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THE CHANGING TRADE AND REVEALED COMPARATIVE ADVANTAGES OF ASIAN AND LATIN AMERICAN MANUFACTURE EXPORTS

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The Changing Trade and Revealed Comparative Advantages of Asian and Latin American Manufacture Exports

by

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Abstract

Changes in comparative advantage should reflect changes in factor endowment, but increasingly, changes in trade policies also affect a region's trade performance. Based on the arguments in Balassa's stages of comparative advantage thesis, this paper looks at the performance of manufacture exports in a number of Asian and Latin American economies over the period 1981-1997 and examines the revealed comparative advantage indices between economies in East Asia, Southeast Asia and Latin America. Although the RCA measurement may not distinguish between the factor endowment effects from the trade policy effect, we argue that RCA measures provide indication on the movement in a region's comparative advantage. The evidence strongly suggests that despite the strong export performance experienced by East Asian economies, they are losing their comparative advantage to the lower-tier economies in Southeast Asia and Latin America.

Key words: International Trade; Revealed Comparative Advantage; Manufacture Exports

JEL classification: F14

I Introduction

The Classical theory of comparative advantage predicted that gains from exchange maximize welfare and free trade would lead to world economic prosperity. The determinants of comparative advantage, however, differed among trade theories. The Ricardian theory, for example, explained comparative advantage from costs and technological differences, but the Heckscher-Ohlin-Samuelson theory considered factor price differences. The Neo-Factor-Proportion theory looked at factor efficiency, but the technology gap and product cycle theory examined technological innovation and such soft technological change as learning-by-doing as the cause of comparative advantage differences. Recent studies, for example Memedovic (1994), included the 'type of state' (class base, administrative capacity and mode of intervention) and argued that the help of the government can bring about changes in comparative advantage.

In East Asia, for example, Singapore opted a "pick-winner" strategy, while the South Korean government assisted the establishment of "*chaebols*" (large corporation) to promote exports (for a detailed discussion, see Li 2002). Changes in comparative advantages can be brought about in cases where the state played a crucial role in determining the social and economic conditions. Studies on Asian economies (Lee 1986, Rana 1990, Carolan *et al* 1998) showed support of comparative advantage shift from Japan to the newly industrializing economies (NIEs) of South Korea, Hong Kong, Singapore and Chinese Taipei. Other studies (Lutz 1987, Chow 1990) distinguished the complementary effect from the substitution effect in manufacturing and trade, and argue that there may not be any shift in comparative advantages, as manufactured exports from different tier of economies are complementary, instead of substitutes, to each other.

Over the 1980s and 1990s, a number of Latin America countries have experienced economic structural changes linked to trade liberalization and economic openness that replaced the traditional inward-looking policies. Efficient trade policy reduced distortions in factor allocation. For instance, Mexico's increased when it became a member of the North America Free Trade Agreement (NAFTA) in the early 1990s. Argentina achieved a greater degree of economic openness and ran a successful stabilization plan in order to implement the MERCOSUL trade agreements. In the 1980s, Chile also liberalized trade and modernized its production structure.

Comparative advantage faces a measurement problem, as it is defined in terms of autarkic price relationships that are not observable. Trade statistics reflect only post-trade situations. The "revealed comparative advantage" (RCA) approach, pioneered by Balassa (1965, 1977, 1979 and 1986), assumed that the true pattern of comparative advantage can be observed from post-trade data. The availability of data at different levels of aggregation and the data bias caused by government policy distortions (e.g. non-trade barriers and export subsidies) caused immeasurable damage to the "true" pattern of comparative advantage. Nonetheless, Balassa's "stages of comparative advantages" thesis advocated a "catch up" process that shifts economies from one area of comparative advantage to another. Typically, when developing countries take over the labor-intensive product lines from industrialized countries, the production shift provides room for the developed countries to concentrate on the export of technology-intensive products.

This paper examines the structural performance and shift of exports and the revealed comparative advantage of the Asian and Latin American regions over the period 1981-1997. We believe that government policies are trade promoting and the loss in comparative advantage suffered by East Asian economies are captured by the corresponding comparative advantage improvements in Southeast Asian and Latin American countries. Our analysis firstly aims to verify if there are related changes in export pattern among different regions. Secondly, we use the revealed comparative advantage indices to examine if changes in the export pattern are associated with shifts in comparative advantage between regions.

Section II selected the world's trade data for the two regional groups of East Asia and Latin America, and examines the export structure and performance in each of these two regions in comparison with the world. Section III considers four trade performance indices, while section IV works out the revealed comparative advantage of manufactured exports for East Asia, Southeast Asia and Latin America. The last section discusses the various implications and concludes the paper.

Table 1 Analysis of East Asia's Manufactured Exports (US$ Million)

	1981-1983	1984-1986	1987-1989	1990-1992	1993-1995	1996-1997	1981-1997
3 Main Export Sectors							
Average Annual Export	91.32	126.27	188.21	238.97	359.07	449.44	242.21
Average Annual World Imports	300.15	390.53	616.80	843.37	1095.49	1499.34	790.94
Share in Total Exports	50.07	55.72	56.78	55.97	57.44	55.89	55.31
Share in World Imports	30.42	32.33	30.51	28.34	32.78	29.98	30.73
% Growth of Main Exports	1.51	27.82	18.77	27.59	56.78	4.79	391.95
% Growth World Imports	0.48	31.03	27.73	16.09	45.22	5.58	404.37
5 Main Export Sectors							
Average Annual Export	108.25	145.90	221.12	275.75	414.42	530.83	282.71
Average Annual World Imports	413.02	519.52	810.96	1089.59	1409.43	1900.99	1023.92
Share in Total Exports	59.36	64.38	66.72	64.58	66.29	66.29	64.60
Share in World Imports	26.21	28.08	27.27	25.31	29.40	29.40	27.61
% Growth of Main Exports	0.74	28.07	19.61	22.39	62.44	5.94	390.69
% Growth World Imports	-1.57	28.04	27.35	13.65	48.61	5.34	358.42
10 Main Exports Sectors							
Average Annual Export	150.95	190.82	281.24	347.41	512.57	650.77	355.63
Average Annual World Imports	633.59	766.99	1190.52	15787.75	1960.60	2502.25	1438.79
Share in Total Exports	82.78	84.20	84.86	81.36	81.99	81.99	82.86
Share in World Imports	23.83	24.88	23.62	22.01	26.14	26.14	24.44
% Growth of Main Exports	-3.09	21.72	21.00	22.71	59.64	5.88	324.92
% Growth World Imports	-5.10	26.92	27.35	12.05	45.13	4.20	286.37
Total Manufacture Exports							
Average Annual Exports	182.36	226.62	331.44	426.99	625.16	804.19	432.79
Average Annual World Imports	973.13	115.53	178.31	237.87	2903.61	3645.96	2139.97
Share in World Imports	18.74	19.62	18.59	17.95	21.53	22.06	20.22
% Growth of Total Exports	-2.83	19.91	21.41	26.53	60.36	7.24	337.41
% Growth of World Imports	-4.00	22.98	27.24	11.99	40.66	3.83	267.94

Table 2 Analysis of Latin America's Manufactured Exports (US$ Million)

	1981-1983	1984-1986	1987-1989	1990-1992	1993-1995	1996-1997	1981-1997
3 Main Export Sectors							
Average Annual Export Value	8.35	8.40	12.91	18.86	24.37	46.23	19.86
Average Annual World Imports	251.79	302.08	451.68	578.49	665.96	802.35	508.73
Share in Total Exports	39.83	37.59	48.14	49.33	47.13	34.38	40.44
Share in World Imports	3.32	2.78	2.86	3.26	3.66	5.76	3.61
% Growth of Main Exports	-7.68	20.24	54.88	15.00	6.04	11.25	431.99
% Growth World Imports	-3.67	25.54	26.36	10.72	31.73	3.92	211.64
5 Main Export Sectors							
Average Annual Export Value	10.13	10.73	16.07	231.14	301.34	62.36	254.23
Average Annual World Imports	423.26	513.18	791.07	1041.92	1254.56	1596.11	936.68
Share in Total Exports	48.32	47.98	59.90	60.44	58.27	46.38	51.79
Share in World Imports	2.39	2.09	2.03	2.22	2.40	3.91	2.71
% Growth of Main Exports	-4.24	17.93	46.93	12.58	17.17	14.09	516.86
% Growth World Imports	-3.04	24.54	29.23	11.22	40.17	3.80	270.51
10 Main Export Sectors							
Average Annual Export Value	17.51	16.11	21.22	30.08	39.54	79.03	33.91
Average Annual World Imports	606.82	704.73	1047.25	1370.34	1613.26	2024.10	1227.75
Share in Total Exports	83.49	72.04	79.13	78.65	76.46	58.78	69.08
Share in World Imports	2.88	2.29	2.03	2.19	2.45	3.90	2.76
% Growth of Main Exports	17.51	30.44	45.16	9.28	23.98	21.79	430.92
% Growth World Imports	-4.34	17.35	28.58	8.51	39.94	2.81	225.57
Total Manufacture Exports							
Average Annual Manufacturing Exports	20.97	22.36	26.82	38.24	51.71	134.46	49.09
Average Annual World Imports	973.13	1155.27	1783.13	2378.71	2903.61	3645.96	2139.97
Share in World Imports	2.15	1.94	1.50	1.61	1.78	3.69	2.29
% Growth of Total Exports	23.04	22.34	42.74	12.78	28.98	22.78	665.72
% Growth of World Imports	-4.00	22.98	27.24	11.99	40.66	3.83	267.94

II Export Performance in East Asia and Latin America

We use the UNIDO (1999) database that provide the four-digit ISIC code of industrial sector annual exports and imports comprising 81 manufacturing industries for over 73 countries for the period 1981-1997.[1] We first aggregate the data into a three-digit industry classification (see Appendix A). The East Asian Newly Industrializing Economies (EANIEs) consisted of Hong Kong, South Korea and Singapore, while the ASEAN4 composes of the four economies (Indonesia, Malaysia, Philippines and Thailand) of the Association of Southeast Asian Nations (ASEAN). Together with Japan, East Asia contains a total of eight economies. Although we look specifically at three regions of EANIEs, ASEAN4 and LA, we first take an aggregated view on the export performance of the whole East Asia region. Latin America (LA) also consists of eight economies (Argentina, Chile, Colombia, Mexico, Peru, Venezuela, Bolivia and Ecuador). The data for the World consists of 48 largest trading countries that, together, accounted for more than ninety percent of international trade. Statistical analysis on the two regions intends to give preliminary empirical clues on the changes in comparative advantage resulting from shift in trade policies.

Tables 1 and 2 summarize the export performance of the East Asia and Latin America countries, respectively. For the entire period 1981-1997, trade performances are reported on the basis of a three-year average. We aggregate the main three, five and ten main export sectors on a 3-digit industry classification, and the sector's corresponding world imports are used as an indicator of world demand.

East Asia's share of the 10 main manufacturing export sectors is high, with an average exceeding 82 percent; similarly their share in world total manufacturing imports is significant, with an average of more than 20 percent. Nonetheless, East Asia's manufacturing exports have concentrated in the high-value manufacturing sector groups. While their share of the 3 and 5 main export sectors increased, the 10 main export sectors showed a decrease beginning from the early 1990s. The share of East Asia exports in world manufacturing imports – for the 5 and 10 main and the total manufacture exports – showed an increase of up to 4 percent in the 1990s. Therefore, an increase in East Asia's share in world manufacturing imports between 2 and 3 percent can be detected for the

entire 1981-1997 periods. These increases are evidences of the successful trade policies that East Asian economies had pursued in the 1980s and 1990s.

In term of the growth rates, two distinct periods can be identified. In the 1980s, with the exception of the 1981-1983 sub-period, the world demand (the equivalent world imports) of the 3, 5 and 10 main export sectors showed a higher growth performance than their correspondent main export sectors. In the 1990s, on the contrary, East Asia's manufacturing exports had a much better growth performance than the correspondent world imports.[2] For the whole period 1981-1997, East Asia's manufacturing sector exports growth outperformed the world demand growth for the corresponding manufacturing sectors. The success of East Asia trade exports reflected the suitable trade policies these economies had pursued, and their comparative advantage shows an improvement.

For the Latin America region, although their 10 main export sectors accounted for an average share of about 69 percent for the period 1981-1997, their share showed a significant decrease overtime. For example, their share of the 10 main exports decreased from 83.49 percent to 58.78 percent between the 1981-1983 and 1996-1997 sub-periods, showing a decrease of 24.71 percent. Compared to East Asia, however, Latin America's manufacturing exports are much less concentrated, their values are also much lower, and their share in world total manufacturing imports is only about 2.3 percent on average. Beginning from the second half of the 1980s, however, their share showed a steady increase in world manufacturing imports.[3] Similarly, an increase of the share in world manufacturing imports can also be detected for the 3, 5 and 10 main manufacturing export sectors. Evidences show that the shift of trade policies by Latin American economies in the 1990s had revived their export performance and a gain in export advantage is expected.

The pattern of Latin America's export growth rates, however, is different from East Asia. The percentage growth rates within each of the sub-periods are in general, and in particular the 1987-89 and 1996-1997 sub-periods, higher than the world import growth rate for the same sectors. The two exceptions are the 3 and 5 main export sectors for the 1981-1983 and the 1993-1995 sub-periods when world imports performed much better than Latin America's export growth. Trade statistics show that Latin America's

manufacturing export growth had a much better performance than the growth in world imports. This suggests that Latin America had experienced a significant increase in their share of the world manufacturing imports, though their share were much lower than that prevailed in East Asia. However, since Latin America's export pattern is less concentrated, their growth in total manufacturing exports shows a much better performance than world total imports growth for the sub-period 1981-1983, even though their 3 and 5 main exports sectors growth performed worse than the correspondent world imports growth. It should be noted that the growth performance of Latin America's total manufacture exports in the 1981-1983 sub-period was good. This could be seen as a consequence of the external debt crises that affected most Latin American countries, as they followed external adjustment policies and promoted trade surplus so as to finance the interest payment of the external debts.

III Trade Performance Indices

Instead of looking at individual trade policies adopted by individual governments, we work on the aggregate by computing four trade performance indices for the East Asia and Latin America regions. The two indices that reflected structural change are the Lawrence Index and the Beneficial Index. The Lawrence Index gives an index value that ranges from zero to one, and the index indicates a complete upheaval if it is close to unity, otherwise indicates little change if it is close to zero.[4] The Beneficial Index is used to measure whether a given structural change in export pattern is oriented to the most dynamic products demanded by the world.[5] A positive value indicates a beneficial orientation, and that the structural change in exports favored the dynamic sectors. The higher the value of this index, the stronger is the beneficial change in export pattern.

The other two indices relate to trade specialization (Amable 2000). The Michaely Index is the more traditional index, whose value ranges from zero to unity, with a value closer to one indicating a greater degree of trade specialization.[6] The Trade Specialization Index gives an improved version of the Michaely Index. In this case, the degree of specialization in each sector is weighted by its relative importance in the country's total trade. This index also ranges between zero and one, and the value of one implies a

complete specialization in trade.[7] Both the Michaely Index and Trade Specialization Index are inversely related to the conventional Grubel-Lloyd (GL) intra-industry trade index.[8]

Table 3 Trade Performance Indices

East Asia	1981-1983	1984-1986	1987-1989	1990-1992	1993-1995	1996-1997
Lawrence Index	0.03	0.04	0.03	0.04	0.05	0.02
Beneficial Index	0.00	0.01	0.00	0.01	0.01	0.00
Michaely Index	0.29	0.27	0.26	0.20	0.18	0.07
Trade Specialization Index	0.28	0.29	0.27	0.22	0.19	0.15
Latin America						
Lawrence Index	0.10	0.13	0.10	0.08	0.11	0.24
Beneficial Index	0.03	-0.01	0.00	0.01	0.03	0.05
Michaely Index	0.61	0.45	0.44	0.43	0.48	0.25
Trade Specialization Index	0.57	0.44	0.41	0.01	0.38	0.26

In the case of East Asia, Table 3 shows that the values of the Lawrence Index are very low, though they are constant over the sub-periods, suggesting that there was no important structural change in the export pattern of East Asia in the whole period.[9] The Beneficial Index also suggested no significant structural change in exports pattern. Both indices indicate that over the period 1981-1997, East Asia's export pattern remained constant. In other words, the same export structure was kept, even though East Asia had been oriented to the most dynamic product sectors in the world markets during this period.

The two trade specialization indices show the same pattern. From the beginning of the 1980s to the second half of the 1990s, there was a steady decrease in trade specialization, and there were little movements to "diversify" exports (and imports). Although there was an increase in intra-industry trade over the period covered by the data, the absolute value of these indices remained low, indicating that the degree of trade specialization was low since the beginning of the 1980s. This also meant that the extent of intra-industry trade had already reached the "maximum" level. One can further hypothesize from Table 3 that for the East Asia region there was no significant change in manufactured sectors' revealed comparative advantage (RCA), but there could be

improvements in RCA between different sub-regions within East Asia, typically between the EANIEs and the ASEAN4.

In Latin America, the value of the Lawrence Index is higher than East Asia, though some of these indices might be sensitive to the volume of trade. The Lawrence Index, however, shows a clear upward trend in the 1990s, apparently indicating that some structural change in Latin America's export pattern occurred. The Beneficial Index in general has low values but is increasing in the 1990s. Similar to the Lawrence Index, Latin America has experienced beneficial structural change since the 1990s. Economic structural changes increased the shares of export products (sectors) that were dynamic in the world markets.

The two trade specialization indices show a similar pattern for Latin America. Over the entire period 1981-1997, the value of the two indices decreased significantly, showing a greater export "diversification" and an increase in intra-industry trade. The value of the two indices are higher in the first sub-period of 1981-1983, apparently suggesting that intra-industry trade was low in the 1980s in Latin America. These results lead us to believe that Latin America experienced major changes in manufactured sectors' RCAs. Their significant gain in RCA suggested improvement in economic competitiveness.

IV Revealed Comparative Advantage in Manufacture Exports

The positive impact of trade liberalization and expansion can indirectly be measured by the revealed comparative advantage (RCA). The RCA in theory provides an index measure of changes in comparative advantage. Like any other aggregative measure, it does have limitations. Changes in a country's revealed comparative advantage cannot distinguish improvements in factor endowment from the pursuit of appropriate trade policies. While the theory of comparative advantage emphasized the former, the latter has often affected trade improvement, though one can argue that they are inter-related. It is true that difference in trade policy regimes between the East Asian and Latin American regions would contribute more to the different outcome in their revealed comparative advantage than their difference in factor endowment. It is equally true to argue that trade

is affected by inter-country differences in tastes, as well as inter-industry disparities in the extent of protection. The RCA is primarily based on relative export shares that could be biased due to distortions from various trade and non-trade barriers.

This section analyzes the export pattern of manufacturing sectors in three groups of countries in East Asia (EANIEs and ASEAN4) and Latin America (LA). We construct two revealed comparative advantage (RCA) measures. One is Balassa's (1979, 1986) RCA index (denoted as RCA) that compares the export share of a given sector in a country with the export share of that sector in the world market. The other is an improved version constructed by Vollrath (1991) (denoted as RCA#). Since we look at groups of regional economies, Vollrath's RCA# is considered to be the more appropriate measure, because a group of countries is expected to have a much greater impact at the world level than an individual economy. The RCA# considers the significance of the country's export in a given sector and at the world level and eliminates any double counting problem in world trade. For any export sector "i", the RCA and RCA# are defined, respectively, as:

$$(1)\ RCA_i = \left[\frac{\left(X_{ij} \Big/ \sum_i X_{ij} \right)}{\sum_j X_{ij} \Big/ \sum_j \sum_i X_{ij}} \right]$$

$$(2)\ RCA\#_i = \frac{\left\{ \dfrac{X_{ij}}{(\sum_i X_{ij}) - X_{ij}} \right\}}{\left\{ \dfrac{\left((\sum_j X_{ij}) - X_{ij} \right)}{\left((\sum_j \sum_i X_{ij}) - (\sum_j X_{ij}) \right) - \left((\sum_i X_{ij}) - X_{ij} \right)} \right\}}$$

X_{ij} are the exports of sector "i" at country "j"; $\sum_i X_{ij}$ are the total exports of country "j"; $\sum_j X_{ij}$ are the "world" exports of sector "i" (sum of countries sector's "i" exports); and $\sum_j \sum_i X_{ij}$ are the total "world" exports.

The original 4-digit ISIC export data from the UNIDO (1999) database were aggregated into a 3-digit sector classification, giving a total of 31 sectors. The respective RCAs were computed for each of the 31 manufactures sectors, for each year from 1981 to 1997, and for each of the three groups of countries. To get an idea of the changes in export pattern over this sample period, we used the averages of the first three years (1981-1983) and of the last three years (1995-1997) to compute for each sector and country group. These averages should be seen as an indicator of the "true" RCA of each sector between the beginning and end of the period. Changes in these sectors' RCA averages should give an indication on the changing export pattern. We rank the average RCA based on their value at the beginning and at the end of the period, as shown in Table 4. A 3-digit sector like 381>2 means that sector 381 and those above it has RCA#, or RCA, measure higher or equal to 2. Similar interpretation applies to 314>1, 383.1>0.5, 313>0.3 and so on. The special case denoted as 312>2>1 means that sector 312 and those sectors above it have RCA measures higher or equal to 2 and there is no sector whose RCA measure is between 1 and 2 (i.e. 2 > RCA > 1).

With some minor difference, the two definitions of RCA and RCA# produced similar rankings for the sectors in all three groups of countries. For example, EANIE's ranking of 22, 23 and 24 in the first period, LA's ranking of 11, 12, 19 and 20 in the second period and ASEAN4's ranking of 2, 3 and 4 in the second period. In the case of EANIEs, the number of sectors with RCA > 2 reduced from 9 to 3, while the number of sectors with 2 > RCA > 1 maintained at 6. Thus, EANIEs apparently experienced a significant reduction in the number of sectors (from 15 to 9) in which they had revealed comparative advantage (RCA > 1) in the sample period. In the case of ASEAN4, the number of sectors with RCA > 2 maintained at 4 and those with 2 > RCA > 1 increased from 7 to 9. Thus, for ASEAN4, the number of sectors with revealed comparative advantage increased from 11 to 13.

Table 4 Ranking of Average RCA

	1981 – 1983							1995 – 1997					
	EANIEs		ASEAN4		LA			EANIEs		ASEAN4		LA	
Rank	RCA#	RCA	RCA#	RCA	RCA#	RCA	Rank	RCA#	RCA	RCA#	RCA	RCA#	RCA
1	321	321	331	331	353	353	1	353	353	331	331	372	372
2	383.2	383.2	311	311	372	372	2	383.2	383.2>2	383.2	324	323	323
3	356	356	322	322>2	323	323	3	321>2	321	324	311	311	311
4	385	385	353>2	353	311	311	4	323	323	311>2	383.2>2	312>2	312>2
5	390	390	383.2	383.2	312>2>1	312>2>1	5	382.2	382.2	332	332	353	353
6	355	355	390	390	342	342	6	314	314	322	322	371	313
7	342	342	372	372	362	362	7	322	322	356	356	313	371
8	369	369>2	321	321	322	322	8	390	390	390	390	362	362
9	381>2	381	312	312	351	351	9	383.1>1	383.1>1	361	361	322	322
10	371	371	332	332	313	313	10	371	371	321	321	390	390
11	361	361	356>1	356>1	331	331	11	355	355	323	323	383.1	341
12	312	312	324	324	369	369	12	342	342	312	312	341	383.1
13	332	332	323	323	321	321	13	356	356	355>1	355>1	369>1	369>1
14	331	331	361	361	371>0.5	371	14	385	385	353	353	331	331
15	314>1	314>1	369	369	341	341	15	324	324	372	372	332	332
16	324	324	355>0.5	355>0.5	352	352>0.5	16	351	351	362	362	351	351
17	362	362	383.1	383.1	361	361	17	372	372	383.1	383.1	342	342
18	383.1>0.5	383.1>0.5	362	362	390	390	18	381>0.5	381	382.2	382.2	361	361
19	352	352	371>0.3	371	324	324	19	384	384>0.5	369	369	383.2	381
20	351	351	352	352>0.3	381	381	20	312	312	341	341	381	383.2
21	323	323	381	381	354	354	21	362	362	381	381	384	384
22	353	382.2	385	385	383.2	383.2	22	352	352	351>0.5	351>0.5	356	356
23	382.2	353	314	351	356>0.3	356	23	313	313	342	342	385	385
24	311	311	351	314	383.1	383.1>0.3	24	341	341	385	385	321	321
25	313>0.3	384	313	313	314	314	25	354>0.3	354>0.3	314	314	355	355
26	384	313>0.3	342	342	382.2	382.2	26	382.1	382.1	371>0.3	371>0.3	324	324
27	372	372	382.2	382.2	384	384	27	369	369	352	352	352	352
28	341	341	341	341	332	332	28	311	311	354	354	354>0.5	354>0.5
29	354	354	382.1	382.1	355	355	29	332	332	313	313	314	314
30	382.1	382.1	384	384	385	385	30	361	361	384	384	382.1	382.2
31	322?	322?	354	354	382.1	382.1	31	331	331	382.1	382.1	382.2>0.3	382.1>0.3

In the case of LA, the number of sectors with RCA > 2 decreased from 5 to 4, while those with 2 > RCA > 1 increased from 0 to 9. We conclude that Latin America has experienced a big improvement in the number of sectors (from 5 to 13) in which it has revealed comparative advantage. One main reason for that could be the small share of Latin America manufactured sectors' exports in the world imports (and world exports). That is, even a relative "small" increase of her manufactured sectors' exports would imply a relatively "big" change in the RCAs indices.

Between 1997-1995 and 1983-1981 a number of sectors experienced opposite changes in RCA in EANIEs compared to ASEAN4 and LA. We conclude that while the EANIEs has lost their comparative advantage in a significant number of falling competitive sectors, both ASEAN4 and LA have gained comparative advantage in most of these sectors and these two groups of economies have become more competitive.

We define the followings four intervals of RCA: Very High for RCA > 2, High for 2 > RCA > 1, Low for 1 > RCA > 0.5, Very Low for RCA < 0.5. We use a 2-digit ISIC industry classification to incorporate all 3-digit codes. This exercise helps us to detect if a sector's competitive position has improved or worsened between the beginning and the end of the period. For simplicity, we only report the RCA# result in Table 5. In the case of industry "31" (*Food, Beverages, Tobacco*), EANIEs experienced a fall from "High" to "Very Low", while ASEAN4 has maintained its competitive position and Latin America experienced an improvement from "Low" to "High". The EANIEs gained competitive position only in industry "32" (*Textile, Wearing Apparel, Leather*). However, the competitive position for industries "31" (*Food, Beverages, Tobacco*), "33" (*Wood & Wood Products*), "34" (*Paper & Paper Products*), "36" (*Non- Metallic Mineral Products*), "37" (*Basic Metal Industries*), and "39" (*Other Manufacturing Industries*) had clearly worsened. Industries "35" (*Chemicals & Petroleum & Coal & Plastic Products*) and "38" (*Fabricated Metal Products & Machinery and Equipment*) showed a mixed result.

In the case of ASEAN4, industries "32", "34", "36", and "38" have clearly improved in their competitive position, while industries "31", "33", and "39" maintained their competitive position and industry "35" has improved its competitive position, except for sector 353 which fell from "Very High" to "Low". For the Latin America countries, with the exception of "35" (sector 353 fell from "Very High" to "High"), all others have clearly improved in their competitive position.

Table 5 Intervals of RCA#

	Average Value, 1983-1981				Average Value, 1997-1995			
EANIEs	Very High	High	Low	Very Low	Very High	High	Low	Very Low
31		312, 314		311, 313		314		311, 312, 313
32	321		324	322?, 323	321	323, 322	324	
33		332, 331						332, 331
34	342			341			342	341
35	355, 356			351, 352, 353, 354	353		351, 355, 356	352, 354
36	369	361	362					361, 362, 369
37		371		372			371,372	
38	361, 383.2, 385		383.1	382.1, 382.2, 384	383.2	382.2, 383.1	382, 385	382.1, 384
39	390					390		
ASEAN4								
31	311	312		313, 314	311	312		313, 314
32	322	321	323, 324		324	321, 322, 323		
33	331	332			331	332		
34				341, 342			341	342
35	353	356	355	351, 352, 354		355, 356	351, 353	352, 354
36			361, 369	362		361	362, 369	
37		372		371			372	371
38		383.2		381, 382.1, 382.2, 383.1, 384, 385	383.2		381, 382.2, 383.1	382.1, 384, 385
39		390				390		
Latin America								
31	311, 312		313	314	311, 312	313		314
32	323		321, 322	324	323	322	321, 324	
33			331	332			331, 332	
34			342	341		341	342	
35	353		351	352, 354, 355, 356		353	351, 352, 354, 355, 356	
36			362, 369	361		362, 369	361	
37	372		371		372	371		
38				381, 382.1, 382.2, 383.1, 383.2, 384, 385		383.1	381, 383.2, 384, 385	382.1, 382.2
39				390		390		

Notes: Sectors 31 = Manufacture of Food, Beverages & Tobacco; 32 = Textile, Wearing Apparel and Leather Industries; 33 = Manufacture of Wood and Wood Products; 34 = Manufacture of Paper and Paper Products; 35 = Manufacture of Chemicals, Petroleum, Coal, Rubber & Plastic Products; 36 = Manufactures of Non-Metallic Mineral Production; 37 = Basic Metal Industries; 38 = Manufacture of Fabricated Metal Products, Machinery and Equipment; and 39 = Other Manufacturing Industries.

In addition, we work out the changes in the export pattern obtained from the RCA averages between the two periods. Table 6 shows the end-of-period ranking of sectors by the percentage change in the absolute value of RCA. We observe both the gain and loss relationships in the RCAs of the three country groupings. Firstly, the EANIEs experienced loss of their RCAs in 17 cases and gained 14 cases. ASEAN4 gained 24 cases and lost 7 cases. LA gained 25 cases and lost 6 cases. In other words, while EANIEs' loss in their RCAs in the majority of the cases, ASEAN4 and Latin America gained their RCAs in the majority of the 31 cases overwhelmingly.

For the 17 cases that EANIEs have lost, ASEAN4 gained 13 cases and Latin America gained 14 cases. ASEAN4 and Latin America jointly gained in 11 cases (321, 332, 355, 356, 361, 362, 369, 381, 383.2, 385, and 390). The remaining sectors that either ASEAN4 or LA gained includes 311, 312, 331, 342, 352 and 371. In the 14 cases in which EANIEs gained, both ASEAN4 and Latin America also gained 11 cases. There is a joint gain among EANIEs, ASEAN4 and LA in 10 out of these 14 cases. The sectors that ASEAN4 and LA jointly gained include 313, 314, 324, 341, 351, 354, 382.1, 382.2, 383.1 and 384. The sectors where either ASEAN4 or LA gained include 322 and 323. The sectors where ASEAN4 and LA lost were 353 and 372.

The loss of RCA in the EANIEs was gained either by ASEAN4 or LA or shared by both. And in sectors where EANIEs gained, either ASEAN4 or LA has also gained. In the majority of sectors, the gain is shared among the three groups. A pattern of shift in (revealed) competitive advantage existed for manufactured export sectors in the period 1981 and 1997 from EANIEs to ASEAN4 and from EANIEs to LA. There is a close pattern of gain and loss between ASEAN4 and LA. Which sectors experienced the strongest shift in (revealed) comparative advantage from EANIEs to ASEAN4 and LA? We concentrate on those sectors that experienced a fall of around 50 percent and higher in the RCA of EANIEs, and those sectors that experienced a rise of 50 percent or higher in the RCAs of ASEAN4 and LA. For these sectors, the 2-digit industrial classifications that experienced the biggest shift in comparative advantage are, in decreasing order of importance, "36" (*Non-Metallic Mineral Products*), "33" (*Wood & Wood Products*), "38" (*Fabricated Metal Products & Machinery and Equipment*), and "35" (*Chemicals & Petroleum & Coal & Plastic Products*).

Table 6 End-of-Period Ranking of Percentage Change of RCA#

	EANIEs		ASEAN		LA	
Rank	Sector	% Change	Sector	% Change	Sector	% Change
1	353	861.65	354	1333.91	332	375.75
2	382.2	428.58	382.2	818.75	385	348.51
3	323	411.97	341	694.50	355	313.26
4	382.1	238.13	384	341.75	384	280.73
5	354	211.41	342	275.46	383.1	258.87
6	372	155.62	324	255.31	390	215.95
7	383.1	95.26	351	179.12	371	193.55
8	361	-89.62	361	151.51	383.2	173.34
9	369	-88.07	314	143.60	382.1	151.74
10	331	-87.89	385	133.21	381	150.38
11	351	86.91	382.1	125.31	313	110.81
12	332	-85.28	381	111.86	341	109.09
13	356	-74.02	355	95.27	356	108.72
14	385	-73.16	383.2	94.92	361	88.41
15	312	-70.60	323	91.71	353	-80.20
16	381	-68.69	362	89.30	324	72.24
17	342	-61.54	383.1	86.89	322	69.02
18	355	-61.29	332	81.97	382.2	67.83
19	390	-60.42	311	-71.94	354	65.01
20	321	-59.11	356	61.32	314	59.43
21	371	-52.44	353	-57.62	369	57.61
22	384	49.74	331	-45.97	362	50.90
23	341	48.78	372	-41.51	331	43.33
24	314	40.66	313	39.67	351	31.88
25	311	-33.10	322	-32.76	352	25.54
26	362	-31.88	369	26.71	323	-20.07
27	383.2	-29.19	321	26.62	311	-13.24
28	352	-21.31	352	-12.24	312	-11.30
29	324	20.42	312	12.04	372	-10.72
30	313	10.91	371	-9.32	342	-9.06
31	322		390	4.45	321	5.70

Lastly, we consider if these shifts in comparative advantage from EANIEs to ASEAN4 and LA country groups are systematic over the period 1981-1997. Correlations of the RCAs for a given sector between two different country groups over the entire period of 17 years (1981-1997) are considered as an appropriate measure of the systematic shifts, as shown in Table 7. We observe the following results in the 17 cases where EANIEs suffered a loss in RCA. The correlation coefficient is negative in 11 cases

(65%) with ASEAN4 and negative in 12 cases (70%) with LA. A total of 9 cases (53 percent) yielded a negative correlation coefficient between EANIEs and both ASEAN4 and LA. These 9 sectors are 332, 355, 356, 361, 362, 369, 371, 381, and 385. The sectors in which either ASEAN4 or LA shows a negative correlation coefficient include 331, 342, 352, 383.2, and 390. The sectors that show a positive correlation coefficient include 311, 312, and 321. The majority of these correlation coefficients are higher than 0.20 in absolute value term. There are 8 cases in which both country groups showed a coefficient higher than 0.20 in absolute value term. Thus among the 17 cases of RCA loss suffered by the EANIEs, there is a comparative advantage shift of almost 60 percent from the EANIEs to either the ASEAN4 or LA, and over 40 percent from EANIEs to both ASEAN4 and LA. Among those correlation coefficients that exceeded 0.40 in absolute value, there are 5 and 3 cases that showed a negative correlation relationship between EANIEs and either ASEAN4 or LA and between EANIEs and both ASEAN4 and LA, respectively. For a significant subset of the 17 cases, there are strong systematic shifts in comparative advantage from the EANIEs to either ASEAN4 or LA or both in the period 1981-1997.

For the 14 cases in which EANIEs gained in RCA over the period, there is a positive correlation coefficient with ASEAN4 and LA in 10 and 8 cases, respectively, and a positive correlation coefficient for both ASEAN4 and LA is found in 7 cases. These 7 sectors are 313, 324, 341, 382.1, 382.2, 383.1, and 384. The sectors where either ASEAN4 or LA shows a positive correlation coefficient with EANIEs include 322, 323, 351, and 354. The sectors where ASEAN4 and LA show a negative correlation coefficient with EANIEs include 314, 353, and 372.

These correlation coefficients demonstrate a pattern of comparative advantage shift from the EANIEs to ASEAN4 and LA country groups. In the majority of these cases, the shift in comparative advantage is systematic during the whole period 1981-1997, and for a significant subset the shift is systematic and strong. These results support our hypothesis that appropriate changes in trade policies can help to promote trade and gain comparative advantage. Since world trade is fixed, one country or region's gain in comparative advantage must be another country or region's loss. The RCA indicators

show a relative measure only, but improvement by LA and ASEAN4 does ring a bell on EANIE's export competitiveness.

Table 7 Correlation of Loss and Gain of RCA by the EANIEs

Loss of RCA by EANIEs			Gain of RCA by EANIEs		
Sectors	Correlation with ASEAN 4	Correlation with LA	Sectors	Correlation with ASEAN4	Correlation with LA
311	0.51	0.60	313	0.43	0.08
312	0.16	0.76	314	-0.07	-0.30
321	0.02	0.23	322	0.06	-0.16
331	0.26	-0.11	323	-0.16	0.02
332	-0.43	-0.47	324	0.09	0.51
342	-0.47	0.06	341	0.68	0.32
352	0.00	-0.32	351	0.28	-0.33
355	-0.45	-0.65	353	-0.59	-0.68
356	-0.34	-0.14	354	0.27	-0.17
361	-0.41	-0.54	372	-0.16	-0.47
362	-0.32	-0.27	382.1	0.61	0.63
369	-0.26	-0.38	382.2	0.83	0.14
371	-0.09	-0.34	383.1	0.77	0.53
381	-0.74	-0.76	384	0.52	0.59
383.2	-0.86	0.23			
385	-0.31	-0.25			
390	0.01	-0.48			

V Reflections, Implications and Conclusion

Improvements in RCA do imply a greater extent of trade liberalization. Schott (1994, p. 61) rightly pointed out that trade-weighted average tariffs has fallen between the pre-Uruguay and post-Uruguay round from 6.3% to 3.9% for developed countries, from 15.3% to 12.3% for developing countries, and from 8.6% to 6.0% for transition economies. The more hidden trend is the growth of non-tariff barriers. Kelly and McGuirk *et al* (1993, Table 4) showed that developed countries had increased the use of non-tariff measures during the 1980s, particularly in such trade-sensitive sectors as iron and steel, motor vehicles, textile and clothing, footwear and foot items. Indeed, both Greenaway and Milner (1993, Chapter 2) and Mikic (1998, Chapter 9) argued that trade liberalization in the 1980s showed a diverging trend. While the developed countries had increased the use of non-trade barriers on imports, developing countries have dismantled

their non-trade barriers. Trade distortion resulting from non-trade barriers could not be captured in the RCA measures.

Based on the statistical data from the UNIDO (1999) source, the empirical study supports the hypothesis of a comparative advantage shift between East Asia and Southeast Asia, and that Latin America also captured the loss in comparative advantage in East Asia. Despite East Asia's strong growth in exports in the 1980s and 1990s, its export pattern is losing its comparative advantage to the lower-tier major ASEAN4 and Latin American countries. Between the 1980s and 1990s, the falling strength in East Asia's trade is captured by the growing strength in the exports of ASEAN4 and Latin American countries. Although the UNIDO (1999) data do not include the trade data Mainland China, it can easily be conjectured that part of the EANIEs' loss in RCA in the sample period could have gone to Mainland China.

Admitting that the RCA is not a perfect measure, as it failed to distinguish between a region's factor endowment and changes in trade policy, we believe that the RCA measure are still acceptable as the impact of changes in trade policies can be seen from movement of RCA. The loss of RCA among the three EANIEs, especially South Korea, could be one of the underlying fundamental reasons that caused the Asian Financial Crisis in 1997. This is because, intuitively, the fall in RCA reflected a weak performance in the real economy, and the sharp fall in export in 1996, unmatched by corresponding currency devaluation, resulted in an excess supply shock. The lost in RCA, however, is not the end for the EANIEs. Their large trade volume enables them to play new roles in both the international and regional context. For example, East Asian economies have become key suppliers of capital to their neighboring economies. The advanced status of their economies could allow them to restructure the texture of their economies accordingly.

The rise in ASEAN4's RCA is encouraging, despite the emergence of the Asian Financial Crisis (AFC) in 1997-1998, though many believe that ASEAN4's success faces new challenge from South Asia and Mainland China. A major implication for the ASEAN4 economies is that they should restore post-AFC economic stability as much and soon as possible so as to exploit and maximize the benefit from the improved comparative advantage they gained in the 1990s.

Latin America is the other group of economies that gained substantial competitive advantage in the 1990s. Their improvement in RCA and trade diversification reflected more their government's trade and liberalization strategy than changes in factor endowment. One reason for the strong RCA improvement certainly is Latin America's initial low share in world export. That is, a relatively small increase in export value accounts for a relatively high increase in the RCA indices of Latin America. Several other factors are also responsible for improvements in Latin America. The North America Free Trade Agreement (NAFTA) concluded in the late 1980s welded together the economies of the United States, Canada and Mexico, thereby forming a solid regional trading block that benefited directly Mexico and indirectly other Latin American economies. Secondly, by the early 1990s, Argentina gained economic stability and an improved export performance emerged. Argentina's trade improvement strengthened with the MERCOSUL (incomplete) trade union. During the 1970s and 1980s, Chile pursued a process of trade liberalization that reorganized and modernized the economy's production structure. All this reflected in a significant improvement in trade performance by the Chilean economy. Peru was also another Latin America country that succeeded in stabilizing the economy in the early 1990s, and improvement in economic conditions was reflected in an improvement in export performance. Argentina, Chile Peru and Mexico are the key Latin American economies in our RCA calculation. For the improvement of RCA to be sustainable, however, Latin American economies should maintain a period of stability and avoid economic or political shocks that devastated her hard-earned comparative advantage.

Changes in a region or a country's RCA can have multiple implications. The more fundamental factor, for example, is the trend in total factor productivity. One would expect that improvement in RCA be positively correlated with increase in total factor productivity. For example, investigation on the total factor productivity of the 2-digit industry classification sectors - 36 (*Non-Metallic Mineral Products*), 33 (*Wood & Wood Products*), 38 (*Fabricated Metal Products & Machinery and Equipment*) and 35 (*Chemicals & Petroleum & Coal & Plastic Products*) - that experienced improvement in RCA could give new insights in trade and productivity. This, of course, would be the subject matter that deserves full investigation in another paper.

Appendix A: ISIC Classification of Manufacture Sectors

3-Digit	4-Digit
311	3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119
312	3121, 3122
313	3131, 3132, 3133, 3134
314	3140
321	3211, 3212, 3213, 3214, 3215, 3219
322	3220
323	3231, 3232, 3233
324	3240
331	3311, 3312, 3319
332	3320
341	3411, 3412, 3419
342	3420
351	3511, 3512, 3513
352	3521, 3522, 3523, 3529
353	3530
354	3540
355	3551, 3559
356	3560
361	3610
362	3620
369	3691, 3692, 3699
371	3710
372	3720
381	3811, 3812, 3813, 3819
382.1	3821, 3822, 3823
382.2	3824, 3825, 3829
383.1	3831
383.2	3832, 3833, 3839
384	3841, 3842, 3843, 3844, 3845, 3849
385	3851, 3852, 3853
390	3901, 3902, 3903, 3909

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Endnotes:

[1] The UNIDO database does not include Brazil, People's Republic of China and Chinese Taipei.

[2] We note that 1996 was exceptional. East Asia's 3, 5 and 10 main export sectors showed a decrease of about 3%, but the world demand (imports) for the same sectors showed an increase that ranged from 10% (for the 3), to 7.8% (for the 5) and to 4% (for the 10).

[3] Latin America experienced a decrease in the share of the world's total manufacturing imports for the two sub-periods of 1984-1986 and 1987-1989, despite a better growth performance in manufacturing exports within each of these two sub-periods. The two beginning years of 1984 and 1987 in the two sub-periods were important, as Latin America's exports decreased by 12% and 13%, while the world imports increased by 19% and 10%, respectively. So, at the beginning of the two sub-periods (1984 and 1987), Latin America's export level was much lower than the previous year and its share in world demand also started from a level lower than the previous year.

[4] This index is computed as: $L = (1/2)\sum_{i=1}^{n}\left|s_{i,t} - s_{i,t-1}\right|$, where $s_{i,t} = X_{i,t} \Big/ \sum_{i} X_{i,t}$, that is, $s_{i,t}$ is the share of sector i's exports in total exports of the country at year t (Sapir, 1996).

[5] The Beneficial Structural Change Index (BSCI) is defined as (for details see Bender, 2001):

$$BSCI = \sum_{i=1}^{n}\left\{\left[\frac{X_{i,t} \Big/ \sum_{i} X_{i,t}}{X_{i,t-1} \Big/ \sum_{i} X_{i,t-1}} - 1\right] \bullet \left[\frac{\left(M_{i,t} \Big/ M_{i,t-1}\right)^{"world"}}{Average\left(M_{i,t} \Big/ M_{i,t-1}\right)} - 1\right] \bullet \left(\frac{X_{i,t}}{\sum_{i} X_{i,t}}\right)\right\}$$

[6] This index is defined as: $I = \left(\frac{1}{2}\right)\sum_{i=1}^{n}\left|\frac{X_i}{\sum_i X_i} - \frac{M_i}{\sum_i M_i}\right|$, where X_i and M_i are, respectively, exports and imports of sector "i" in a given year (Amable, 2000).

[7] For a given sector i, its degree of specialization is unambiguously given by the following ratio: $\frac{|X_i - M_i|}{X_i + M_i}$. The value of one for this ratio indicates a complete specialization (to export or to import). Therefore, the aggregate measure of trade specialization can be obtained first by weighting all the individual sectors' measures and then summing over all sectors. So, the trade specialization index (TSI) is defined as (for details, see Bender, 2001):

$$TSI = \sum_{i=1}^{n}\left\{\left(\frac{(X_i + M_i)}{\sum_i (X_i + M_i)}\right)\frac{|X_i - M_i|}{(X_i + M_i)}\right\} = \sum_{i=1}^{n}\left\{\frac{|X_i - M_i|}{\sum_i (X_i + M_i)}\right\},$$

$$\textit{where the weights are} = \frac{(X_i + M_i)}{\sum_i (X_i + M_i)}$$

[8] Defined for industry "i" as $GL_i = \left\{1 - \left[|X_i - M_i| \Big/ (X_i + M_i)\right]\right\}$, see Brulhart and Hine (1999).

[9] Changes in export pattern, however, may have occurred in sub-regions (or particular countries) within the whole East Asia Region.