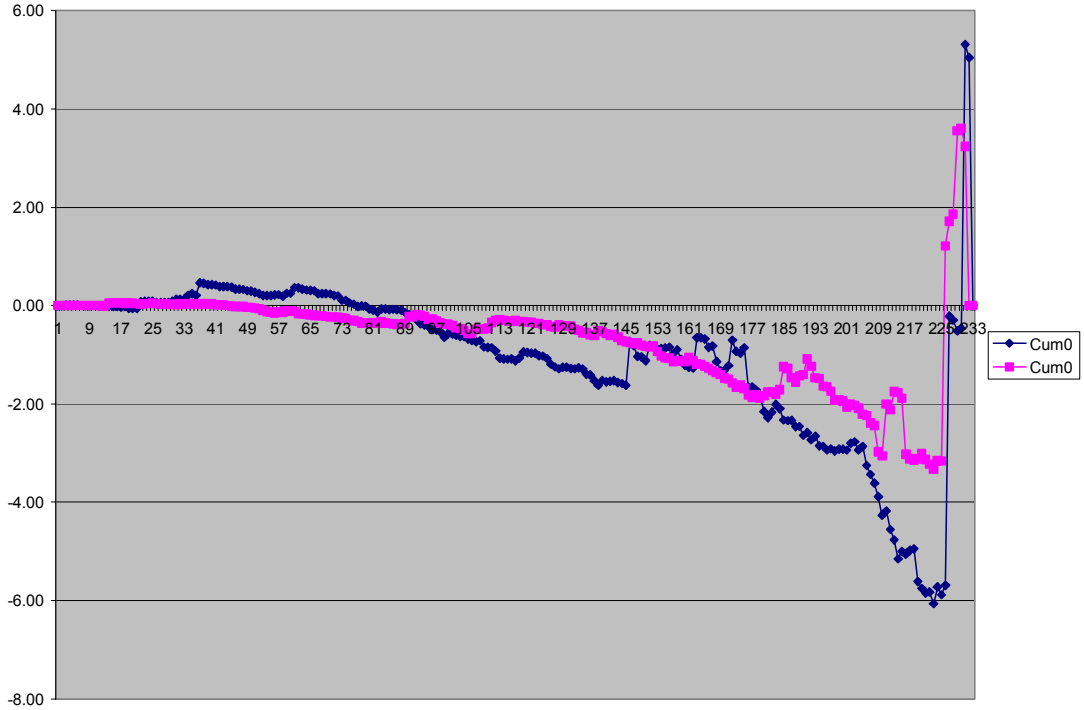
e. Malaysia



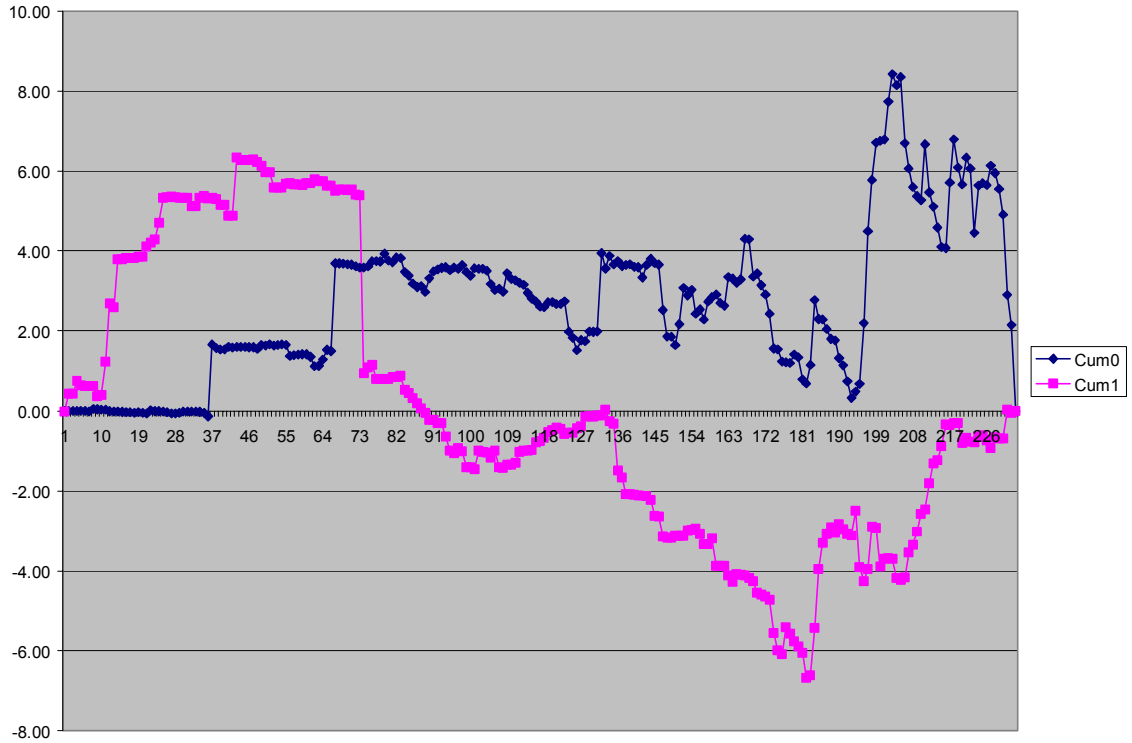
f. Philippines



g. Singapore



h. Thailand



Integration and Specialization

This section analyzes the nature of relationship between specialization and economic integration in East Asia. That is, whether countries in the region become more or less specialized in their exports as a result of the increasing regional economic integration. The classical trade theory suggests that when a country opens itself to trade with other countries, it will be compelled to specialize in products where it has comparative advantages vis-à-vis its trading partners. The more recent development in trade theory suggests that this may not always be the case, however. Krugman (1979, 1981) develops a model where trade is driven by economies of scale. The model essentially argues that trade occurs even between countries with identical tastes, technology and factor endowments because consumers have a taste for a variety of differentiated products. The model also shows that as countries become more similar, the trade between them becoming more intra industry in nature.

For our purpose, we follow the approach proposed by Beine and Coulombe (2004) who use dynamic panel data model to find out whether Canada-US free trade arrangement leads to industrial specialization on the part of some of the Canadian provinces. In our case, we look into the process of economic integration among eight East Asian countries considered in the previous sections and find out whether their exports become more or less specialized. For this purpose, we construct a panel data consisted of a number data from each of the eight countries under investigation for a period that spanned between 1990 and 2003. The description of the data is given below.

Following Beine and Coulombe, we use Herfindahl index to represent export specialization. We choose to use Herfindahl index instead of Lafay index for our regression analysis for a number of reasons. First, as noted earlier we are interested to know how economic integration, or the lack of it, influence specialization. As discussed in Section 2, economies in East Asia have been increasingly integrated since 1990. We would like to know whether those economies have become more specialized or less specialized in their exports as a result. For this purpose it is more appropriate to use Herfindahl index to measure the degree of export specialization. Second, Herfindahl

index has nice property that is lacking in Lafay index, namely, the higher the index the more specialized the country is.

For the current study we construct for each country two different of Herfindahl indexes. The first one is a regional Herfindahl index, i.e., and index which is calculated based on exports of the country under consideration to the other seven countries in the group. The other index, hereafter a world Herfindal index, is calculated based on exports of the country in question to the world.

The Herfindahl index $S_{i,t}$ for country i at year t is computed as following:

$$S_{i,t} = \sum_{k=1}^{J} (s_{i,t}^{k})^2$$

where $s_{i,t}^{k} = x_{i,t}^{k} / \sum_{k=1}^{J} x_{i,t}^{k}$, $x_{i,t}^{k}$ is country i's export of good k in year t; J is the total number of industries in the country's economy. It follows $s_{i,t}^{k}$ is the share of export of good k in country i's total export. The value of the index ranged between zero and one, and it is immediately that, as noted above, the higher the index the more specialized the country is.

The regional Herfindahl index for each of the eight countries is given in Figure 3 below. In the early 1990s there was a tendency for the indexes to decline. But by mid 1990s some of the indexes, most notably those of the Philippines and Singapore began to increase. This indicates that, since then, those countries were becoming increasingly specialized. Meanwhile, the world Herfindahl index for each of the countries is depicted in Figure 4. Notice the similarity between the two sets of indexes, which indicates exports of a particular country to the region follow a similar pattern as its exports to the world. In addition, observe also the sharp increase, especially, in the Philippines' index took place during the height of the East Asian financial crisis. Unfortunately, we do not have any information that would allow us to establish whether or not the two events have any causal relation with each other.

Figure 3. The Dynamics of the Regional Herfindahl Index 1990 - 2003

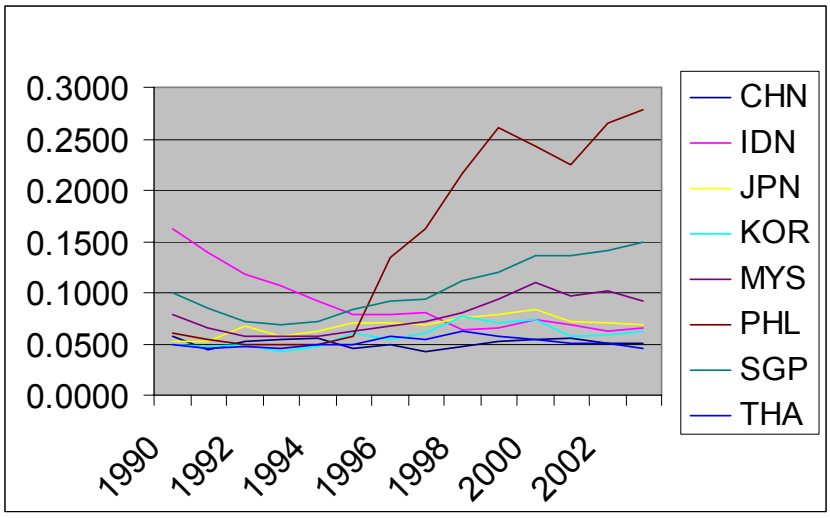
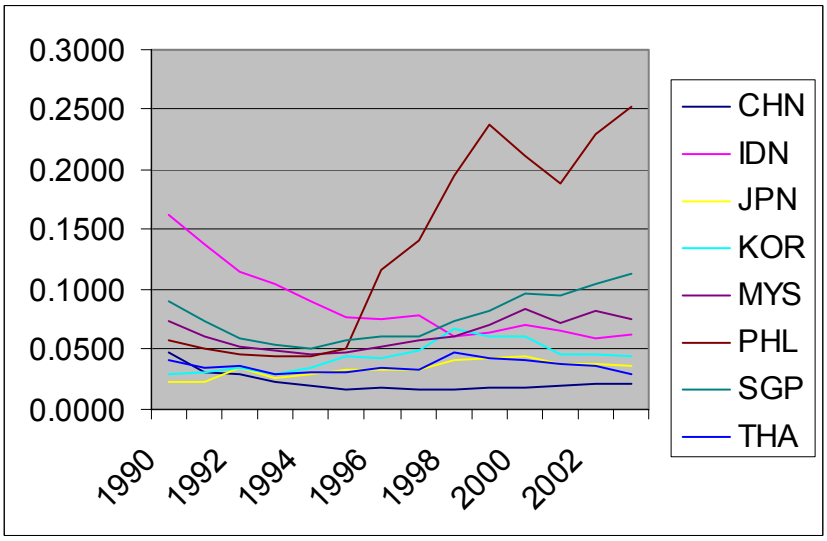


Figure 4. The Dynamic of the World Herfindahl Index 1990 - 2003



As for the degree of trade integration, we use import-weighted tariffs applied by of each of the members of the group on imports from the other members to measure it. Given two different sets of tariffs applied by some countries in the region, we therefore construct two different measures for trade integration. The first set of measures consists of what we call weighted preferential tariffs. As a result of AFTA, the five ASEAN countries in the group apply preferential tariffs on imports from each other but apply MFN tariffs on imports from the other three member of the group, i.e., China, Japan and

Korea. On the other hand, China, Japan and Korea apply MFN tariffs on imports from all members of the group.

Meanwhile, it has been suggested that the utilization rate of AFTA preferential tariffs is relatively low. In other words, most of the goods traded between ASEAN countries still come under MFN tariffs. This is partly, it seems, due to the fact MFN tariffs applied by of the ASEAN members are, in general, significantly low which means that the margins of preference, i.e., the differences between MNF and preferential tariffs are considerably low. As a result, many people in the region do not even bother to apply for preferential treatments. Hence, the second set weighted tariffs consists of the weighted MFN tariffs applied by all members of the group, including the five ASEAN countries.

The weighted average tariff WT_i^t facing country i's exports is calculated as following:

$$WT_{i,t} = \frac{\sum_k \sum_j M_{ijt}^k T_{ijt}^k}{\sum_k \sum_j M_{ijt}^k},$$

where M_{ijt}^k is county j's import of goof k from country i in year t while T_{ijt}^k is import tariff imposed by country j on good k imported from country i. There are 233 commodities altogether in the sample.

In addition to weighted tariffs we also include other variables in the model, namely, gross domestic product (GDP) and real exchange rates of the currencies of countries under consideration. The reason for including GDP is that as Krugman (1979, 1980) argues, consumers have a taste for a variety of differentiated products. GDP (or GDP per capita) reflects income effect of the demand for foreign products. Alternatively, in line with Imbs and Wacziarg (2003), a country may want to diversify its products and at the same time may also want to diversify the sources of raw materials and intermediate inputs. This will lead to intra-industry trade. Imbs and Wacziarg argue that specialization

depends on level of development of the country; low income countries tend to diversify their production to reduce risk associated with idiosyncratic (sector-specific) shocks.

Following Beine and Coulombe (2004) and Crabbe et al (2005) we estimate the following dynamic model:

$$\Delta \log(S_{i,t}) = \alpha + \beta_1 \log(S_{i,t-1}) + \beta_2 \log(TW_{i,t-1}) + \beta_3 \Delta \log(TW_{i,t}) + \beta_4 Z_{i,t} + \varepsilon_{i,t}$$

where $Z_{i,t}$ consists of two variables namely GDP (or GDP per capita) and real exchange rate. To capture the dynamic of the issue at hand, we add the lagged value of the dependent variable on the right hand side of the equation. However, as noted by Kennedy (2003, pp 397-98), by doing so both fixed and random effect estimators are biased as a result. Hence, in this study we use generalized method of moments (GMM) to fix the problem.

The results of our regressions are presented in Table 4.1 and Table 4.2 below. The regression reported in

Table 10 has the change in regional Herfindahl index, D(HHW), as the dependent variable. Columns (1) and (2) have log of GDP, LGDP, as one of the independent variables. Meanwhile, column (1) has lagged weighted preferential tariff, LPRF(-1) as another independent variable while column (2) has lagged weighted MFN tariff, LMFN(-1), instead. The coefficient of LGDP is also positive and significant in both cases. The results are not as strong when replace log of GDP with log of GDP per capita in the regression as reported in columns (3) and (4). This time only the coefficient of LMFN(-1) that comes out positive and significant. Similar but somewhat weaker results are obtained when we use the change in world Herfindahl index the dependent variable instead, as reported in Table 11.

The results suggest that as the countries in question becoming more integrated economically, they also tend to de-specialize in their exports. In

Table 10, for instance, the coefficients of variables LPRF(-1) and LMFN(-1) are positive and significant at 1% level. As noted, there variables represent the degree of economic integration. When their levels fall, it implies the economies in question, at least theoretically, become more integrated. The fact their coefficients positive means that as

they increase or decrease, Herfindahl will increase or decrease as well – hence supporting the above inference.

Table 10. The Dynamics of Industrial Specialization - Regional Herfindahl

Dependent Variable: D(HHI)

	(1)	(2)	(3)	(4)
Constant	**0.049564**	**0.047090****	**0.000559**	**0.025434**
	(0.036441)	(0.019063)	(0.025122)	(0.020394)
HHI (-1)	**0.003955**	**0.068075*****	**0.063184*****	**0.060190*****
	(0.018602)	(0.021185)	(0.024104)	(0.022192)
LRR	**0.027036**	**0.012775**	**-0.002499**	**-0.017988**
	(0.024246)	(0.010492)	(0.013824)	(0.011591)
LGDP	**-0.009639*****	**-0.008524*****		
	(0.002426)	(0.001038)		
LGCAP			**0.000467**	**-0.000195**
			(0.000744)	(0.001034)
LPRF(-1)	**0.015116*****		**0.001201**	
	(0.003012)		(0.002367)	
D(LPRF)	**-0.033728**		**0.022847**	
	(0.039463)		(0.015237)	
LMFN(-1)		**0.027006*****		**0.009269*****
		(0.005517)		(0.003541)
D(LMFN)		**0.010846**		**-0.007786**
		(0.016510)		(0.017618)
No. Obs	99	99	99	99

Notes: * : Significant at 10% level
** : Significant at 5% level
*** : Significant at 1% level

Notations:

HHI : regional Herfindahl index
D(HHI) : delta HHI, i.e., change in HHI
HHI(-1) : lagged HHI
LRR : logarithm of real exchange rate
GDP : gross domestic product
GCAP : GDP per capita
PRF : weighted average preferential tariff
MFN : weighted average MFN tariff

Table 11. The Dynamics of Industrial Specialization – World Herfindahl

Dependent Variable: D(HHIW)

	(3)	(2)	(4)	(6)
Constant	**0.037587**	**0.001857**	**-0.026085**	**-0.025071**
	0.029554	0.010511	0.022422	0.017207
HHIW (-1)	**0.003134**	**0.030933**	**0.035239**	**0.051528****
	0.035579	0.027895	0.029903	0.025290
LRR	**0.024251**	**0.031126*****	**0.011737**	**0.010151**
	0.017333	0.008147	0.011152	0.009370
LGDP	**-0.008127*****	**-0.007107*****		
	0.002475	0.001073		
LGCAP			**0.000230**	**-0.000239**
			0.000584	0.000553
LPRF(-1)	**0.014056*****		**0.002488**	
	0.003153		0.001778	
D(LPRF)	**-0.050452***		**-0.004565**	
	0.026393		0.012461	
LMFN(-1)		**0.022495*****		**0.005672***
		0.003898		0.003290
D(LMFN)		**0.039240****		**0.003517**
		0.015783		0.009522
No. Obs	99	99	99	99

Notes: * : Significant at 10% level

** : Significant at 5% level

*** : Significant at 1% level

Notation:

HHIW : world Herfindahl index

(see also notation in
Table 10)

Since we are using panel data, there is a possibility that some of the variables may have unit root problem. As suggested by Levin and Lin (1993) and Pedroni (2004) we therefore run augmented Dickey-Fuller (ADF) test on those variables that we suspect may have that problem. The variables are GDP, Herfindahl index, and real exchange rate. The results of the test are all negative.

Finally, a few words caution. The period under consideration is a turbulent one for most of the economies under consideration. With the exception of China and Japan, all of the countries suffered a downturn during the East Asian financial crisis. But Japan also suffered a prolonged recession during the period. This is likely to have an impact on the nature of some of the variables used in our regression but which we have not taken into account.

Conclusion

The 1990s saw East Asia becoming more integrated as trade barriers fell and production networks formed. This greater integration has resulted in changing patterns of trade specialization in the region. Our analysis shows that pattern of trade specialization in East Asian countries has moved towards manufacturing products. Several countries, such as Japan, Korea and Malaysia exhibited a high level of specialization on various items from the high-productivity sector of machinery and transport equipments. Others specialized on various middle-productivity manufacturing products such as garments, footwear and furniture. Indonesia and Thailand, on the other hand, still maintained their comparative advantages in natural-resource-related products despite their high-level of specialization in other manufacturing products like car manufacture and electronics.

Across time, Southeast Asian countries tended to produce a greater variety of products. At the same time, these countries also increased their trade (and production) specialization several key products. China is the most dynamic country in the region, while more developed countries like Japan does not show significant change in their trade specialization pattern. Analyzing the patterns with regard to technology intensity of products also provides general picture that those countries have gained comparative

advantages in the production of items associated with higher technology intensity and productivity.

The dynamics of specialization also reveals the level of "specialization mobility" in East Asia, and the extent to which EA8 countries might be locked in a "wrong specialization" – or, in what we call a "low-productivity specialization trap" where a country became specialized in goods or commodities that are losing their dynamism over time. The evidence suggests that the EA8 countries are not under the threat of such a trap. Specialization mobility remained relatively high, and the experience of the past one-and-a-half decade suggests mobility towards higher-productivity goods. The tentative result from the regression analysis corroborates the above conclusion. In essence, it argues that as countries in the economies in the region become increasingly integrated their trades tend to be more diversify as a result and, hence, reduce the likelihood that any of them will get trapped in a wrong specialization.

If one takes the above conclusion at face value, then one policy implication that can be derived from it is that countries in East Asia should continue to liberalize their respective economies. That will allow them to diversify their economies and hence avoid getting trapped in a "wrong specialization" and while enabling them to withstand any idiosyncratic shock.

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