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## **Competitiveness of the Hong Kong economy**

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# Competitiveness of the Hong Kong Economy<sup>1</sup>

Hongyi Li, Xiangdong Wei, and Danyang Xie<sup>2</sup>

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## Abstract

Our assessment of the competitiveness of the Hong Kong economy from various perspectives indicates that the overall competitiveness of Hong Kong economy has been improving during the past several years. However, from a longer term historical perspective, there are still a number of areas in which Hong Kong's competitiveness has been eroded relative to her main competitors in East Asia, especially in export sector. On the aggregate level, although Hong Kong's Total Factor Productivity (TFP) growth rate is amongst the best performers in East Asia in the recent years, it has been adversely affected by the continuing relocation of Hong Kong's manufacturing production to the Mainland China. On sectorial levels, although Hong Kong's unit labour costs started to decline since 2000 comparing to her Asian competitors, the unit labour cost-based real effective exchange rate continues to appreciate against her major trade partners. Furthermore, Hong Kong's competitiveness deteriorated in several important categories of goods and service exports. Overall, our study shows that the Hong Kong economy still maintains its resilience to outside shocks, nevertheless it needs to explore new areas to fuel its future growth.

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<sup>1</sup> The views expressed in this report are those of the authors and do not necessarily represent those of the Bauhinia Foundation Research Centre.

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## **Executive Summary**

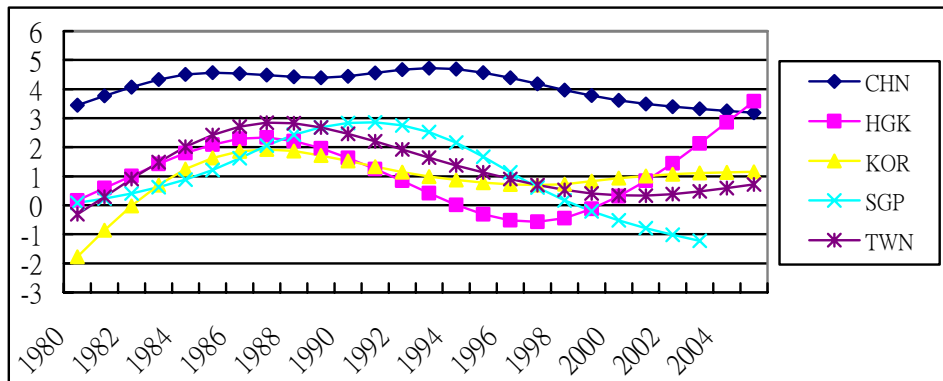
Our assessment of the competitiveness of the Hong Kong economy from various perspectives indicates that the overall competitiveness of Hong Kong economy has been improving during the past several years. However, from a longer term historical perspective, there are still a number of areas in which Hong Kong's competitiveness has been eroded relative to her main competitors in East Asia, especially in export sector. On the aggregate level, although Hong Kong's Total Factor Productivity (TFP) growth rate is amongst the best performers in East Asia in the recent years, it has been adversely affected by the continuing relocation of Hong Kong's manufacturing production to the Mainland China. On sectorial levels, although Hong Kong's unit labour costs started to improve since 2000 comparing to her Asian competitors, the unit labour cost-based real effective exchange rate continues to appreciate against her major trade partners. Furthermore, Hong Kong's competitiveness deteriorated in several important categories of goods and service exports. Overall, our study shows that the Hong Kong economy still maintains its resilience to outside shocks, nevertheless it needs to explore new areas to fuel its future growth.

### **1. TFP Analysis**

Our analysis indicates that the total factor productivity (TFP) growth rate had been declining during the 1990's largely due to the hollowing out of the manufacturing industry in Hong Kong. Such a decline was also aggravated by the Asian Financial Crises in years 1997-1999. However, a strong rebound of the TFP growth rate took place in 2000 and this rebound was further fueled by the signing up of CEPA in 2003, which gave Hong Kong a huge boost of confidence. In the past 3 years, our TFP growth rate is amongst the best performers in East Asia.

Figure 1 below plots the HP-filtered TFP growth rates for Hong Kong (HKG) and her major competitors, China (CHN), South Korea (KOR), Singapore (SGP), and Taiwan (TWN), which gives a visual comparison. More specifically, our econometric analyses reveal that the Asian Financial Crises did not seem to have a long lasting impact on Hong Kong's TFP. But they did have a transitory adverse impact during 1997-1999: it lowered Hong Kong's TFP growth by about 0.5% to 0.65% per year for each of these three years. On the other hand, the effect of CEPA appears to be very positive and robust, raising Hong Kong's TFP growth by approximately 1.5 percentage points per year since 2003. The declining of the manufacturing industry has a negative impact on TFP growth rate: one percentage point reduction in the manufacturing share in total GDP lowers the TFP growth rate by 0.4 percentage points. This impact is largely expected as the manufacturing sector normally has faster productivity growth than services.

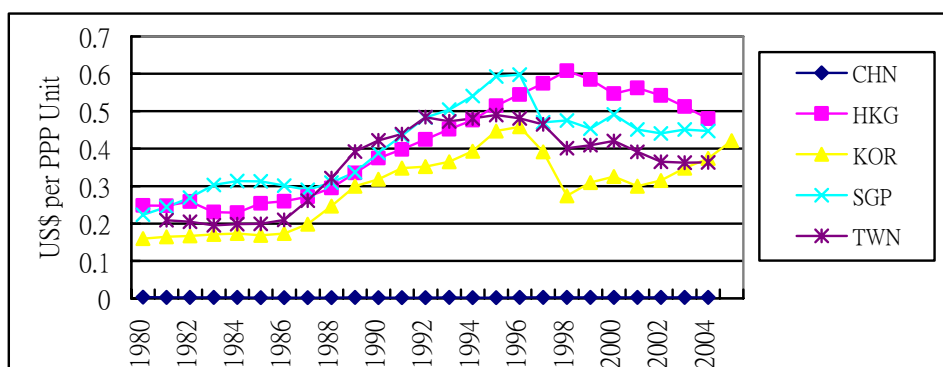
**Figure 1.** Comparison of TFP Growth Rates (HP filtered)



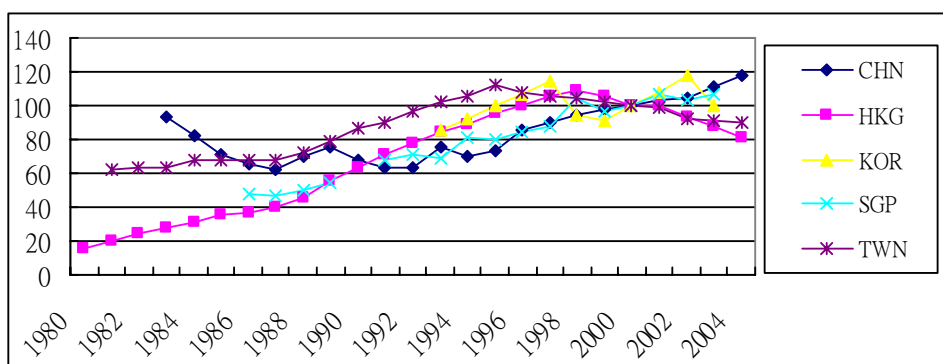
## 2. Unit Labour Cost Analysis

In terms of unit labour cost, Hong Kong became more expensive than her Asian competitors during the midst of the Asian Financial Crises (Figure 2). The situation has improved recently, largely due to the drastic decline of the unit labour cost in the service sector (Figure 3). Nevertheless, Hong Kong's unit labour cost-based real effective exchange rate continues to appreciate (Figure 4) due to declining unit labour costs in her major trade partners.

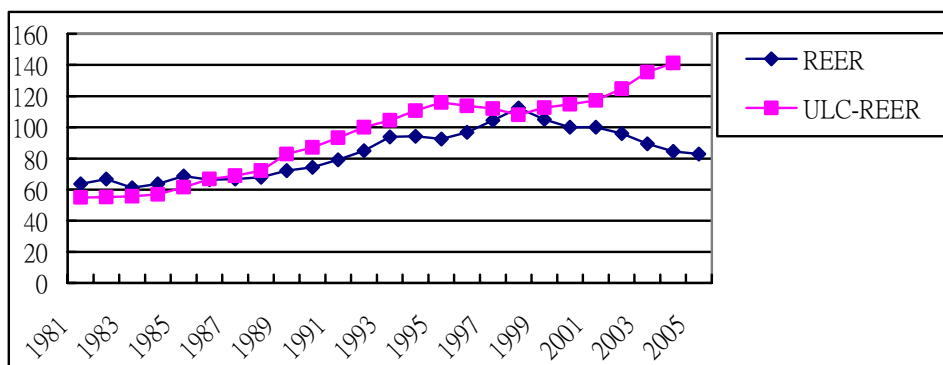
**Figure 2.** Comparison of GK-PPP-adjusted Unit Labour Cost



**Figure 3.** Comparison of Service Sector Unit Labour Cost Index (2000 = 100)



**Figure 4.** Hong Kong's REER and Unit Labour Cost-based REER



## Dynamic Shift-Share Analysis of Competitiveness in Goods and Service Exports

The following tables, which are based on our dynamic shift-share analysis (henceforth the DSSA), summarize the direct comparison of performance between Hong Kong

and the Asian competitors in both merchandise and service exports. In merchandise exports, when China is in the reference group, Hong Kong's loss of competitiveness amounts to an accumulated 28 billion USD between 1992 and 2004. When China is excluded from the reference group, Hong Kong's loss is reduced to 1.2 billion USD. Nevertheless, Hong Kong scores consistently behind Korea and Singapore whether or not China is in the reference group. When China is excluded from the reference group, Hong Kong performs relatively well in SITC 76 (telecommunication and sound equipments) and SITC 84 (clothing), but does poorly in SITC 776 (transistors) and SITC 75 (office equipments).

**Table 1.** Cumulative Net Shift between 1992 and 2004 including China

SITC	HKG	KOR	MYS	SGP	THA	TWN	CHN
65	-4,064	-2,365	-2,737	-5,262	-455	-1,887	16,771
75	-13,000	-6,456	-207	-10,801	-2,263	-13,099	45,826
76	-594	9,719	-7,238	-13,389	-3,107	-12,775	27,385
776	-6,456	-3,378	3,405	20,977	-2,303	5,487	-17,732
84	-3,944	-9,745	-4,146	-6,541	-2,002	-7,890	34,268
Overall	-28,059	-12,224	-10,924	-15,016	-10,130	-30,164	106,516

Note: In millions of USD. China is in the reference group. Destination market: the World.

**Table 2.** Cumulative Net Shift between 1992 and 2004 excluding China

SITC	HKG	KOR	MYS	SGP	THA	TWN
65	241	729	-449	-2,064	617	926
75	-1,366	2,145	6,208	-2,157	650	-5,480
76	6,250	14,758	-3,465	-8,004	-1,360	-8,179
776	-11,254	-6,601	1,129	17,526	-3,459	2,659
84	4,898	-3,457	396	128	197	-2,162
Overall	-1,232	7,575	3,820	5,429	-3,354	-12,237

Note: In millions of USD. China is excluded from the reference group. Destination market: the World.

Hong Kong's mediocre performance in the DSSA results from the deteriorating competitiveness of domestic exports. The re-export as a separate export centre in fact does an excellent job in keeping up with its competitors, at least since 2000. Nevertheless, the fact that the total exports have lost ground in all destination markets, the USA, the EU, Japan, even the Mainland China market, is a source for concern.

**Table 3.** Cumulative Net Shift between 1995 and 2004 including China

Services	HKG	KOR	MYS	SGP	THA	CHN
Transportation	-4,273	7,091	-2,123	-211	-1,305	821
Travel	-5,773	-3,221	2,834	-6,384	283	12,260
Insurance	63	225	275	845	116	-1,524
Finance	112	450	-37	394	-268	-652
Other Business	3,075	-4,690	-3,374	-910	-4,076	9,974
Overall	-6,796	-145	-2,424	-6,265	-5,249	20,880

Note: In millions of USD. Destination market: the World.

In service exports, Hong Kong has been losing competitiveness overall, largely due to the accumulated loss in net shift incurred in transportation and travel that totaled 10 billion USD. The gains in competitiveness in financial and insurance service exports are quantitatively unimportant. The only bright spot is the other business service exports which are mainly trade related (see Table 3 above).

### Policy Implication

In our view, further integration measures with the Mainland should be fostered. Given the minimal size of the manufacturing sector in Hong Kong, the only way to maintain a healthy TFP growth is to promote innovation in the service sector. Besides innovations in financial sector and logistic industry, Hong Kong should promote innovations in sports, travel, culture, and entertainment industry as well. Labour market flexibility remains important for maintaining Hong Kong's competitiveness. Policies that target export growth in high-tech industry (SITC 776 for instance) may be considered. Partnership with Guangdong (Shenzhen in particular) to develop high-tech manufacturing is the right way forward as it utilizes both sides' comparative advantages. It would enable Hong Kong to maintain some manufacturing activities, especially those up-stream ones, such as research and development, and hence could help Hong Kong maintain high economic growth.

### END OF EXECUTIVE SUMMARY

## **I. Introduction**

1. Despite the collapse in July 2006 of the WTO Doha “Development” Trade Round, globalization trend sees no sign of abating. To survive in a world “flattened” by globalization, competitiveness of an economy has become increasingly crucial. In this report, we assess the competitiveness of the Hong Kong economy from three different angles: the productivity change, the unit labour cost, and export performance. On each of these aspects, we examine Hong Kong’s performance in terms of changes over time as well as the comparisons with her East Asian competitors.

2. We conduct the analysis of the productivity change based on estimates of total factor productivity (TFP). The TFP growth captures the part of growth in aggregate output that is not attributable to additions of physical capital and increases in labour. The idea is that the economic growth that comes from additions of capital and increases in labour will eventually be subject to the law of diminishing returns and hence will be unsustainable. The economic growth that originates from the improvement of TFP, for instance, technological innovations, managerial innovations, new business ideas, as well as human capital accumulation, can be sustainable.

3. High labour cost is commonly viewed as one main reason for the deterioration of the competitiveness of an economy. However, high labour cost may not indicate low competitiveness if matched by high productivity. So we need to take into account both labour cost and productivity when assessing the competitiveness. The unit labour cost, defined as the ratio of real output over total labour compensation, serves the purpose. We estimate Hong Kong’s unit labour cost both for the economy as a whole and for different sectors. This enables us to see not only how the unit labour cost changes over time but also how it varies across different sectors. Furthermore, using the purchasing power parity (PPP) adjusted real output figures, we calculate Hong Kong’s unit labour cost along side with its major competitors in East Asia for comparisons. We also compile a measure of Hong Kong’s real effective exchange rate using unit labour costs as deflators. We then study the impact of the changes in the real effective exchange rates on Hong Kong’s exports.

4. To evaluate Hong Kong’s export competitiveness vis-à-vis its Asian

neighbours, we run a detailed dynamic shift-share analysis (DSSA), for both commodity exports and service exports. The DSSA allows us to assess in which export categories Hong Kong gains or loses competitiveness and in which periods such gains or losses have been incurred. Also, the DSSA can illustrate whether the gains and losses are quantitatively important.

5. The rest of the report is organized as follows. In section II, the main results of the TFP analysis are presented. In section III, we focus on unit labour costs. In section IV, we report the findings of the DSSA. Section V provides concluding comments as well as policy discussions. Technical details of data and methodological issues can be found in the Appendices.

## **II. TFP Analysis**

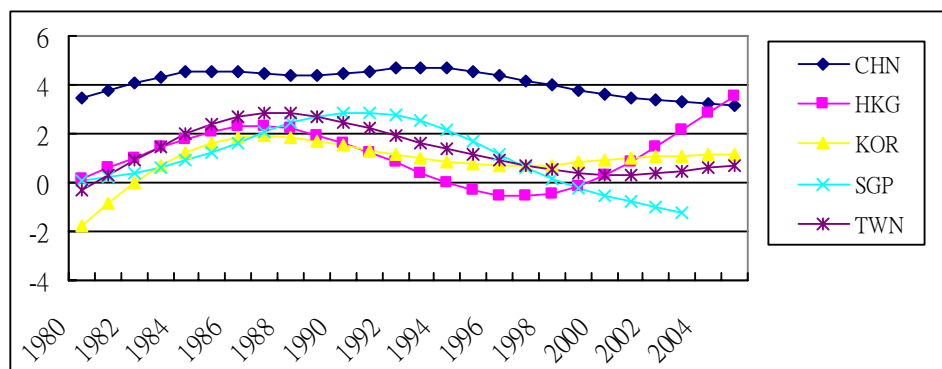
6. The total factor productivity (TFP) is a concept that captures the change of output not accounted for by changes of inputs. Growth accounting exercises aiming at disentangle the TFP can be dated back to the 1957 seminal paper of Robert Solow, Nobel Laureate of 1987. Solow studies the US economy and concludes that 87.5 percent of the increase in gross output *per man hour* during the period of 1909-49 is attributable to technical changes.

7. The interest on TFP analysis was revived in 1992 with Alwyn Young's study on Newly Industrialized Economies (NIEs), in particular on Hong Kong and Singapore. Young (1992) found that Hong Kong's TFP growth for the period 1971-90 was much greater than that of Singapore, suggesting that Singapore's rapid growth during the period is unlikely to sustain. Subsequently, other researchers have examined Hong Kong's TFP growth using various empirical approaches and found mixed results (Kim and Lau 1994, Collins and Bosworth 1996, Klenow and Rodriguez-Clare 1997, Hsieh 2002, Iwata, Khan, and Murao 2003, Ferreira, Pessoa and Veloso 2005, and Li 2006). In this report, we update these studies and go further to ask whether Hong Kong's TFP growth is affected by structural change of the economy, integration with China, and the Asian Financial Crises.

8. The data and methodological issues regarding TFP are gathered in Appendix 1.

Let us focus on the main results here. Our analysis on TFP indicates a slowdown as Hong Kong's manufacturing production relocates to the Mainland China, a temporary setback during the Asian Financial Crises between 1997-1999 and a rebound as the integration measures with the Mainland China such as CEPA, which helped to boost confidence of the local economy and revive the manufacturing sector<sup>3</sup>.

**Figure 1.** Comparison of TFP Growth Rates (HP filtered)



9. Figure 1 above plots the HP-filtered TFP growth rates for Hong Kong and her major competitors, China, South Korea, Singapore, and Taiwan, which gives a visual comparison. These HP-filtered series are calculated by applying the Hodrick-Prescott (HP) filter to the estimated TFPs from growth accounting. As explained in the technical appendix, such a filtering procedure helps to bring out the major trends in the estimated TFPs. The figure shows that the Mainland China out-performed all these economies over this period. Hong Kong's performance was among the best of the NIEs before 1990, but became the worst amongst the NIEs in the entire 1990s. It started to recover from 2000, and has retained the leading position amongst the NIEs since 2002. Table 1 further gives the average TFP growth rates, breakdown by 5-year periods. It is clear from the table that Hong Kong had serious difficulties during the period of 1995 to 1999. Hong Kong's TFP then bounced back strongly and performed the best among the NIEs during the period of 2000-2004.

<sup>3</sup> Domestic consumption, investment and manufacturing production bounced back sharply in 2004 after the implementation of CEPA.

**Table 1.** Average Growth Rates of TFP by Countries

Economy	Average Growth rate by Period				
	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004
China	4.023	4.479	4.690	3.777	3.414
Hong Kong	0.999	2.178	0.828	-0.396	1.515
Korea	-0.144	1.797	1.171	0.751	1.050
Singapore	0.443	2.003	2.625	0.677	-0.887
Taiwan	0.875	2.695	1.922	0.734	0.426

To understand better the historical performance of Hong Kong's TFP, we run a series of econometric models. The results are summarized below:

**Table 2.** Regression Analysis of TFP (Dependent Variable: TFP)

Independent variables	Model I	Model II	Model III
Constant	-8.876 (8.27)***	-8.379 (8.575)***	-8.683 (8.067)***
Trend	.347 (7.628)***	.334 (8.684)***	.355 (8.509)***
Manufacturing Share in GDP (%)	.403 (10.081)***	.382 (10.296)***	.390 (9.489)***
CEPA Dummy (2003-2005=1)	1.699 (5.643)***	1.543 (5.534)***	
CEPA Dummy (2004,2005=1)			1.539 (4.552)***
Asian Financial Crisis Dummy (=1 from 1997)	-.049 (.179)		
Asian Financial Crisis Dummy (1997-1999=1)		-.511 (2.148)**	-.640 (2.460)**
Adjusted-R <sup>2</sup>	.890	.910	.889
DW-Statistic	1.746	2.038	1.836
ADF test of the residuals	-4.545***	-5.068***	-4.317***
Sample period: 1980-2005			

Note: t-statistics are in the brackets. \*\* significant at 5% level and \*\*\* significant at 1% level.

10. The comparison of Models I and II suggests that the Asian Financial Crises do not seem to have a long lasting impact on Hong Kong's TFP. But they do have a transitory adverse impact during 1997-1999. In this period, the Asian financial crises lowered Hong Kong's TFP growth by about 0.5 to 0.65 percent per year. In all the three models, the effect of integration measures such as the CEPA appears to be very robust, raising Hong Kong's TFP by 1.5 percent per year. The table above also shows that the declining of the manufacturing industry has a negative impact on TFP growth rate: one percentage point reduction in the manufacturing share in total GDP lowers the TFP growth rate by 0.4 percentage points. This impact is largely expected as the

manufacturing sector normally has faster productivity growth than services.

### **III. Unit Labour Cost**

11. It is widely recognized that Hong Kong faces high labour cost amongst its major competitors in East Asia now. Many observers in the investment community express concern that this high labour cost may seriously undermine Hong Kong's competitiveness position in the world. While high labour cost is an important factor affecting an economy's competitiveness, almost equally important is the productivity levels of that economy. So it will certainly be mistaken to evaluate an economy's competitiveness by only looking at its labour cost.

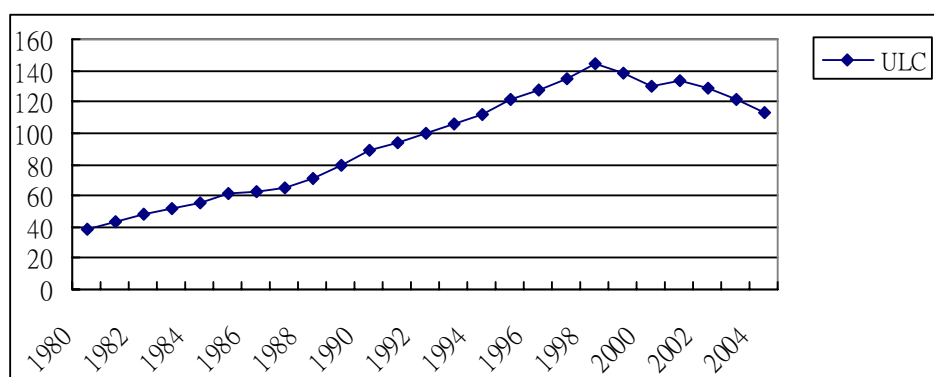
12. A widely used index to compare different countries' competitiveness is the unit labour cost index. This is simply the measure of the labour cost needed to produce one unit of output. It can also be interpreted as the ratio of average labour compensation per employee over the average productivity per employee. As both the productivity factor and the labour cost factor have been taken into account when calculating this unit labour cost, it can better reflect the true competitiveness of an economy.

13. In this part of the study, we intend to calculate the unit labour cost for Hong Kong and its major competitors at both the aggregate and the sectoral levels. By so doing, we hope to address the following set of questions. First, what is the trend of the overall unit labour cost in Hong Kong? Second, what are the trends of the unit labour costs for different sectors in Hong Kong? Third, how do the changes in unit labour costs in Hong Kong compare to those of its major competitors in East Asia? Finally, how do the changes in unit labour cost compare with those of its major trade partners?

#### **The ULC for Hong Kong**

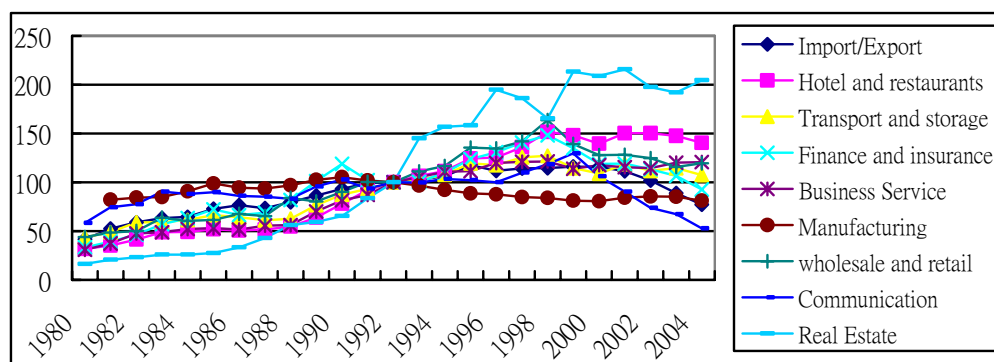
14. We find that the unit labour cost for Hong Kong climbed steadily between 1980 and 1998, at an average growth rate of 7.7 percent, and then reversed course equally steadily (Figure 2).

**Figure 2.** Unit Labour Cost Index for Hong Kong (1992 = 100)



15. A closer look at the disaggregate level reveals that the trend reversal is brought about by the decline of the unit labour cost in the service sector, especially in communication services, trade services, and finance and insurance sector (see Figure 3 and Table 3).

**Figure 3.** Unit Labour Cost Index by Sectors (1992 = 100)



**Table 3.** Average Growth Rate of Unit Labour Cost by Sectors

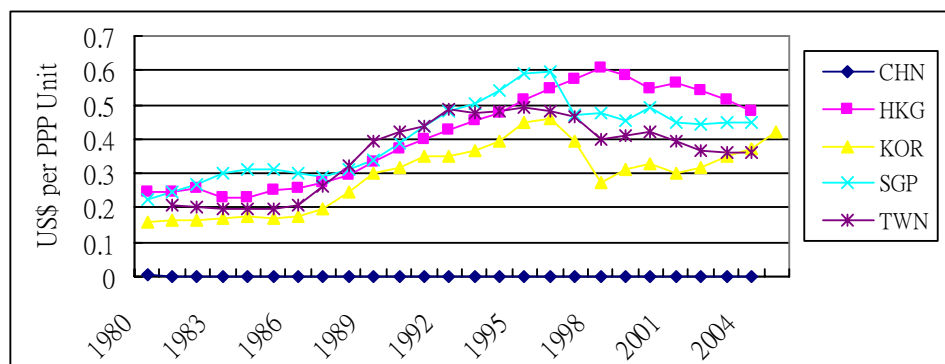
ULC Index	Average Growth Rate				
	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004
Import/Export	11.92	6.14	4.24	1.92	-7.70
Hotel and Restaurants	11.59	5.63	11.99	5.99	-0.94
Transport and Storage	9.37	4.89	7.16	1.50	-1.08
Finance and Insurance	17.44	10.46	2.21	4.45	-7.15
Business Service	14.48	6.49	9.73	0.64	1.19
Manufacturing	3.38	2.55	-2.02	-2.53	0.08
Wholesale and Retail	9.08	6.52	7.85	4.25	-2.91
Communication	11.46	1.96	1.73	4.77	-16.37
Real Estate	12.94	18.49	22.14	7.48	-0.68

16. It is worth noting that the real estate sector was the one that witnessed the highest average growth rate in unit labour cost. This was mainly due to the sharp rising of total labour compensation accompanied by declining in labour productivity in this sector.

### International Comparison of ULC

17. First, we compare the unit labour costs for Hong Kong, the Chinese Mainland, Taiwan, Singapore and South Korea, taking the economy as a whole. We use the Geary-Khamis method to obtain purchasing power parity (PPP) adjustment to make the comparison of these unit labour costs meaningful. (See Figure 4.) We find that to no one's surprise, China has by far the lowest unit labour costs. For the rest of the economies, we observe convergence in unit labour costs toward the end of 1980s. Since then the unit labour costs went on divergent paths, with Hong Kong surpassing Singapore and became the least competitive during the midst of the Asian Financial Crisis as Hong Kong dollar, which was linked to the US dollar, appreciated strongly against the currencies of other economies. Recently, the convergence process in unit labour costs seems to have resumed as Hong Kong's unit labour cost in the service sector declines and the unit labour cost in Korea rises.

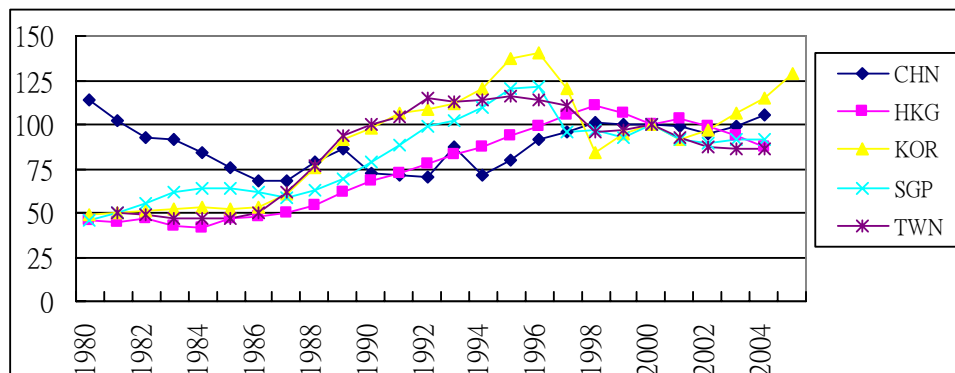
**Figure 4.** Comparison of PPP-adjusted Unit Labour Cost



18. Although the Mainland China has the lowest level of the unit labour cost in this comparison, it is nevertheless of interest to see whether this advantage is strengthening or weakening over the years. To do so, we convert the ULC into index by setting the index value to 100 for year 2000. The figure below (Figure 5) shows

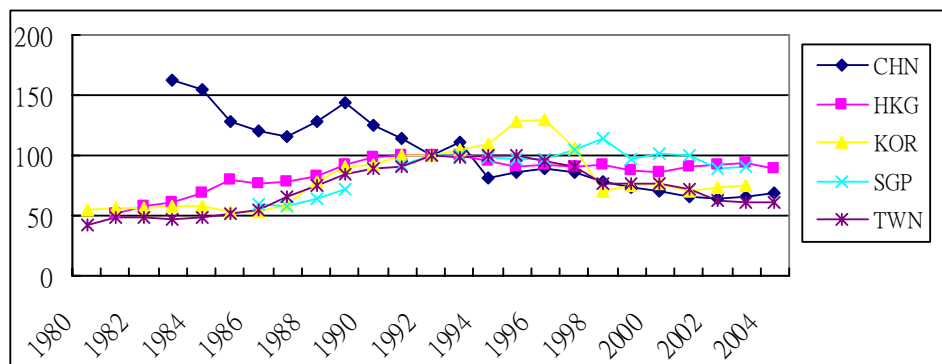
that during the early periods of reform in China, its unit labour cost declined, but this cost has been steadily increasing since 1994.

**Figure 5.** Comparison of PPP-adjusted Unit Labour Cost Index (2000 = 100)

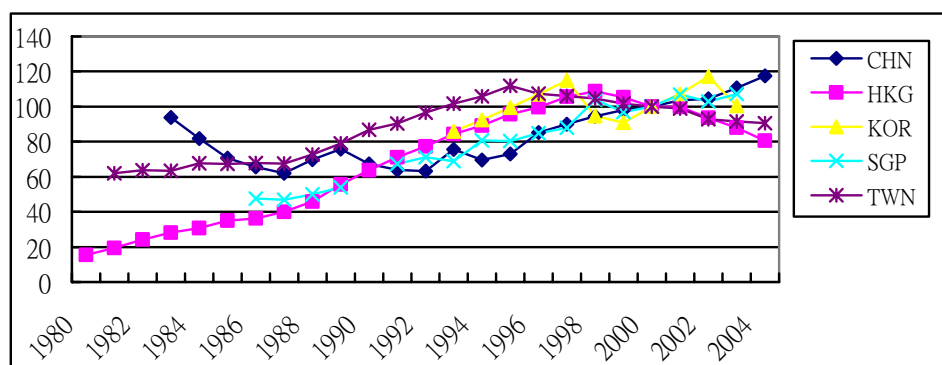


19. A closer look at the disaggregate level data finds that China's unit labour cost in the manufacturing sector continues to decline until 2002 and then shows a small increase. China's service sector however sees a strong upward trend in ULC since 1992. The two figures below (Figure 6 and Figure 7) suggest that while the gap in the unit labour costs in the service sector between Hong Kong and the Mainland China closes somewhat since 1998, the gap in the manufacturing sector widens for most of the years, which may reflect a fast catching up of manufacturing productivity in the Mainland.

**Figure 6.** Comparison of Manufacturing Unit Labour Cost Index (1992 = 100)



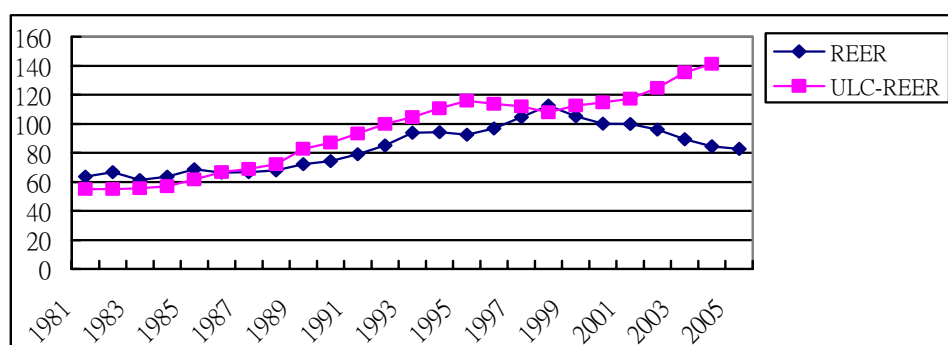
**Figure 7.** Comparison of Service Sector Unit Labour Cost Index (2000 = 100)



### ULC-based REER for Hong Kong

20. Despite the recent decline in unit labour costs in Hong Kong, its real effective exchange rate (REER) deflated by the unit labour costs continues to rise, as in Figure 8. The Figure also shows the traditional REER (which is deflated by consumer price index). The traditional REER shares very much the same pattern with ULC-based REER up until 1999. But the two rates diverged afterwards, reflecting the fact that in relative terms the declining of Hong Kong's ULC has not been as sharp as its price level with comparison to its major trade partners.

**Figure 8.** Hong Kong's REER and ULC-based REER



21. To get a sense of the effect of the real effective exchange rates on Hong Kong's exports, we carry out the regression analysis of export growth (both total and domestic goods export) on ULC-based REER or traditional REER, respectively. The results are shown in Table 5 below. It turns out that both the ULC-based REER and

the traditional REER have no effect on either total export or domestic exports growth in Hong Kong. This may have something to do with the change of Hong Kong's export structure, which is now becoming increasingly dominated by export of services and offshore trade<sup>4</sup>. These regressions suggest that the real effective exchange rates, although should not be ignored in studies of competitiveness, are nevertheless less crucial to export performance in Hong Kong.

**Table 5.** Regression of ULC-based REER and REER on Exports

Independent Variable	Dependent Variable	
	Growth Rate of Total Exports	Growth Rate of Domestic Exports
<b>Panel A. Regression of ULC-based REER on Exports</b>		
Constant	-2.795 (-0.364)	-0.132 (-0.022)
Growth Rate of Main Trade Partner's GDP	4.482 (3.111)***	3.283 (2.670)**
Growth Rate of Unit Labour Cost based REER	-0.358 (-0.629)	-0.111 (-0.236)
Adjusted R-squared	0.350	0.234
DW Statistics	2.180	1.919
<b>Panel B. Regression of Traditional REER on Exports</b>		
Constant	-3.734 (-0.445)	0.151 (0.023)
Growth Rate of Main Trade Partner's GDP	4.347 (2.452)**	3.115 (2.235)**
Growth Rate of Traditional REER	-0.090 (-0.179)	-0.104 (-0.265)
Adjusted R-squared	0.341	0.236
DW Statistics	2.130	1.930
Sample Size (period)	23 (1982-2004)	

Note: All series are stationary at 5% level (ADF). \*\* Significant at 5%. \*\*\* Significant at 1%. t-statistics are in the brackets. An AR(1) error term is added to correct for possible serial correlation in the regression residuals.

#### IV. Dynamic Shift-Share Analysis on Export Performance

22. The performance of the export sector is important to the economic growth of Hong Kong. Domestic merchandise exports, re-exports earnings, and service exports were about 10%, 26%, and 35% of GDP, respectively, in 2005<sup>5</sup>. Furthermore, about half of the exports of services are related to merchandise trade. Thus, competitiveness of merchandise exports is an important component of any assessment of the

<sup>4</sup> The weights used to calculate Hong Kong's REER are only based on merchandize trade not service trade.

<sup>5</sup> Re-export earnings are defined as margins from re-export activities.

competitiveness of the whole economy. Often the real effective exchange rate is used to measure the competitiveness of exports. However, as shown above, the real effective exchange rate does not capture the effect of structural changes in the economy on exports. An alternative way is to examine the structural changes in the composition of exports over time and derive the implications for export competitiveness. The so-called dynamic shift-share analysis (DSSA) is often used for this purpose (see MAS Occasional Paper 23, 2002).

23. A shift-share analysis compares export growth by commodity between Hong Kong and a set of reference economies, which export broadly similar categories of goods to similar markets. In this setting, growth of exports of a commodity may be attributable to a broad-based increase in external demand (e.g. an increased demand in the US in general would raise exports from Hong Kong as well as from the reference economies such as Singapore) and/or an improvement in Hong Kong's competitiveness relative to the reference economies (which would raise Hong Kong's exports to the common market at the expense of the reference economies). The shift-share analysis offers a quantitative tool to disentangle these two sources of growth in exports. Specifically, it compares changes in Hong Kong's exports of a commodity with the corresponding exports of the reference economies. Any remainder of Hong Kong's export change between periods after removing the part that might be ascribed to the rate of export growth of the reference group – the share effect – is referred to as the net shift. A positive net shift implies an improvement in competitiveness for Hong Kong relative to the reference economies, and a negative value indicates deterioration in its competitiveness.

24. The shift is further accounted for by three additive factors: (a) industry mix effect; (b) competitive effect; and (c) interaction effect. To fix idea, we will call an export industry a sunrise industry if the export of this industry from the reference group to a common destination market grows over time. The opposite is called a sunset industry. Also, when we state that Hong Kong is overweight in an industry, it means that the export of this industry from Hong Kong as a percentage of Hong Kong's export is greater than the average percentage of the reference group. With these terminologies in mind, the industry mix effect is positive if Hong Kong is overweight in a sunrise industry or underweight in a sunset industry. The competitive

effect is positive if Hong Kong's export growth rate in an industry is greater than the average growth rate of the reference group. The interaction effect is positive if Hong Kong's export is overweight in an industry and grows faster than that of the reference group (strengthening the lead) or Hong Kong's export is underweight in an industry and grows slower than that of the reference group (abandoning this industry). The interaction effect is negative if Hong Kong's export is overweight in an industry and grows slower than that of the reference group (losing the lead) or Hong Kong's export is underweight in an industry and grows faster than that of the reference group (catching up from behind). It is common that the three effects go in different directions and what matters is the net shift. Nevertheless, the DSSA helps identify what factors, the IME, the CE, or the IE, have caused the rise and fall in the net shift.

25. We conduct DSSA for both the merchandise exports and the service exports. To conduct DSSA, we need to specify the environment: the export subcategories, the reference group, and the destination markets. For merchandise exports, we select those subcategories that are most important for Hong Kong, namely SITC 65 (textiles), SITC 75 (office equipments), SITC 76 (telecommunication and sound equipments), SITC 776 (transistors), and SITC 84 (clothing)<sup>6</sup>. The exports of these five categories account for more than 70 percent of Hong Kong's total merchandise exports in 2005. For service exports, we have data for 5 subcategories: transportation, travel, finance, insurance, and other business services (mostly trade-related). The reference economies for merchandise exports are China, Singapore, Korea, Taiwan, Malaysia, and Thailand. The reference economies for service exports are the same except that Taiwan has to be removed from the group due to data limitation. We experiment with several destination markets such as the USA, the EU, Japan, China, and the World as a whole. The DSSA generates a great deal of charts, most of which are left in Appendix 3 for easy reference. In the following, we will summarize the major findings in a few tables and figures.

## **Merchandise Exports**

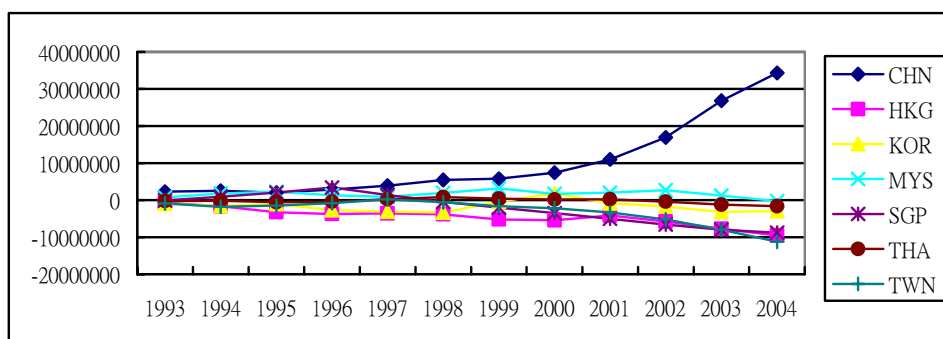
26. In terms of cumulative total net shift, which measures the gain or loss of an

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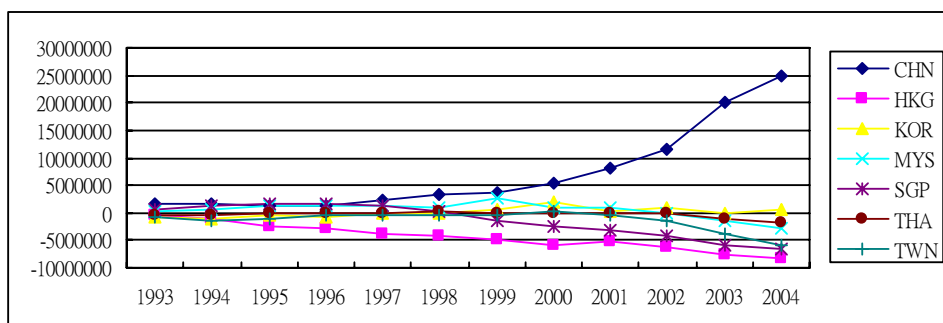
<sup>6</sup> SITC is the Standard International Trade Classification system. For more details on the items covered under SITC 65, 75, 76, 776, and 84, see Appendix 3.

economy's competitiveness in the five selected merchandise exports subcategories, Hong Kong is the worst performer in the EU market, and second worst performer in the US and Japan markets (see Figures 9-11). Note that the shift effect is a flow concept. Therefore, these Figures do not indicate that Hong Kong has the lowest level of competitiveness, only that Hong Kong has been losing competitiveness over the sample period being considered.

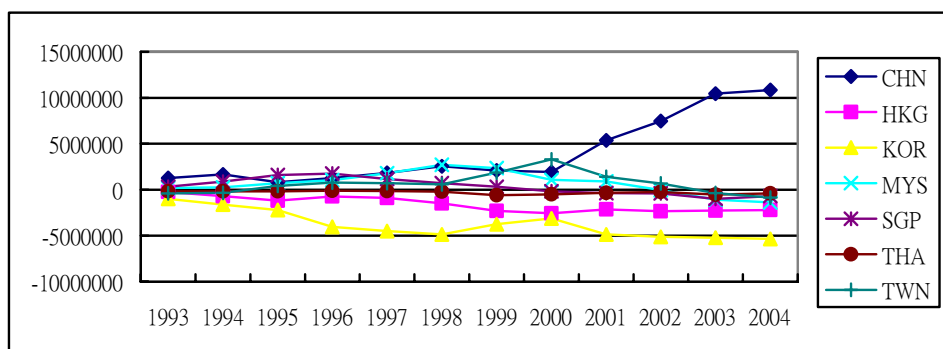
**Figure 9.** Cumulative Total Net Shifts of Export to US Markets



**Figure 10.** Cumulative Total Net Shifts of Export to EU Markets



**Figure 11.** Cumulative Total Net Shifts of Export to Japan Markets



27. These figures show that the Mainland China is the biggest gainer in export competitiveness, in all the destination markets. If we exclude China from the reference group, the DSSA results change somewhat. In particular, Korea and Singapore now perform better than Malaysia and Thailand. This suggests that China competes more directly with Korea and Singapore and thus the presence of China in the reference group hurts the performance of Korea and Singapore more than it hurts Malaysia and Thailand. The robust conclusion that we can draw from these exercises, as shown in the tables below when we use the World as the destination market, is that Hong Kong always ranks as one of the worst performers overall with or without China in the reference group. The relative rankings among the 4 NIEs in terms of the overall competitiveness gains remain robust with or without China in the reference group, namely, Korea (the strongest gainer), Singapore, Hong Kong, and Taiwan (the worst performer).

**Table 6.** Rankings of Changes in Competitiveness Including China

SITC	Strongest Gainers					Worst Gainers	
	1	2	3	4	5	6	7
65	CHN	THA	TWN	KOR	MYS	HKG	SGP
75	CHN	MYS	THA	KOR	SGP	HKG	TWN
76	CHN	KOR	HKG	THA	MYS	TWN	SGP
776	SGP	TWN	MYS	THA	KOR	HKG	CHN
84	CHN	THA	HKG	MYS	SGP	TWN	KOR
Overall	CHN	THA	MYS	KOR	SGP	HKG	TWN

Note: Destination Market: the World; China is in the reference group.

**Table 7.** Rankings of Changes in Competitiveness Excluding China

SITC	Strongest Gainers				Worst Gainers	
	1	2	3	4	5	6
65	TWN	KOR	THA	HKG	MYS	SGP
75	MYS	KOR	THA	HKG	SGP	TWN
76	KOR	HKG	THA	MYS	SGP	TWN
776	SGP	TWN	MYS	THA	KOR	HKG
84	HKG	MYS	THA	SGP	TWN	KOR
Overall	KOR	SGP	MYS	HKG	THA	TWN

Note: Destination Market: the World; China is excluded from the reference group.

28. The above two tables also show that Hong Kong does relatively well in SITC 76 (telecommunication and sound equipments) and 84 (clothing), and does poorly in SITC 65 (textiles), 75 (office equipments), and 776 (transistors). In order to understand the reasons behind these gains and losses, we compiled two more tables below to show the accumulated net shifts in millions of US dollars.

**Table 8.** Cumulative Net Shift between 1992 and 2004 Including China

SITC	IME HKG	CE HKG	IE HKG	Net HKG	Net KOR	Net MYS	Net SGP	Net THA	Net TWN	Net CHN
65	1,088	-4,378	-774	-4,064	-2,365	-2,737	-5,262	-455	-1,887	16,771
75	-12,343	-880	223	-13,000	-6,456	-207	-10,801	-2,263	-13,099	45,826
76	3,813	-3,321	-1,086	-594	9,719	-7,238	-13,389	-3,107	-12,775	27,385
776	-11,145	7,026	-2,337	-6,456	-3,378	3,405	20,977	-2,303	5,487	-17,732
84	5,215	-5,745	-3,414	-3,944	-9,745	-4,146	-6,541	-2,002	-7,890	34,268
Overall	-13,372	-7,298	-7,389	-28,059	-12,224	-10,924	-15,016	-10,130	-30,164	106,516

Note: In millions of USD. China is in the reference group. Destination Market: the World

**Table 9.** Cumulative Net Shift between 1992 and 2004 Excluding China

SITC	IME HKG	CE HKG	IE HKG	Net HKG	Net KOR	Net MYS	Net SGP	Net THA	Net TWN
65	681	-410	-30	241	729	-449	-2,064	617	926
75	-10,269	13,377	-4,474	-1,366	2,145	6,208	-2,157	650	-5,480
76	2,637	3,530	83	6,250	14,758	-3,465	-8,004	-1,360	-8,179
776	-17,274	11,051	-5,032	-11,254	-6,601	1,129	17,526	-3,459	2,659
84	139	2,141	2,618	4,898	-3,457	396	128	197	-2,162
Overall	-24,086	29,689	-6,834	-1,232	7,575	3,820	5,429	-3,354	-12,237

Note: In millions of USD. China is excluded from the reference group. Destination Market: the World

29. To illustrate, let us focus on the case when China is excluded from the reference group. It is clear from this table that Hong Kong's largest loss (-11.3 billion USD in net shift) is in SITC 776 (transistors). The reason for the loss is that even though Hong Kong has been growing faster than the group average and thus the competitiveness effect (CE) is positive (11 billion USD), Hong Kong is nevertheless very much underweight in a sunrise industry and the industry mix effect (IME) is hugely negative (-17.3 billion USD). In addition, since Hong Kong is catching up from behind, the interaction effect (IE) is negative (-5 billion USD). The following table shows how far behind Hong Kong still is underweight in SITC 776:

**Table 10.** Export Weights in Subcategories

SITC	Group 1992	Group 2004	HKG 1992	HKG 2004
65	0.179	0.083	0.226	0.109
75	0.217	0.268	0.113	0.216
76	0.212	0.243	0.183	0.282
776	0.160	0.326	0.065	0.201
84	0.232	0.081	0.413	0.192

Note: Export weight in a subcategory is the ratio of export in this subcategory to the sum of exports in all 5 subcategories.

30. Since Hong Kong's export in SITC 776 grows at a faster rate than that of the entire reference group, the export weight in this subcategory has increased (from 6.5% to 20.1%) faster for Hong Kong than that (from 16% to 32.6%) for the whole group. Nevertheless, Hong Kong is still far underweight in this subcategory. Singapore, Taiwan, and Malaysia have been gaining competitiveness in SITC 776.

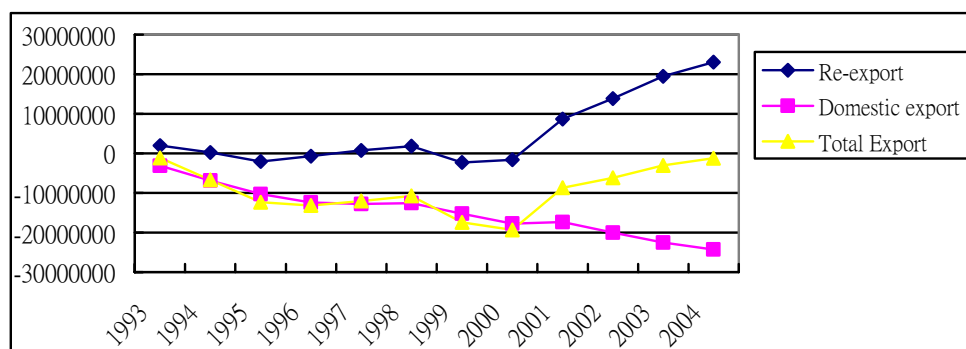
31. Although Hong Kong's case for SITC 75 (office equipments) shows the same pattern as for SITC 766, Hong Kong's growth in this subcategory is much higher than the group's (without China) so that the loss of competitiveness (the net shift) is only -1.4 billion USD, much smaller than the loss in SITC 776 (-11.3 billion USD). When China is added to the reference group, however, the loss in SITC 75 becomes the largest, since the addition of China raises the average growth rate of the reference group above that of Hong Kong's, pushing Hong Kong's competitiveness effect to the negative territory. The addition of China also makes Hong Kong's industry mix effect much worse.

32. On the positive side, Hong Kong has gained much competitiveness in SITC 76 (telecommunication and sound equipments), largely at the expense of Taiwan and Singapore. All three effects (IME, CE, and IE) work to Hong Kong's favor (without China in the reference group).

33. We also separate Hong Kong's export into domestic export and re-export and we are able to confirm, using the DSSA, the common perception that Hong Kong's re-export has been gaining competitiveness. Nevertheless, it is clear that the loss of competitiveness of Hong Kong's domestic export outweighs the gains from re-export so that Hong Kong's total export has been losing competitiveness (Figure 12). The

advantage of the DSSA is its ability to show that Hong Kong's loss of competitiveness occurred more drastically in 1993-1996 and 1999-2000 due to the continued deterioration of domestic export; the gain in competitiveness of the re-export sector has become visible only since 2001.

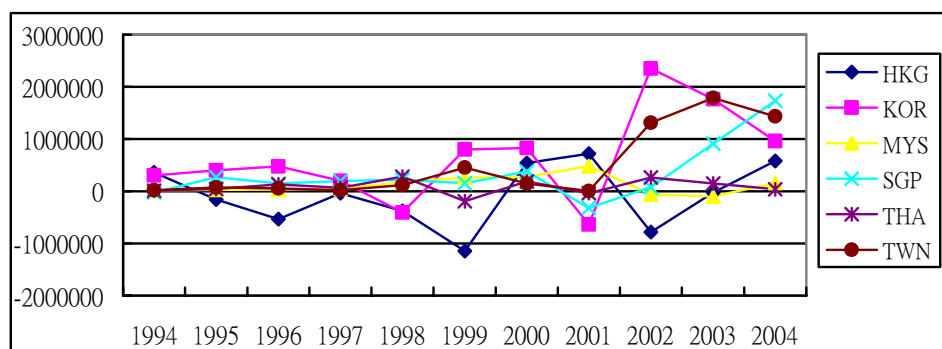
**Figure 12.** Cumulative Total Net Shifts of Hong Kong Export



Note: China is excluded from the reference group. Destination market: the world.

34. Furthermore, even when we use the Mainland China as the destination market, Hong Kong still performs badly: a phenomenon that begs explanation. Again, the loss of competitiveness occurred mostly in the 1990s.

**Figure 13.** Total Net Shifts of Export to China Market



Note: Destination market: China. Non-accumulated total net shifts

## Service Exports

35. Similar to the case of merchandise exports, Hong Kong has been losing competitiveness in the service export overall, as indicated by the following table.

**Table 11.** Rankings of Changes in Competitiveness Including China

Services	Strongest Gainers				Worst Gainers	
	1	2	3	4	5	6
Transportation	KOR	CHN	SGP	THA	MYS	<b>HKG</b>
Travel	CHN	MYS	THA	KOR	<b>HKG</b>	SGP
Insurance	SGP	MYS	KOR	THA	<b>HKG</b>	CHN
Finance	KOR	SGP	<b>HKG</b>	MYS	THA	CHN
Other Business	CHN	<b>HKG</b>	SGP	MYS	THA	KOR
Overall	CHN	KOR	MYS	THA	SGP	<b>HKG</b>

Note: Destination Market is the World. Sample period: 1995 to 2004.

36. Hong Kong does relatively well in Other Business service exports (mostly trade-related) and finance service exports, but does poorly in transportation, travel, and insurance. The table below shows that Hong Kong's loss in Transportation and Travel are quantitatively important, so as its gain in Other Business. The changes in competitiveness in Financial and Insurance service exports are quantitatively unimportant. Hong Kong's loss of competitiveness in transportation service exports is due to its slower growth than the reference group (negative CE); its loss of competitiveness in travel is due to both its slower growth than the reference group (negative CE) as well as the fact that Hong Kong is underweight in this sunrise sector (negative IME).

**Table 12.** Cumulative net shift between 1995 and 2004

Services	IME <b>HKG</b>	CE <b>HKG</b>	IE <b>HKG</b>	Net <b>HKG</b>	Net KOR	Net MYS	Net SGP	Net THA	Net CHN
Transportation	149	-4,030	-392	-4,273	7,091	-2,123	-211	-1,305	821
Travel	-2,534	-3,708	468	-5,773	-3,221	2,834	-6,384	283	12,260
Insurance	202	-56	-83	63	225	275	845	116	-1,524
Finance	996	-349	-535	112	450	-37	394	-268	-652
Other Business	1,182	3,309	-1,416	3,075	-4,690	-3,374	-910	-4,076	9,974
Overall	-4	-4,835	-1,957	-6,796	-145	-2,424	-6,265	-5,249	20,880

Note: In millions of USD. Destination market: the World.

## **V. Concluding Comments and Policy Discussions**

37. From the above analysis, we arrive at a mixed evaluation of Hong Kong's competitiveness. On the one hand, the Hong Kong economy as a whole is sufficiently flexible and dynamic and seems to adjust well to external shocks, as evidenced by the short-lived impact of the Asian Financial Crisis on Hong Kong's TFP. In the face of globalization forces, Hong Kong has moved past the difficult period in the 1990s when the transition to a service economy dented the TFP growth. Embracing the opportunity to further integrate with the Mainland China, Hong Kong's TFP rebounded strongly in recent years. On the other hand, Hong Kong's real effective exchanged rate deflated by the unit labour costs continue to appreciate, which can potentially hurt Hong Kong's export sector, although the empirical findings denies such a linkage for the time being.

38. Furthermore, the direct comparison of performance between Hong Kong and the Asian competitors in both the merchandise and the service export indicates a case for concern. In merchandise exports, when China is in the reference group, Hong Kong's loss of competitiveness amounts to an accumulated 28 billion USD between 1992 and 2004. When China is excluded from the reference group, Hong Kong's loss is reduced to 1.2 billion USD. Nevertheless, Hong Kong scores consistently behind Korea and Singapore whether or not China is in the reference group.

39. Hong Kong's mediocre performance in the DSSA results from the deteriorating competitiveness of domestic exports. The re-export as a separate export centre in fact does an excellent job in keeping up with its competitors, at least since 2000. Nevertheless, the fact that the total export has been losing its ground in almost all destination markets, including the Chinese mainland market, is a source for concern.

40. In service exports, Hong Kong has been losing competitiveness on the whole, largely due to the accumulated loss incurred in transportation and travel that totaled 10 billion US dollars. Hong Kong's gains in competitiveness in financial and insurance service exports are quantitatively unimportant. The only bright spot is the trade-related other business service exports.

41. In our view, further integration measures with the Mainland should be fostered. Given the minimal size of the manufacturing sector in Hong Kong, the only way to maintain a healthy TFP growth is to promote innovation in the service sector. Besides innovations in financial sector and logistic industry, Hong Kong should promote innovations in sports, travel, culture, and entertainment industry as well. Labour market flexibility remains important for maintaining Hong Kong's competitiveness. Policies that target export growth in high-tech industry (SITC 776 for instance) may be considered. Partnership with Guangdong (Shenzhen in particular) to develop high-tech manufacturing is the right way forward as it utilizes both sides' comparative advantages. It would enable Hong Kong to maintain some manufacturing activities, especially those up-stream ones, such as research and development, and hence could help Hong Kong maintain high economic growth.

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## Technical Appendix 1: TFP Analysis

### The Estimation of TFP

The estimation of TFP typically uses the following aggregate production function:

$$Y = f(K, L, A) \quad (1)$$

where  $Y$  is real GDP;  $K$  is total capital stock in real terms;  $L$  is labour input; and  $A$  is TFP. This production function follows the normal neoclassical assumptions: (1) it exhibits constant return to scale; (2) it has positive and diminishing marginal products with respect to  $K$  and  $L$ ; and (3) the technology progress is Hicks-neutral, i.e.

$$\frac{\partial f}{\partial A} = \frac{f}{A}.$$

Then, if we take a natural logarithm of both side of equation (1) and differentiate with respect of time, we have:

$$\dot{Y}/Y = \dot{A}/A + \frac{Kf_K}{Y} \dot{K}/K + \frac{Lf_L}{Y} \dot{L}/L \quad (2)$$

If we assume that the factor market is perfect and so each input is paid at its marginal product, then  $\frac{Kf_K}{Y}$  and  $\frac{Lf_L}{Y}$  are capital share and labour share of income, respectively. Denoting  $\frac{Kf_K}{Y}$  and  $\frac{Lf_L}{Y}$  as  $s_K$  and  $s_L$ , respectively, and re-arranging terms in equation (2), we obtain:

$$\dot{A}/A = \dot{Y}/Y - s_K \dot{K}/K - s_L \dot{L}/L \quad (3)$$

Equation (3) gives us an estimator of the growth rate of TFP. If we further assume that equation (1) measures the actual real GDP with a random error  $\varepsilon$  then the true TFP growth rate should also differ from the estimated TFP growth rate in (3) by this error. One way to get a better estimate of TFP is to apply the Hodrick-Prescott (HP) filter to the estimated TFP from (3). This is a statistical tool to smooth the data without

referring to the underlying determinants of TFP. However, it may suffer the problem of over-estimating or under-estimating TFP when the actual TFP is high or low towards the end of the estimated period.

The above methodology is standard in literature and has been applied by many others before, such as Young (1995), Collins and Bosworth (1996) and Islam, Dai and Sakamoto (2006). Alternatively, the estimation of TFP has also been carried out by estimating directly a production function (typically in the form of Cobb-Douglas or translog) using either a single country time series data (e.g. Young 1994) or cross-country data (e.g. Kim and Lau 1994). However, the latter methodology often suffers from the problem of simultaneity, multicollinearity and limited degree of freedom. Hence, we use the growth accounting approach to estimate TFP for Hong Kong as well as for its major competitors: the mainland China, Taiwan, South Korea and Singapore.

### **The Regression of the Determinants of TFP**

While it is interesting to show the pattern of TFP growth, it is more important to know what underlying factors contributed to the changes of TFP. To do so, we can run the following regression.

$$TFP = \alpha_0 t + \Phi Z + \varphi \quad (4)$$

where  $\alpha_0$  is the coefficient on time trend,  $t$ .  $Z$  contains exogenous variables that affect the changes of TFP and  $\Phi$  is its coefficients.  $\varphi$  is a random error term. In our estimation for the case of Hong Kong,  $Z$  contains the share of manufacturing output in GDP that captures the structural change, a dummy for Asian Financial Crisis, and a dummy for the implementation of CEPA.

### **The Data**

The implementation of the methodology presented above requires data on real GDP, real capital stock, labour input and capital and labour income shares.

## GDP

The figures for Hong Kong are taken from the 2005 Gross Domestic Product, a statistical booklet published by the Census and Statistics Department of the Hong Kong Special Administrative Region in February 2006. For Taiwan, the data are extracted from the Macroeconomic Database of the National Statistics, maintained by the Government. For other economies, they are taken from the Penn World Tables for the historical series and the relevant governments' homepages for the latest figures.

## Capital Stock

There are no capital stock data published by the government, and only the domestic gross capital formation data are available. We use the same data source as that for GDP to get the domestic gross capital formation data, and then use the the following perpetual inventory method to estimate the capital stock in year  $t$ :

$$K_t = (1 - \delta)K_{t-1} + I_t \quad (5)$$

where  $\delta$  is the depreciation rate and is assumed to be 5% per year and  $I_t$  is investment in year  $t$ . The base year capital stock,  $K_0$ , is approximated by six times of the base year investment,  $I_0$ .

## Labour Input

Ideally, we should use the total weighted hours of work by different skill levels. However, total hours of work and skill compositions of the labour force are not readily available for Hong Kong in long time series. We simply use the number of employed people as our measure of labour input. For Hong Kong, this data is available on the homepage of the Census and Statistics Department. The data for Taiwan are acquired from the same database mentioned above. For all other economies, they are available from the International Labour Office's LABORSTA database and the relevant governments' homepages.

### Capital and Labour Income Shares

The sum of the capital income share and labour income share equals unity ( $s_K + s_L = 1$ ) under the assumption of constant return to scale. So if we have the figure on labour income share  $s_L$ , the capital income share,  $s_K$ , is simply  $1 - s_L$ . As the labour income share is the ratio of total compensation over GDP, we need to have the data on total compensation in order to know the labour income share. For Hong Kong, the total compensation data is provided by the Census and Statistics Department. The data for Taiwan is again available from the same database mentioned before. For all other economies, they are either estimated from the hourly pay and hours of work data from the LABORSTA or statistics published by the government.

### **Comparison with past studies**

Many studies have been carried out to estimate the TFP for East Asia countries. We summarize the results of some of the most influential studies that were done during the past decade along with our own for comparison. They are in the Table A1 below.

**Table A1.** Comparisons of TFP Estimates for Selected East Asian Economies

Study	Country	Data period	Methodology	Average TFP growth rate
Young (1994)	Hong Kong	1970-1985	Econometric	2.5
	Singapore			0.1
	South Korea			1.1
	Taiwan			1.5
Kim and Lau (1994)	Hong Kong	1966-1990	Econometric & growth accounting	0 - 2.4
	Singapore			0 - 0.4
	South Korea			-0.5 - 1.2
	Taiwan			0 - 1.2
Young (1995)	Hong Kong	1966-1990	Growth accounting	2.3
	Singapore			0.2
	South Korea			1.7
	Taiwan			2.6
Collins and Bosworth (1996)	Singapore	1960-1994	Growth accounting	1.5
	South Korea			1.5
	Taiwan			2.0
Klenow and Rodriguez-Clare (1997)	Hong Kong	1960-1985	Growth accounting	4.4
	Singapore			3.3
	South Korea			2.5
	Taiwan			3.0
Hsieh (2002)	Hong Kong	1966-1991	Growth accounting (dual approach)	1.98-2.92
	Singapore	1968-1990		1.65-1.89
	South Korea	1966-1990		1.62-2.07
	Taiwan	1966-1990		3.36-3.87
Iwata, Khan and Murao (2003)	Hong Kong	1960-1995	Non-parametric	3.5
	Singapore			3.1
	South Korea			3.3
	Taiwan			3.4
	China			3.0
Thangavelu (2004)	Singapore	1970-1998	Growth accounting	-1.03
Ferreira, Pessoa and Veloso (2005)	Hong Kong	1960-2000	Growth accounting	3.35
	Singapore			2.68
	South Korea			1.52
	Taiwan			1.97
Islam, Dai and Sakamoto (2006)	China	1978-2002	Growth accounting (dual approach)	3.23-4.08
Li (2006)	Hong Kong	1981-2000	Growth accounting	0.86
Ours	Hong Kong	1980-2005	Growth accounting	1.12
	Singapore	1980-2003		1.02
	South Korea	1980-2005		0.93
	Taiwan	1980-2005		1.31
	China	1980-2005		4.11

## **Technical Appendix 2: Analysis on Unit Labour Costs**

### **The Unit Labour Cost**

The unit labour cost is commonly defined as the labour cost needed to produce one unit of output in a particular sector/industry or for the whole economy. It is often measured as the ratio of labour cost per unit of labour over the productivity of labour. This shows that an economy can improve its competitiveness by either containing the increase of its labour cost or raising its productivities. Labour compensation per unit of labour is either the wage rate or the total labour compensation per employee or per hours of employment. Since the total labour compensation reflects better the true labour cost it is the more desirable measure used for this purpose. Also, as the unit labour cost aims to capture the labour cost of producing a constant unit of output at any particular time, the numerator, the labour cost per unit of labour, is measured in nominal rather than real terms while the denominator, the productivity of labour, is measured in real or volume terms. So for calculation of the unit labour cost (ULC) the following formula is used:

$$ULC = \left(\frac{TC}{L}\right) / \left(\frac{Y}{L}\right) = \frac{TC}{Y} \quad (6)$$

where  $TC$  stands for total nominal labour compensation;  $L$  is total labour input (total number of workers or hours of work); and  $Y$  stands for real output. To calculate the ULC for the whole economy,  $Y$  is the real GDP and  $TC$  is the nominal total labour compensation in the national accounts. The figures in the national accounts are favoured as they are more comprehensive, consistent and comparable across different sectors. We measure the ULC for the whole Hong Kong economy as well as for different sectors (9 sectors in total: manufacturing, import/export, hotel and restaurants, transportation and storage, communication, finance and insurance, wholesale and retail, real estate and other business services).

### **The Cross-country Comparison of ULC**

To make cross-country comparisons of ULC, both the denominator and the numerator

of the ULC have to be made comparable. Hence,  $TC$  needs to be measured in common currency unit, often in US dollars. It is more difficult to make  $Y$  comparable across countries as  $Y$  meant to measure the real “quantity unit” of output produced and the real GDP of different countries may not measure the same “quantity unit”. So we need to make adjustment for GDP using Purchasing Power Parity (PPP). A commonly used PPP adjustment method recommended by the United Nations Statistics Division is the Geary-Khamis (G-K) method. This is an aggregation method in which “category international prices” (reflecting relative category values) and country PPPs (depicting relative country price levels) are estimated simultaneously from a system of linear equations. It has the properties of base-country invariance, matrix consistency and transitivity as defined by the United Nations Statistics Division. The ULC used for international comparison can be expressed as:

$$ULC = \frac{TC_{US\$}}{Y_{GK-PPP}} \quad (7)$$

For international comparisons, we compare ULC of Hong Kong with the Mainland China, Taiwan, Singapore and South Korea. Since it is impossible to get the same sectoral breakdown for all these economies as we do for Hong Kong, we only divide sectors into manufacturing and services. However, we have to bear in mind that there are several limitations of using ULC as a measure of international competitiveness. First, the ULC measure only takes into account labour cost, and it does not include the capital costs and costs for intermediate inputs. Both of these two latter categories of costs can take quite significant shares in total costs, and capital costs in particular can vary significantly across countries. Second, the measure only reflects cost competitiveness. Other factors, such as innovative capabilities, quality of goods and services, have not been accounted for by the measure. Third, international competitiveness may be also affected by various trade barriers and political factors that also cannot be captured by the ULC.

### **A ULC-based Real Effective Exchange Rate Measure**

For international comparisons of ULC, it is useful if we can derive an overall measure

of cost competitiveness of a country in comparison with its major trade partners. A ULC-based real exchange rate measure (ULC-REER) serves for that purpose and has been widely used by many including the US Bureau of Labour Statistics when making international comparisons. The ULC-REER is defined as below:

$$ULC-REER = \sum_{i=1}^n \alpha_i \frac{ULC}{e_i ULC_i} \quad (8)$$

where  $\alpha_i$  is the weight for country  $i$ , determined by country  $i$ 's share of trade in home country's total trade (the ratio of bilateral trade between the home country and country  $i$  to the total exports and imports of the home country);  $e_i$  is the nominal exchange rate between country  $i$  and the home country. Hence, this ULC-REER measure simply replaces the price level with ULC in the measure of real effective exchange rate, and can therefore be interpreted similarly to REER. It captures the change of home country's ULC relative to its main trade partners'. The merit of ULC-REER is that it represents an overall measure of relative competitiveness of an economy. The major trade partners for Hong Kong in our computation of ULC-based REER include: the Mainland China, US, Japan, Taiwan, South Korea, Singapore, UK and Germany. They together account for over 90% Hong Kong's total foreign trade.

## **The Data**

We need the following data: (1) real GDP and GK-PPP adjusted GDP, and real output by sectors; (2) total labour compensation for the economy as a whole and by sectors; (3) US dollar exchange rates for various countries; and (4) trade shares of Hong Kong's major trade partners. Our data sources for different economies are as follows:

### Hong Kong

2006 Gross Domestic Product published by the Census and Statistics Department, and the total labour compensation data directly obtained from the Census and Statistics Department.

### The Mainland China

The database maintained by the Groningen Growth and Development Centre, the International Labour Office's LABORSTA database and the National Bureau of Statistics of China.

### Taiwan

The database maintained by the Groningen Growth and Development Centre and the National Statistics of Taiwan.

### Korea

The database maintained by the Groningen Growth and Development Centre, the International Labour Office's LABORSTA database and the Korean National Statistical Office.

### Singapore

The database maintained by the Groningen Growth and Development Centre, the International Labour Office's LABORSTA database and the Singapore Official Statistics.

The ULC measures for all other countries are from the database maintained by the Groningen Growth and Development Centre.

### Technical Appendix 3: Dynamic Shift-Share Analysis of Hong Kong's Export Sector

#### DSSA Methodology

The dynamic shift-share analysis (DSSA) is a well established method which has been extensively used in the study of trade competitiveness. It has been applied in MAS (2002) to study the trade competitiveness of Singapore and in Ha, Fan and Shu (2003) to study the trade competitiveness of Hong Kong vis-à-vis the Mainland China.

Consider the home economy in a group of reference economies exporting the same categories of commodities to the same destination markets. Let  $X_t^{ij}$  be the home economy's export of commodity  $i$  to its destination market  $j$  in time period  $t$ . Similar, let  $\widehat{X}_t^{ij}$  be the reference group's total export of commodity  $i$  to the destination market  $j$  in time period  $t$ . Any difference between a country's export change,  $X_t^{ij} - X_{t-1}^{ij}$ , and the part of the total change in exports that might be ascribed to the rate of export growth of the reference group as a whole,  $X_{t-1}^j \left( \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} - 1 \right)$ , is the so-called net shift, which can be further decomposed into three separate effects: industry mix effect (IME), competitive effect (CE), and interaction effect (IE). In particular, we have

$$\begin{aligned}
 (X_t^{ij} - X_{t-1}^{ij}) - X_{t-1}^j \left( \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} - 1 \right) &= \text{Net Shift} \\
 X_{t-1}^j \left( \frac{X_{t-1}^{ij}}{X_{t-1}^j} - \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} - 1 \right) &= \text{Industry Mix Effect (IME)} \\
 + X_{t-1}^j \left( \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{X_t^{ij}}{X_{t-1}^{ij}} - \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} \right) &= \text{Competitive Effect (CE)} \\
 + X_{t-1}^j \left( \frac{X_{t-1}^{ij}}{X_{t-1}^j} - \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{X_t^{ij}}{X_{t-1}^{ij}} - \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} \right) &= \text{Interaction Effect (IE)}
 \end{aligned}$$

The total effect of IME, CE, and IE can also be obtained by summing over all the commodities, i.e.,

$$\begin{aligned}
& \left( X_t^j - X_{t-1}^j \right) - X_{t-1}^j \sum_i \left( \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} - 1 \right) = && \text{Net Shift} \\
& X_{t-1}^j \sum_i \left( \frac{X_{t-1}^{ij}}{X_{t-1}^j} - \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} - 1 \right) && \text{Industry Mix Effect (IME)} \\
& + X_{t-1}^j \sum_i \left( \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{X_t^{ij}}{X_{t-1}^{ij}} - \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} \right) && \text{Competitive Effect (CE)} \\
& + X_{t-1}^j \sum_i \left( \frac{X_{t-1}^{ij}}{X_{t-1}^j} - \frac{\widehat{X}_{t-1}^{ij}}{\widehat{X}_{t-1}^j} \right) \left( \frac{X_t^{ij}}{X_{t-1}^{ij}} - \frac{\widehat{X}_t^{ij}}{\widehat{X}_{t-1}^{ij}} \right) && \text{Interaction Effect (IE)}
\end{aligned}$$

The industry mix effect measures the part in net shift that may be ascribed to the difference in export structure between a particular economy and the reference group as a whole. The competitive effect measures the part in net shift that may come from the difference in export growth rate between a particular economy and the reference group as a whole. The interactive effect measures the part in net shift that may be attributed to the interaction between export structure and competitiveness.

## Data

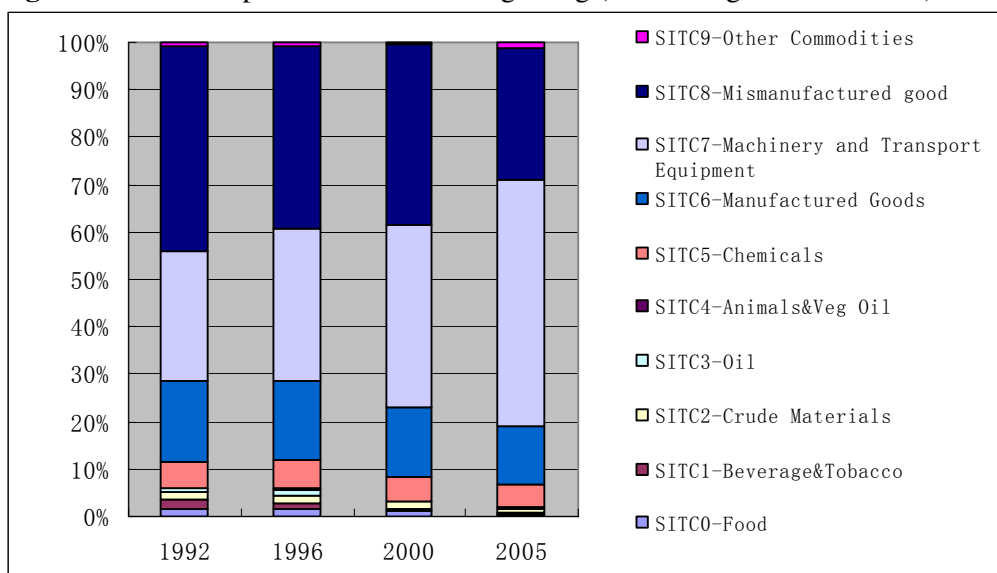
Because the target economy of our research is Hong Kong, the reference economies, the destination markets, and the relevant exports of commodities and services are drawn according to their relative importance to Hong Kong. In this study, we consider the USA, EU, Japan, the World, and the Mainland China as the destination markets. The reference economies are China, Korea, Malaysia, Singapore, Thailand and Taiwan (the actual list may vary conditional on data availability). The reason for the inclusion of these economies is that they are all close competitors of Hong Kong.

### Commodity Trade Data

According to the Annual Review of Hong Kong External Merchandise Trade (2005), clothing, electronic components, textiles, jewellery and precious stones, office machines and components account for more than 70% of Hong Kong's total export. Figures A1-A3 show the export structure of Hong Kong by total export, re-export and domestic export, in SITC 1 digit classifications. Note that commodities of SITC 6 to 8, which comprise textiles, electronics, miscellaneous manufactured articles, account for a major proportion of the export of Hong Kong. For the total export and the re-export,

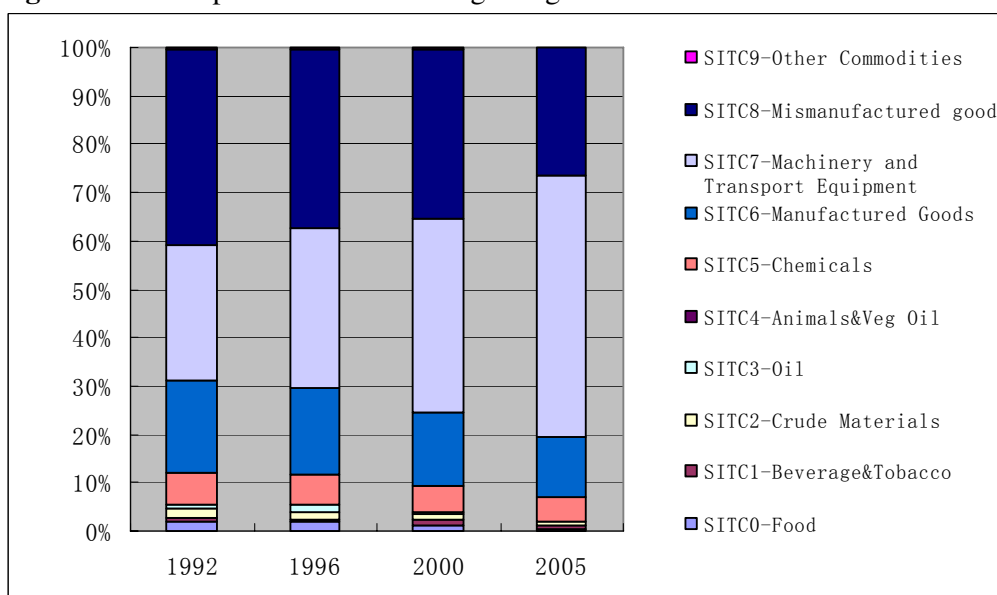
the share of miscellaneous manufactured articles (SITC 8) is declining during our sample period while for domestic export it is relatively stable. For machinery and transportation equipment (SITC 7), their shares are growing in terms of total export and re-export, which accounts for the largest share in 2005.

**Figure A1. Total Export Structure of Hong Kong (SITC 1 digit classification)**



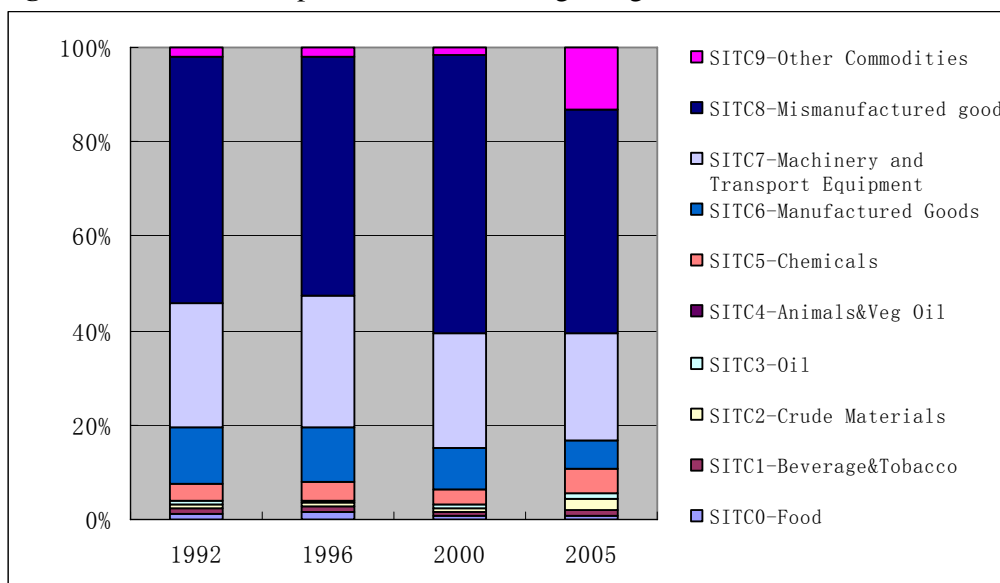
\* Source: United Nation COMTRADE database

**Figure A2. Re-export Structure of Hong Kong**



\* Source: United Nation COMTRADE database

**Figure A3. Domestic Export Structure of Hong Kong**



\* Source: United Nation COMTRADE database

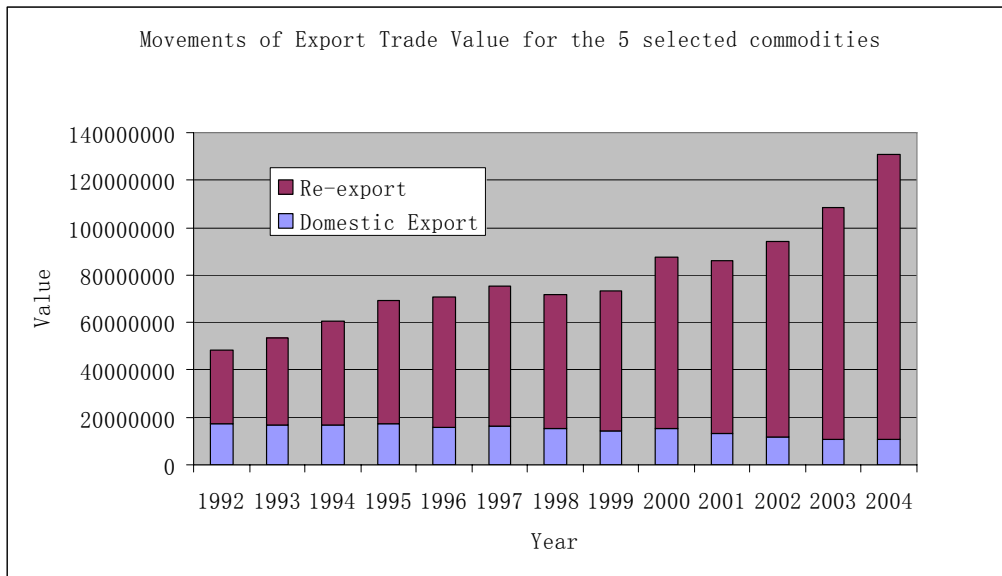
Due to data availability, we choose the following five product categories for our DSSA study:

- Textile, fabric, yarn, etc. (SITC 65)
- Office machines (SITC 75)
- Telecommunications, sound equipments, etc. (SITC 76)
- Transistors, valves, etc. (SITC 776)
- Clothing and accessories (SITC 84)

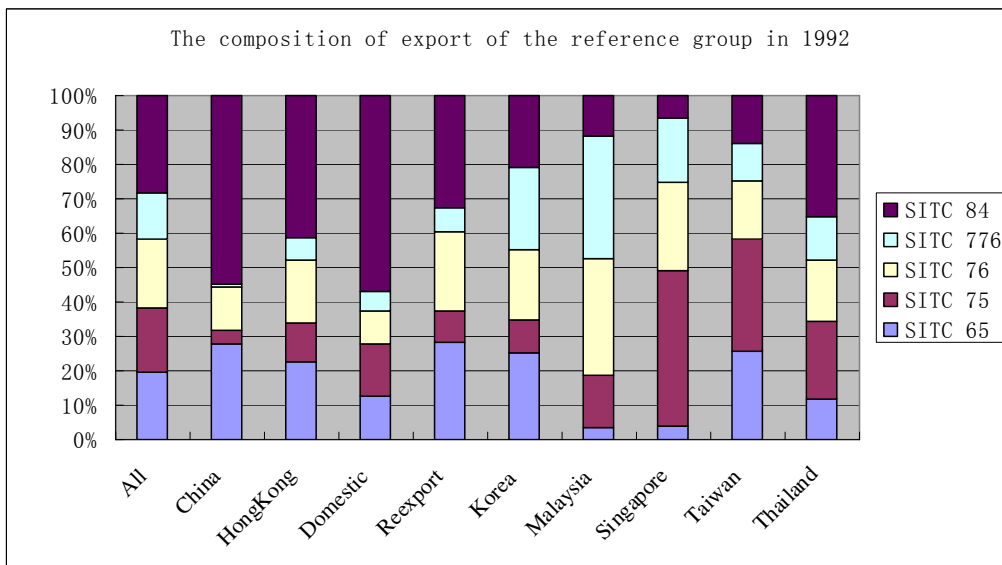
These data are available from the United Nation's COMTRADE database<sup>7</sup>. The sample period is from 1992 to 2004. Figure A4 shows the total trade value for the 5 selected commodity subcategories, Figure A5 and A6 show the compositions of export of the reference group in 1992 and 2004.

<sup>7</sup> See [http://www.wto.org/english/res\\_e/statis\\_e/statis\\_e.htm](http://www.wto.org/english/res_e/statis_e/statis_e.htm) for more details.

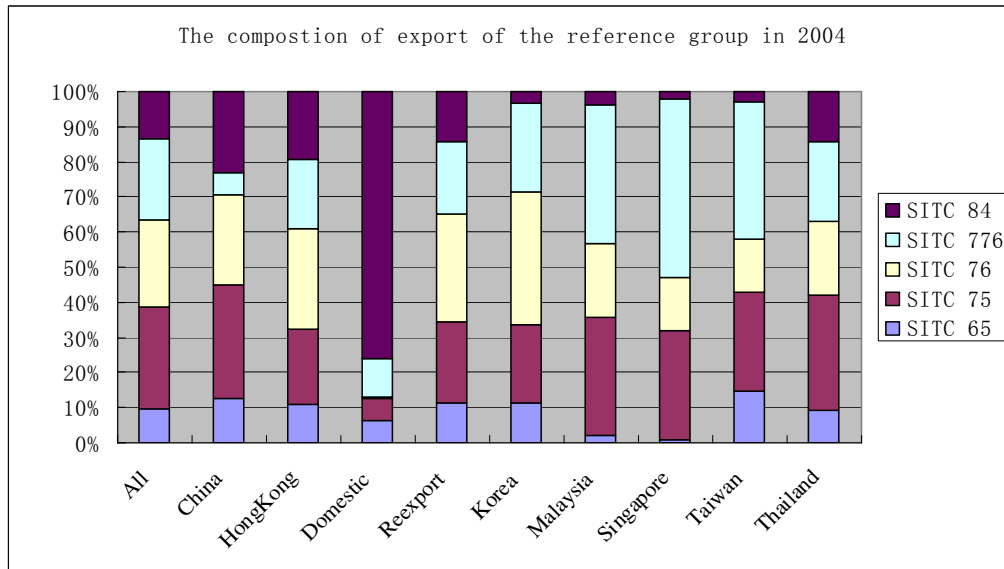
**Figure A4.** Movement of Export Trade Value for the 5 Selected Commodities



**Figure A5.** Composition of Export of the Reference Group in 1992



**Figure A6.** Composition of Export of the Reference Group in 2004



In MAS (2002), similar method was employed to check Singapore's export strengths and weaknesses by using mainly three-digit categories, while we use mainly two-digit categories with an extra three-digit category in our study. Because the Singapore research focuses on electronic related product exports which account for a significant share of the total export of Singapore, using primarily three-digit categories are more suitable in their case. However, several different industries account for an important share of Hong Kong's total export, choosing primarily two-digit categories are more appropriate here.

#### Service Trade Data

According to the Census and Statistics Department of Hong Kong (CSDHK), transportation, travel, finance, insurance and other business services are the main service export industries of Hong Kong. Consequently, the above five categories of service export are selected for the DSSA study. They are:

- Transportation: movement of goods, rental, carriage and relative supporting services
- Travel: goods and services consumed by travellers
- Insurance: net premium for reinsurance, life, general, freight insurance
- Finance: financial intermediary and auxiliary activities
- Other business: mainly trade related services

The above data are available from the Balance of Payment Statistics (BOP) published by IMF (August 2006). The sample period is from 1995 to 2004, with “the world” as the only destination market. No data can be retrieved for Taiwan.

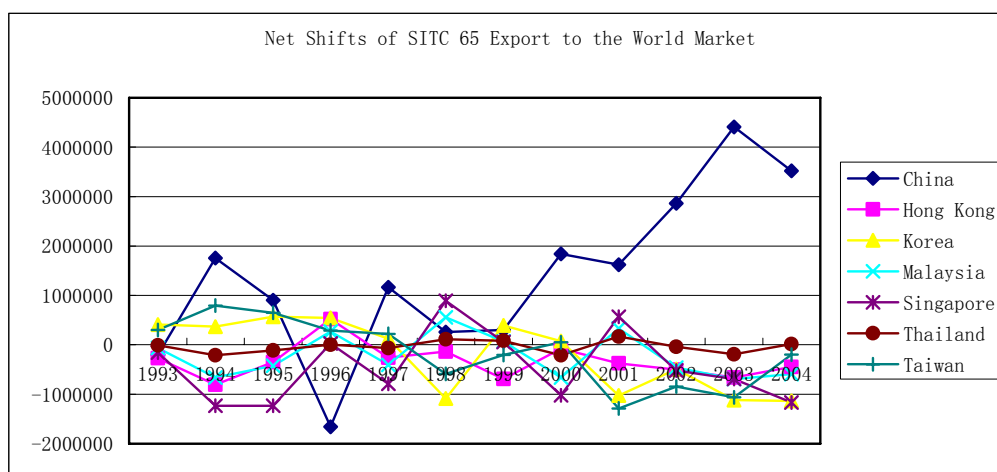
## DSSA Estimation Results

The DSSA generates a huge number of figures describing the net shift, the IME effect, the CE effect, and the IE effect. We report only the net shift effects here due to space concerns. These figures are organized below for reference:<sup>8</sup>

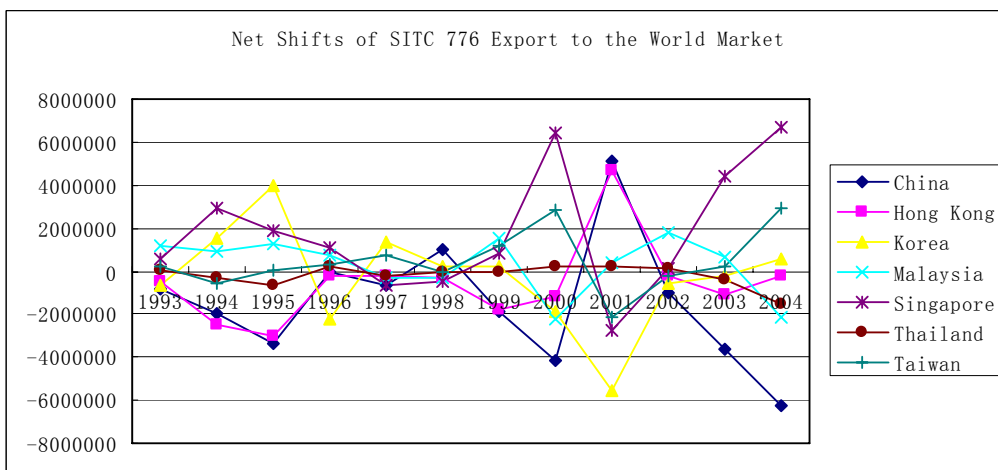
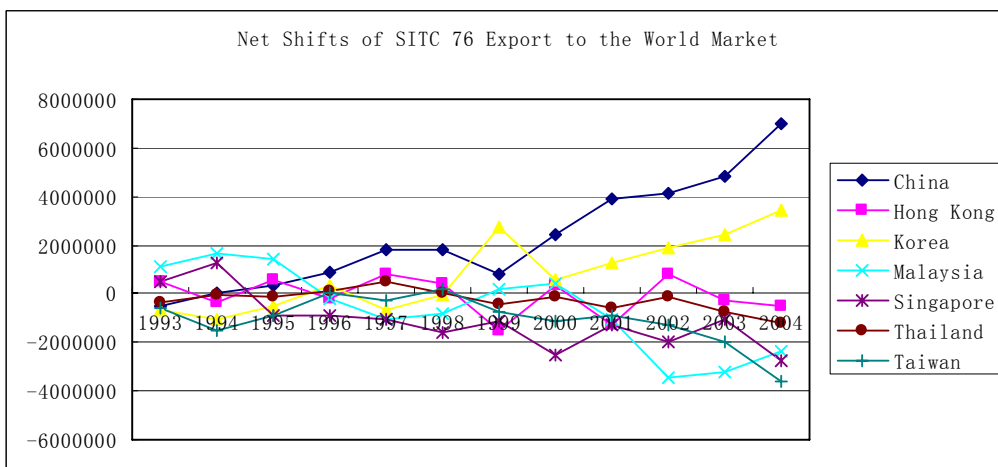
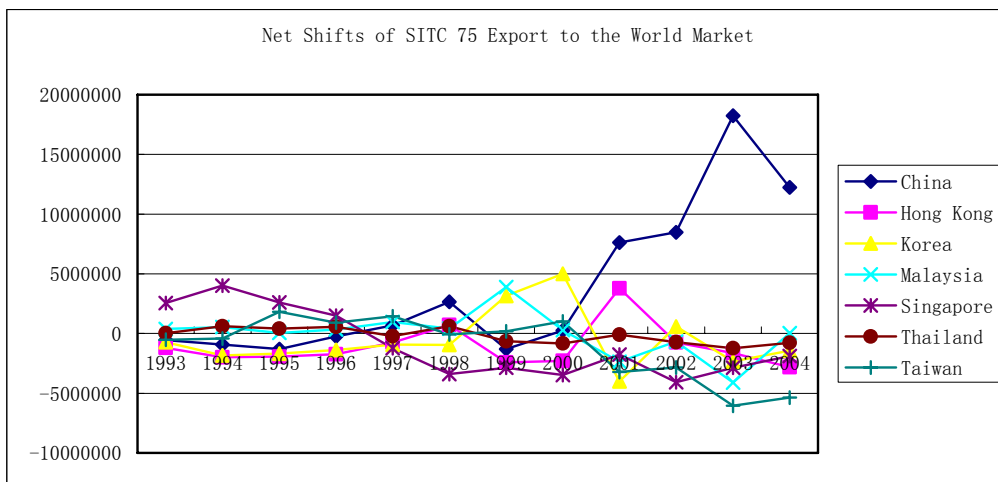
- Net shift in commodity exports to the world market, with or without China, for the five SITC items. (2 by 5 = 10 figures)
- Net shift in commodity exports, with domestic export and re-export treated as separate entities, to the US, the EU, and Japan markets, respectively, with or without China in the reference group, for the five SITC items. (3 by 2 by 5 = 30 figures)
- Net shift in commodity exports, with domestic export and re-export treated as separate entities, China market, for the five SITC items. (1 by 5 = 5 figures)
- Net shift in service export to the world market, with or without China in the reference group, for the five service items. (2 by 5 = 10 figures)

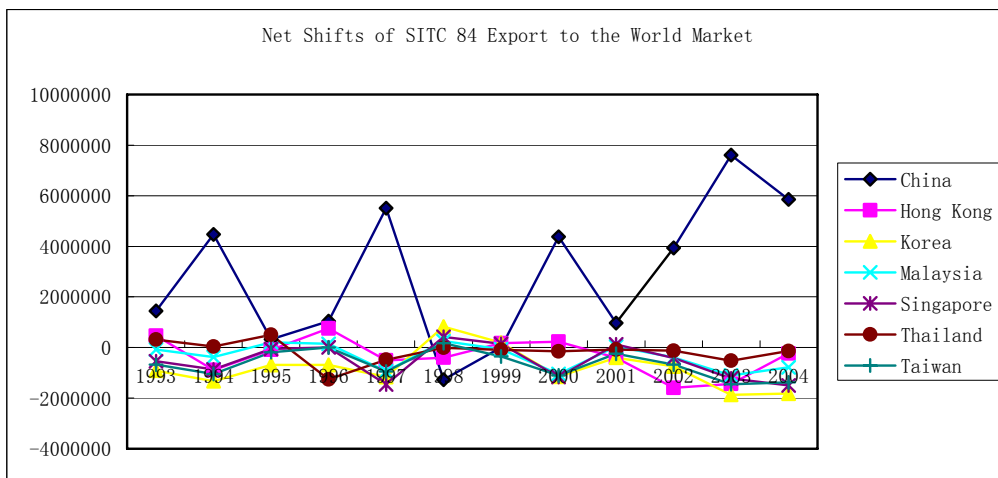
## Commodity export to world markets

### 1. With China

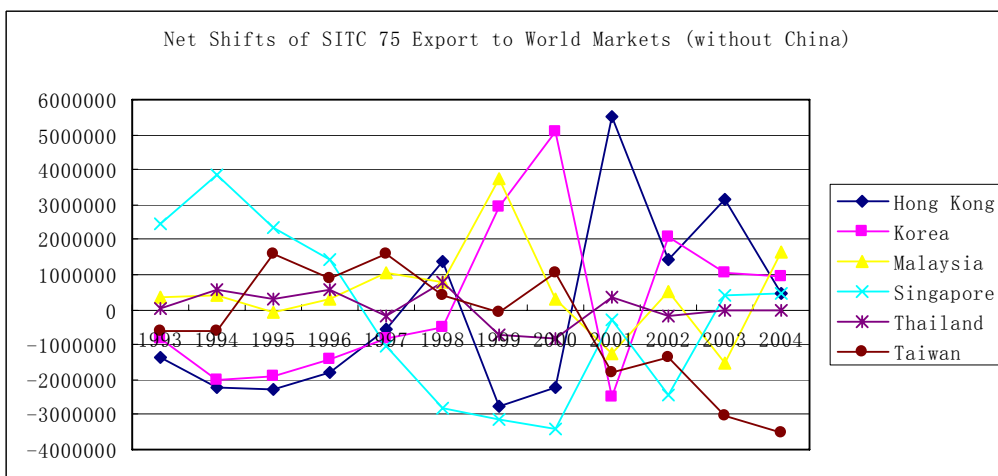
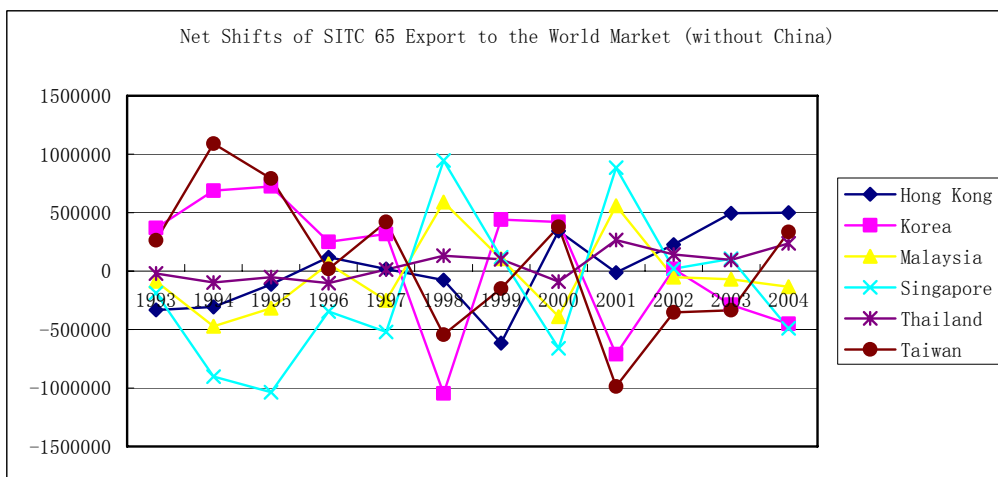


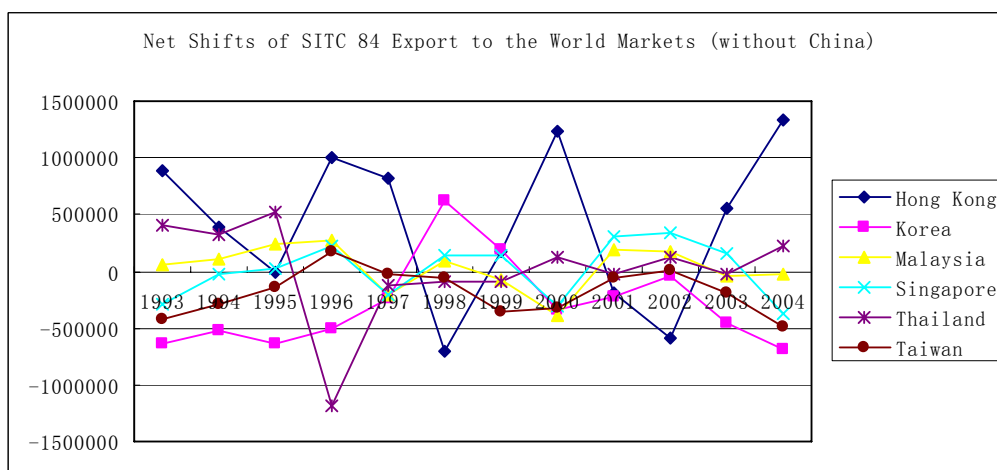
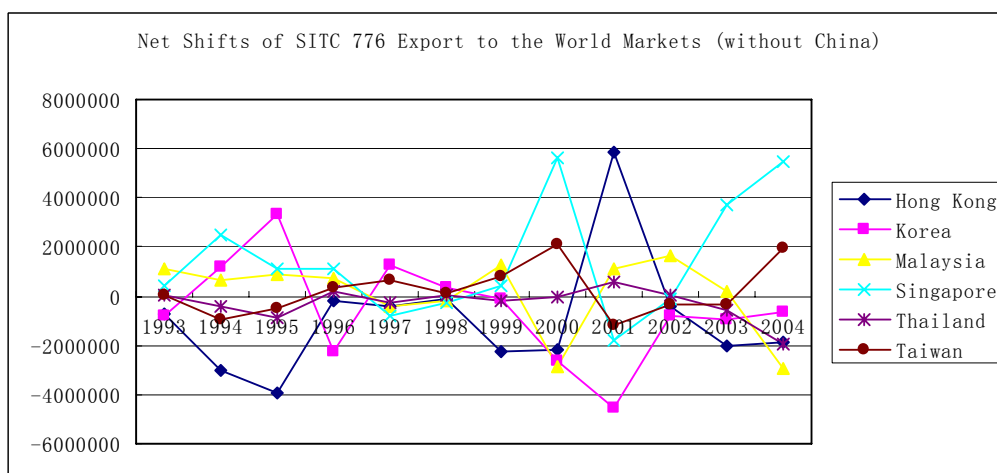
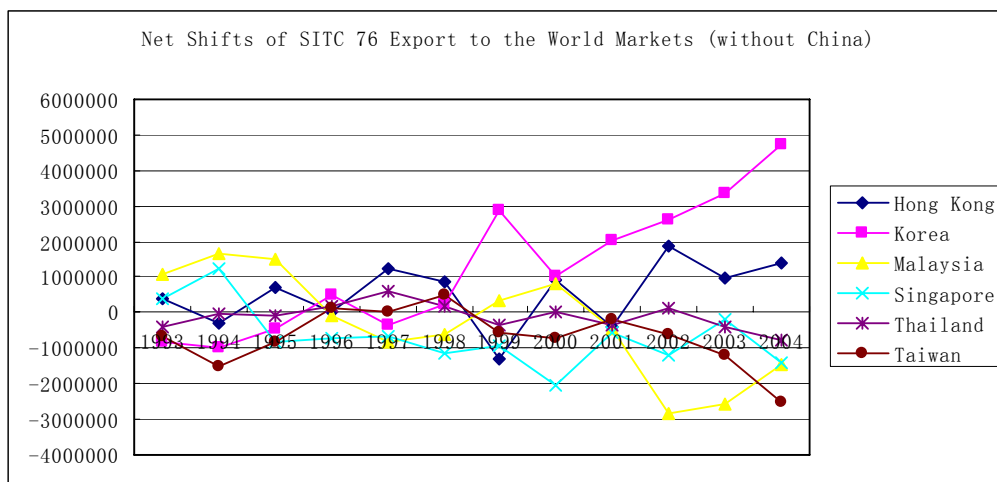
<sup>8</sup> For the other effects, the figures are available upon request.



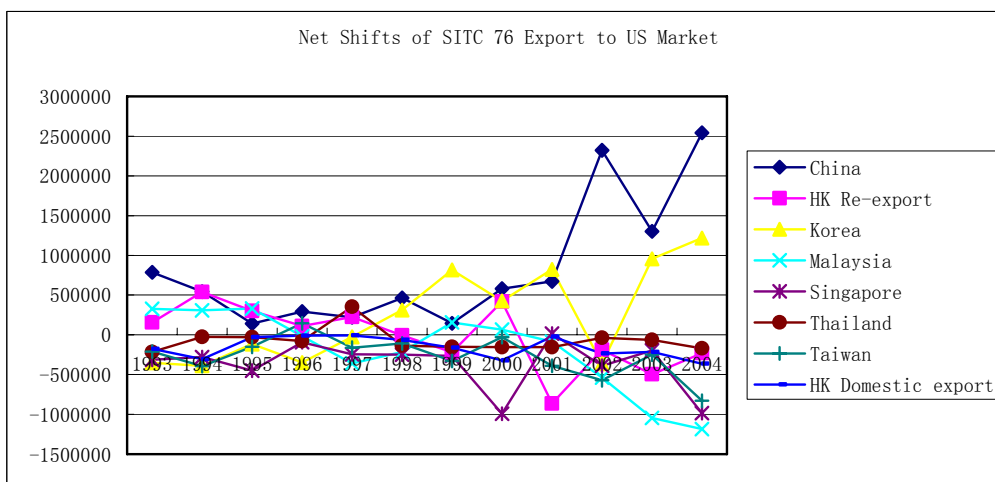
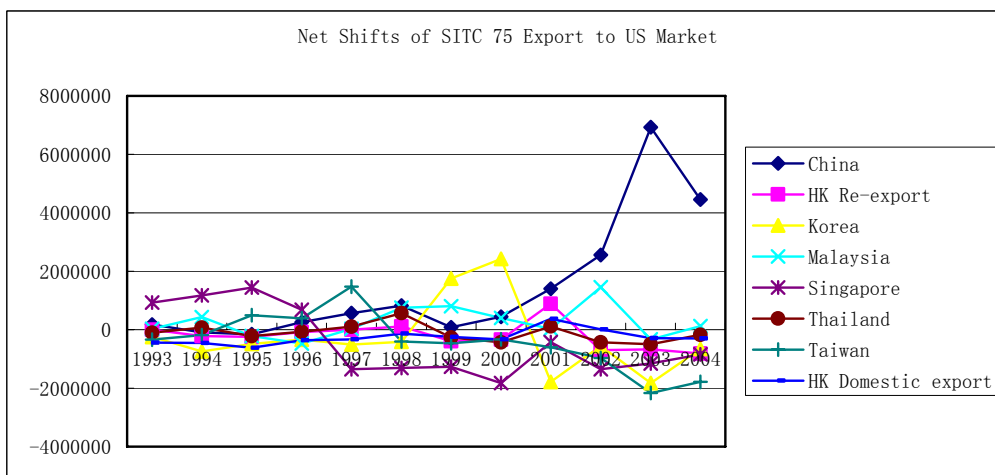
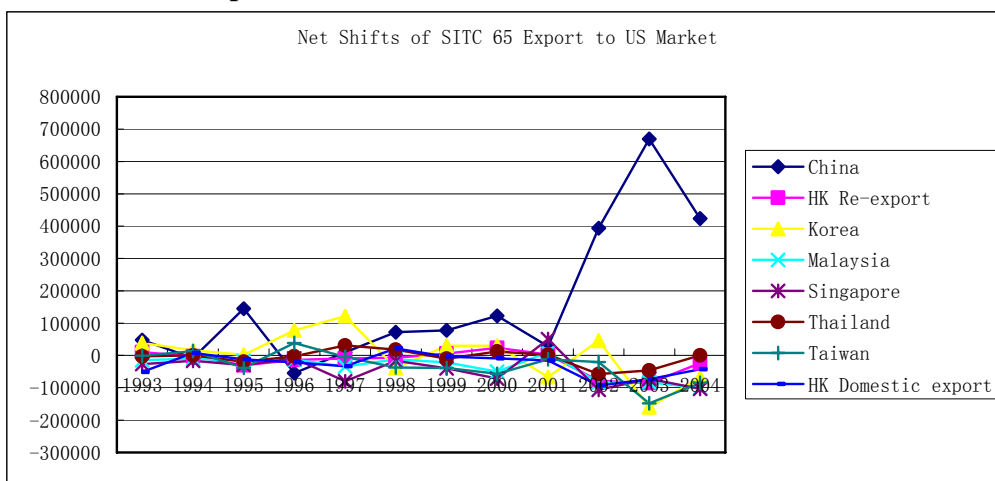


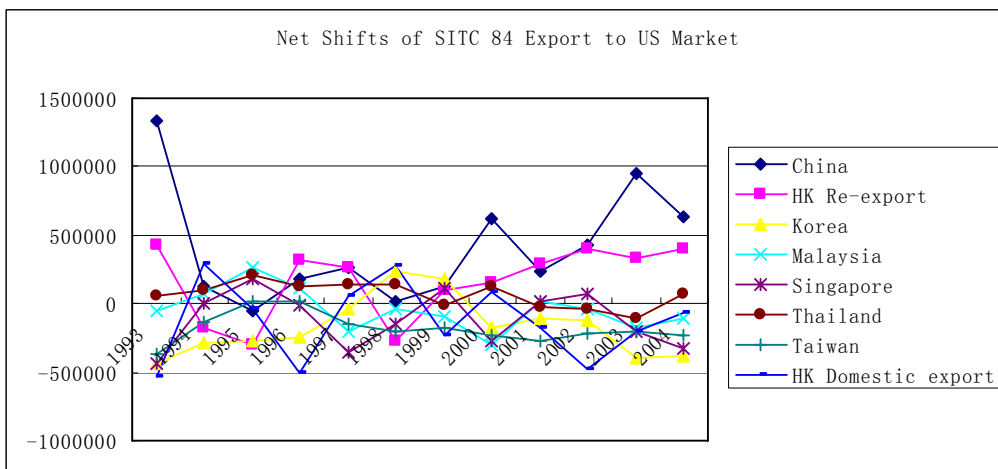
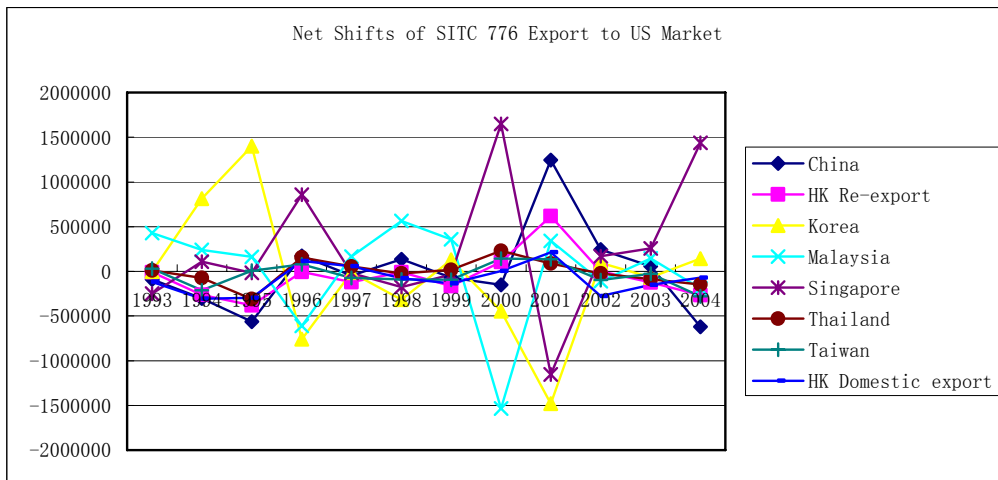
## 2. Without China



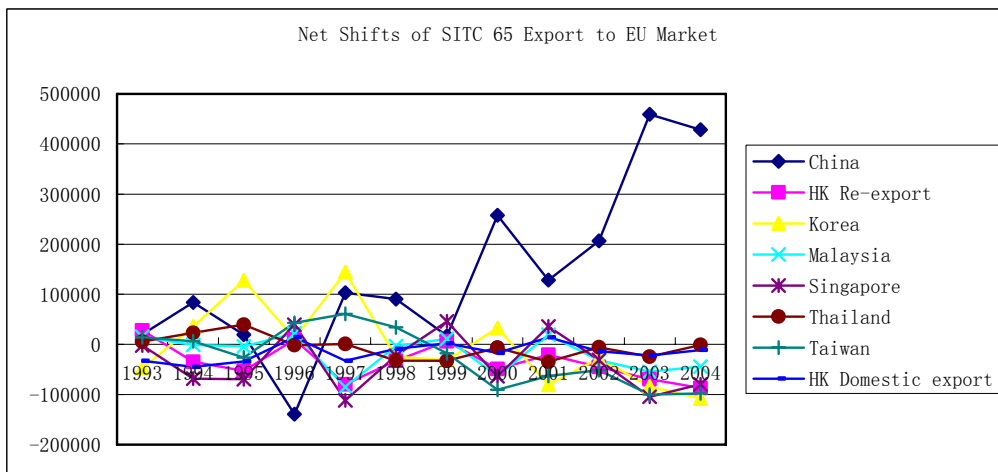


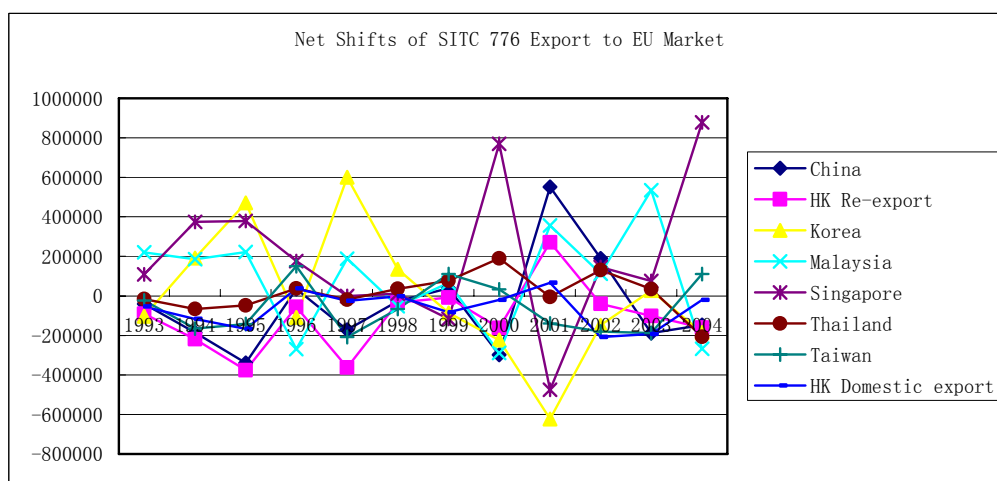
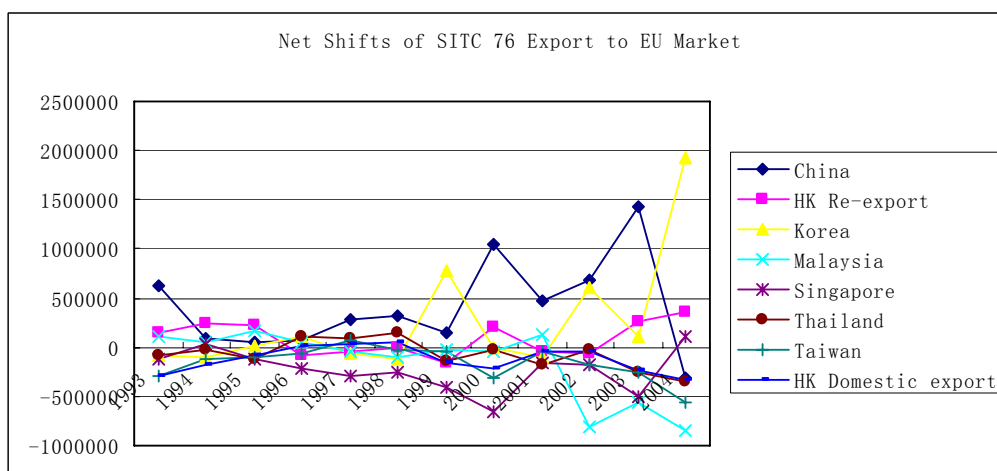
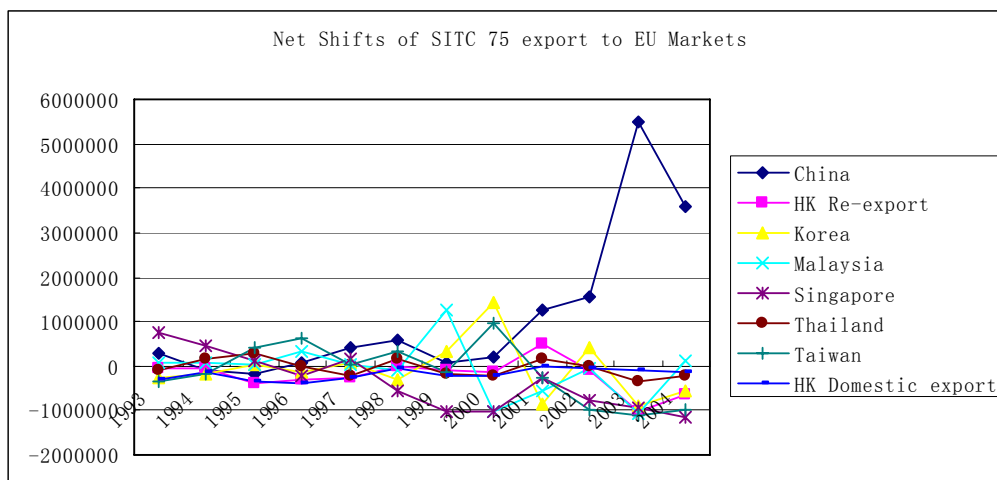
**Commodity export (with HK domestic & re-export as separate entities)**  
**1. With China (Export to the US market)**

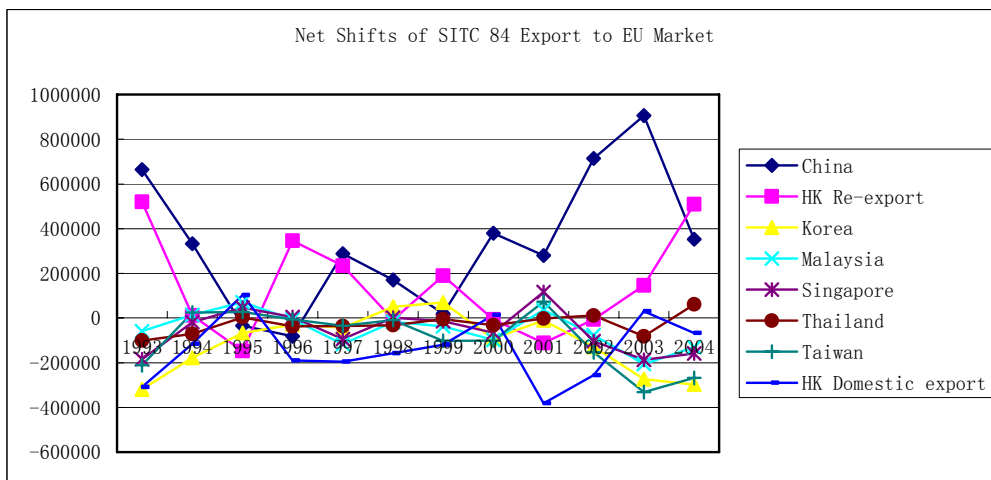




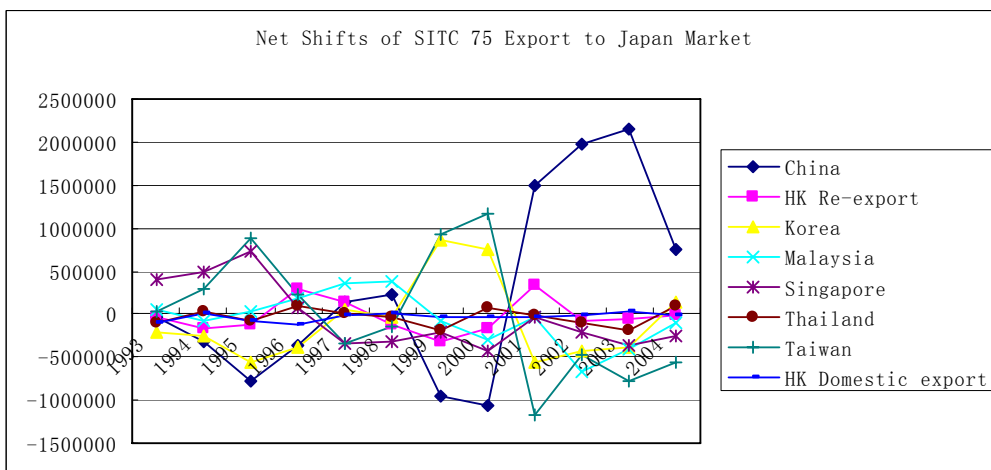
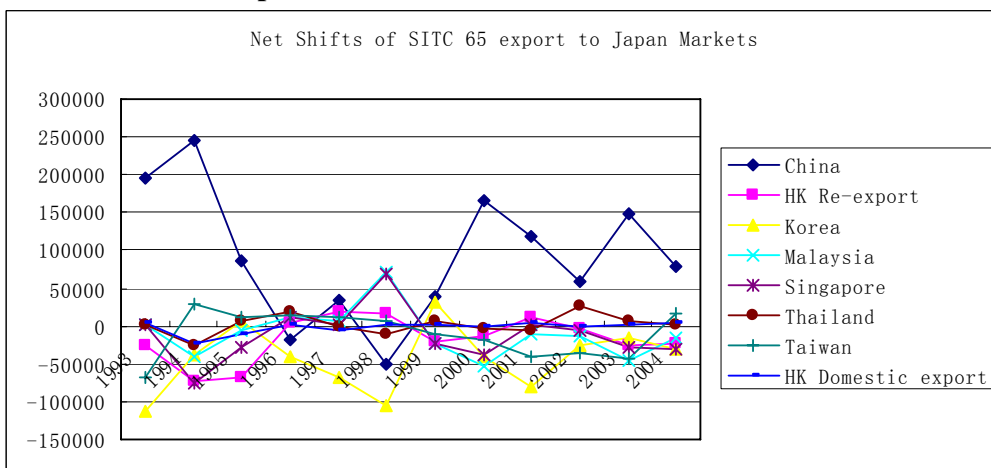
## 2. With China (to the EU market)

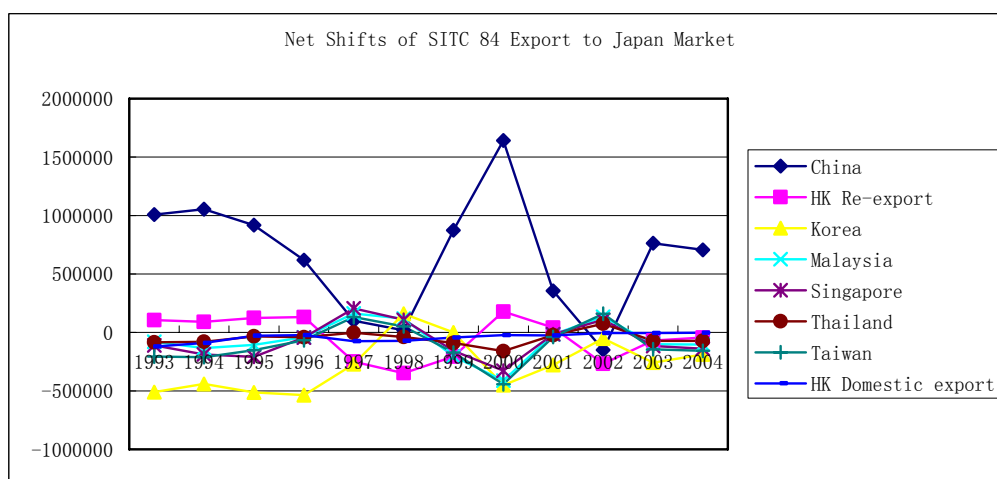
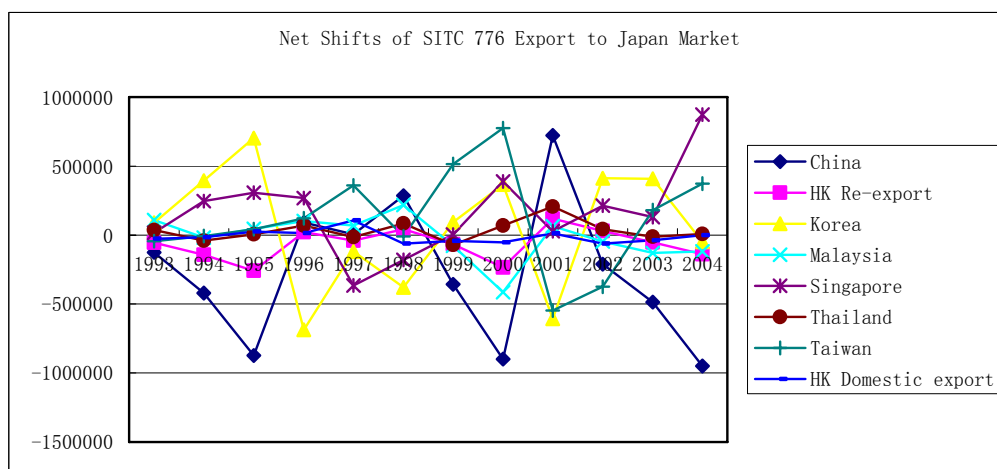
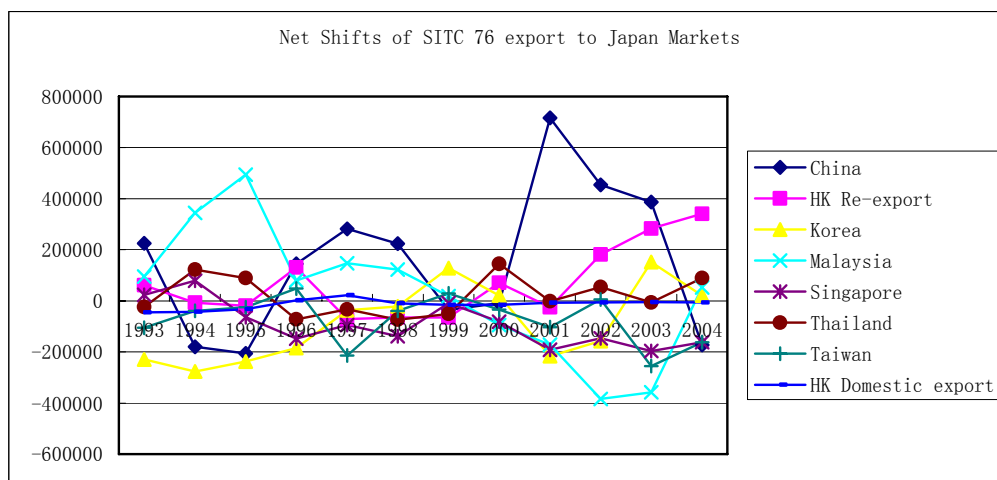




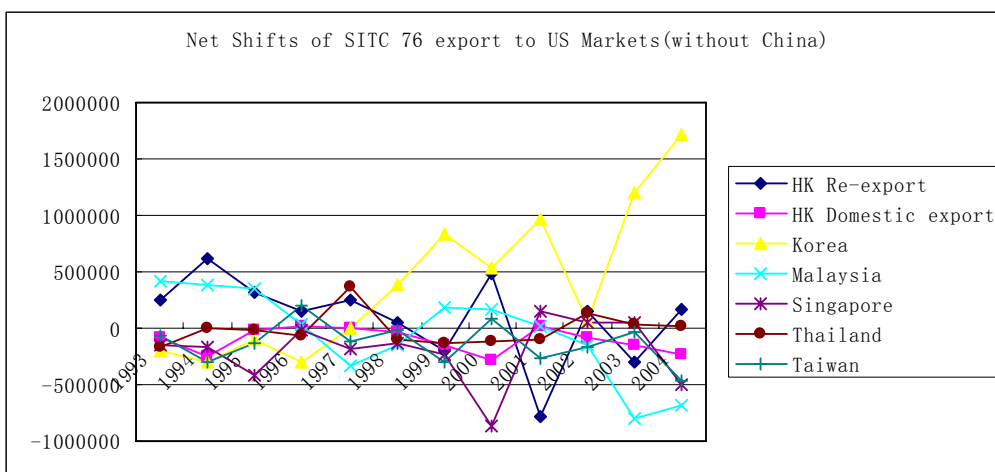
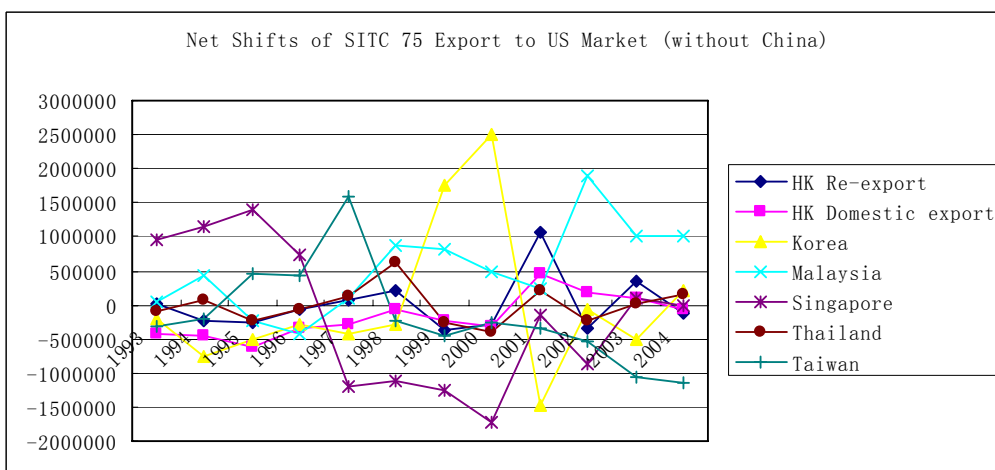
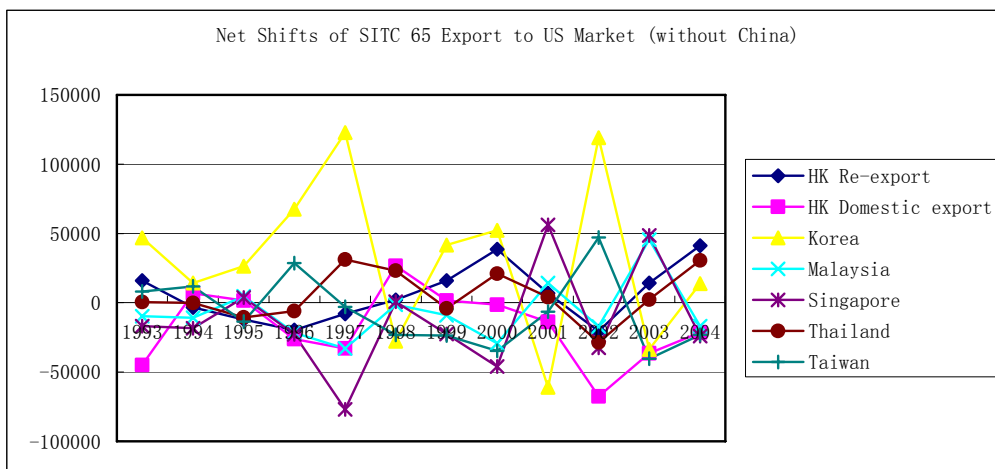


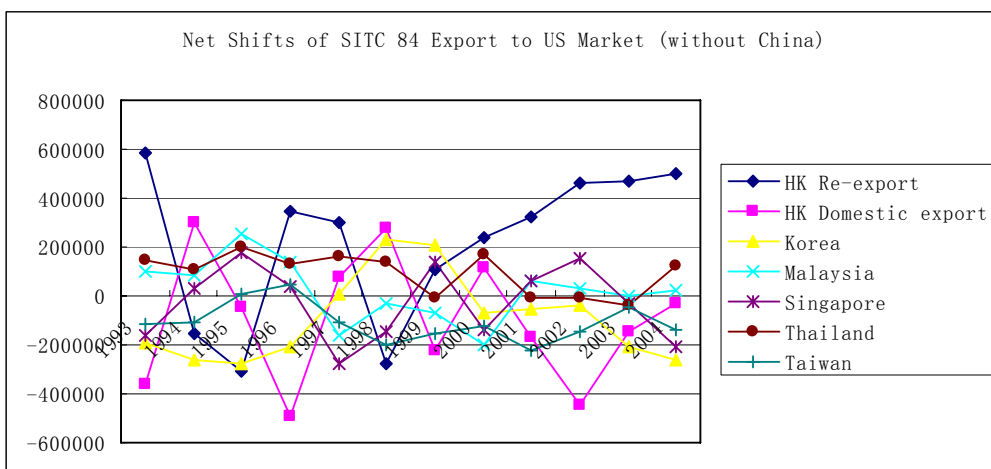
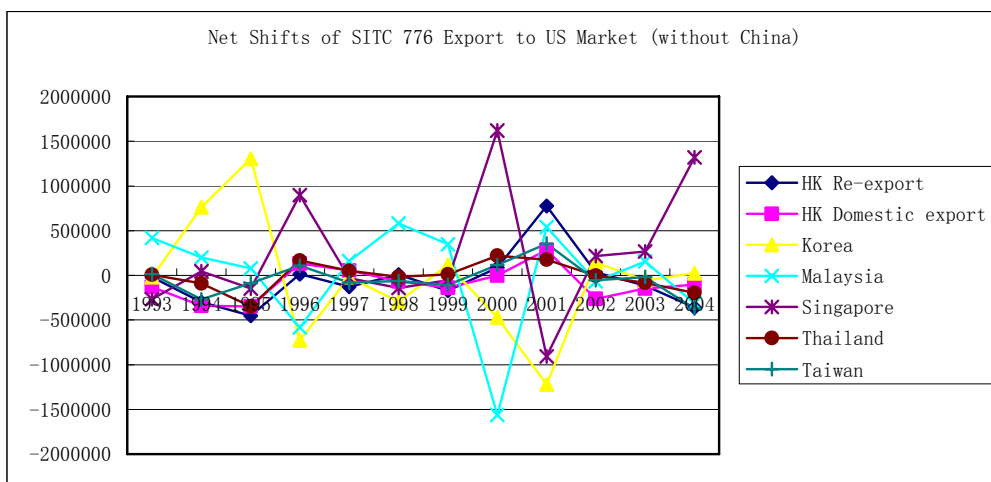
### 3. With China (to Japan market)



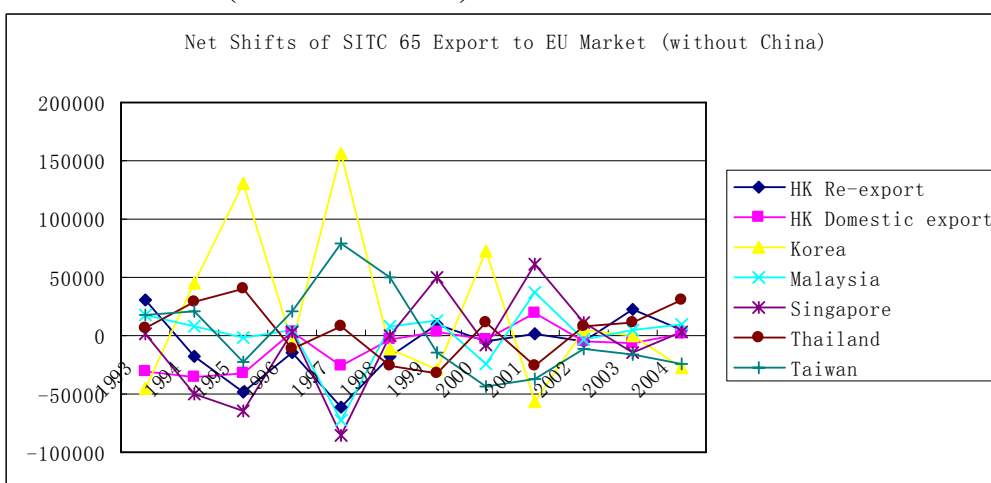


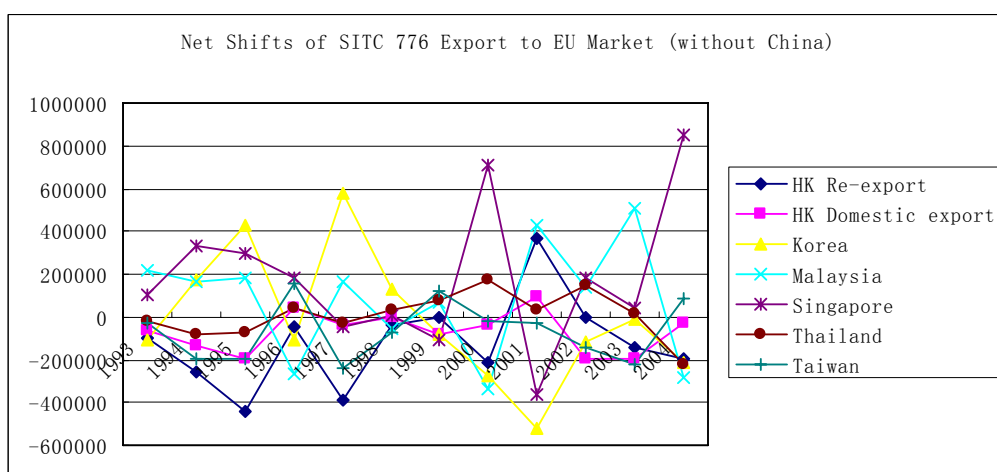
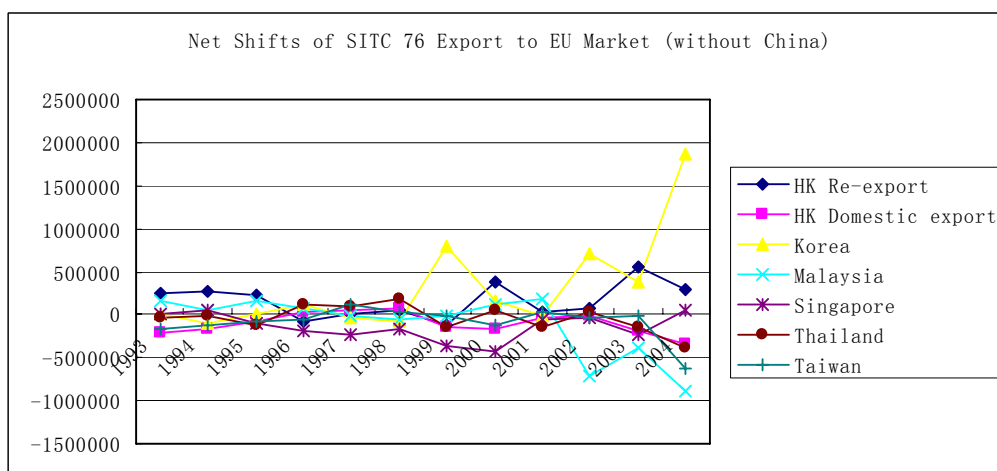
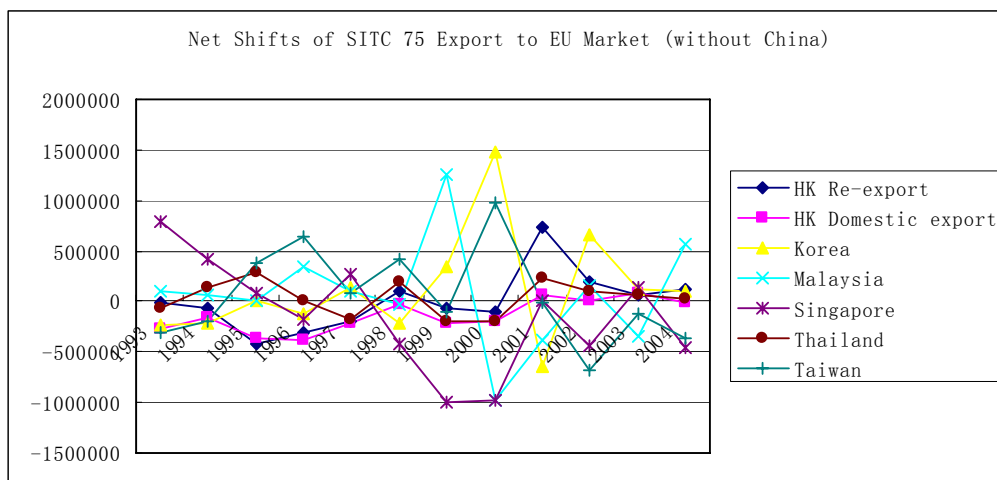
#### 4. Without China (to the US market)

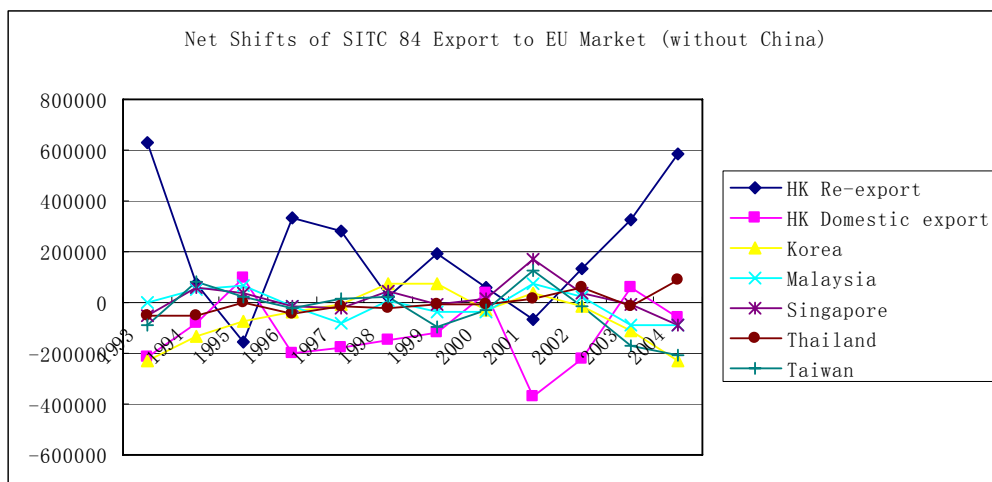




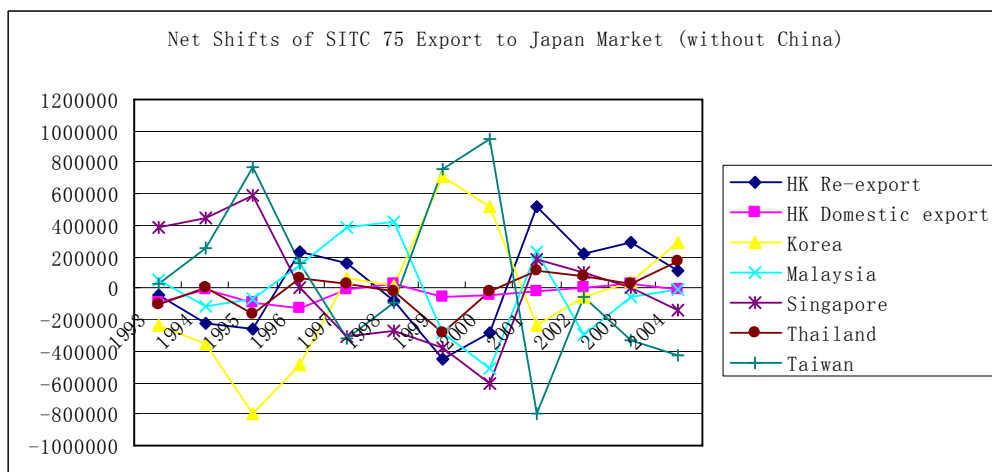
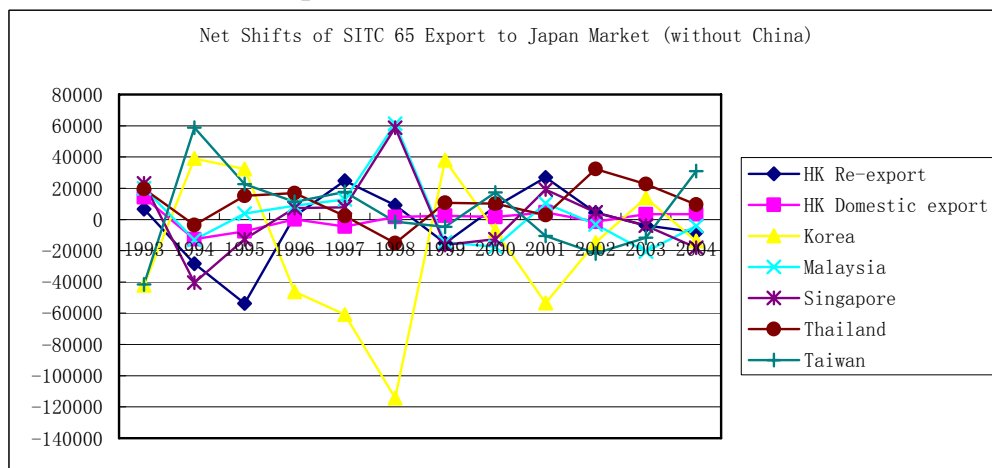
## 5. Without China (to the EU market)

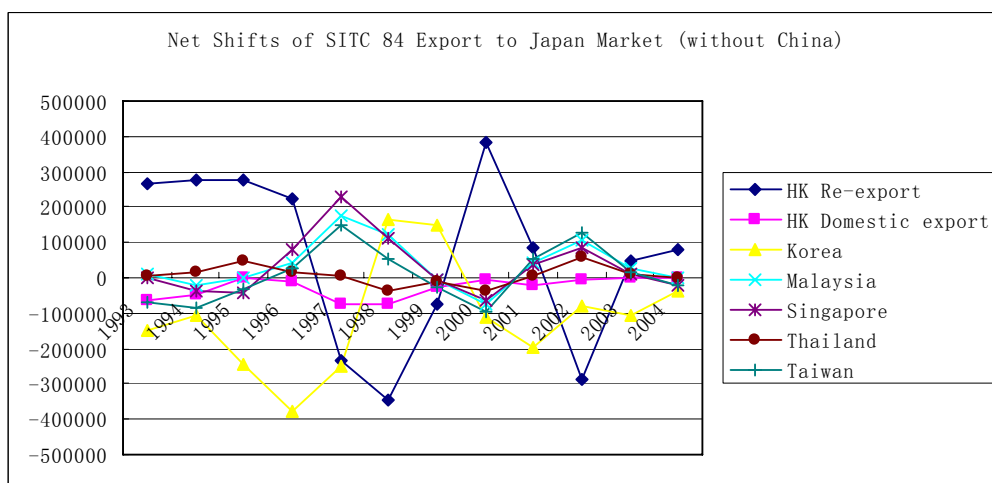
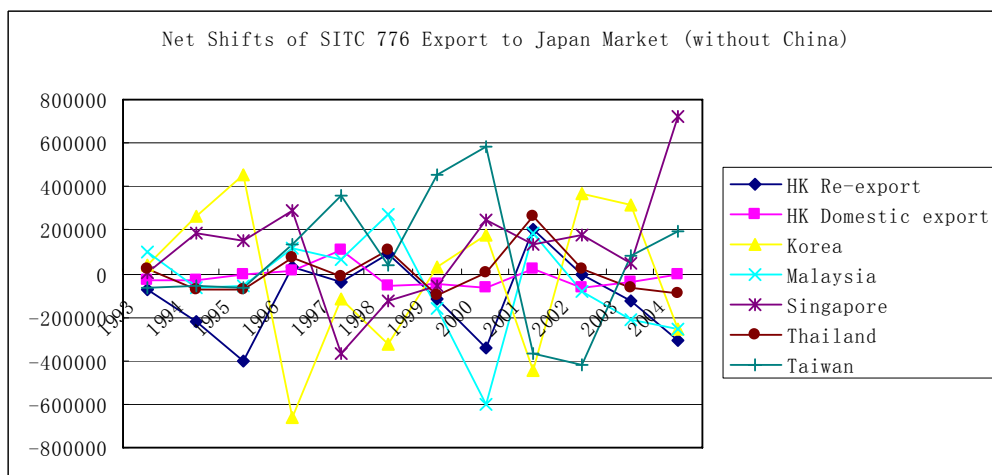
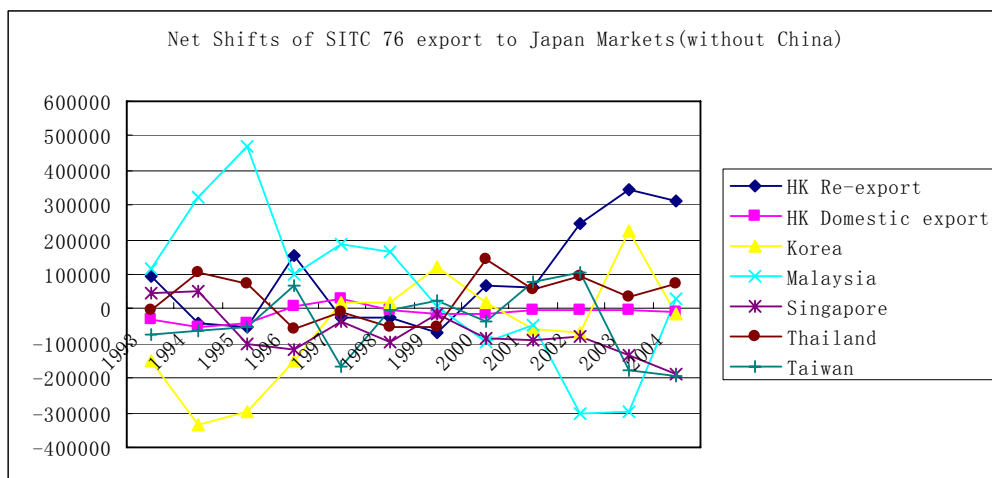




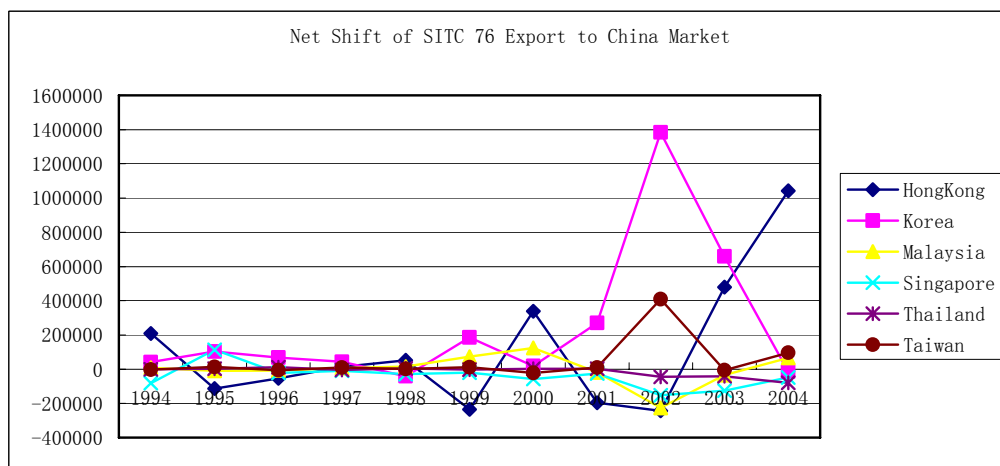
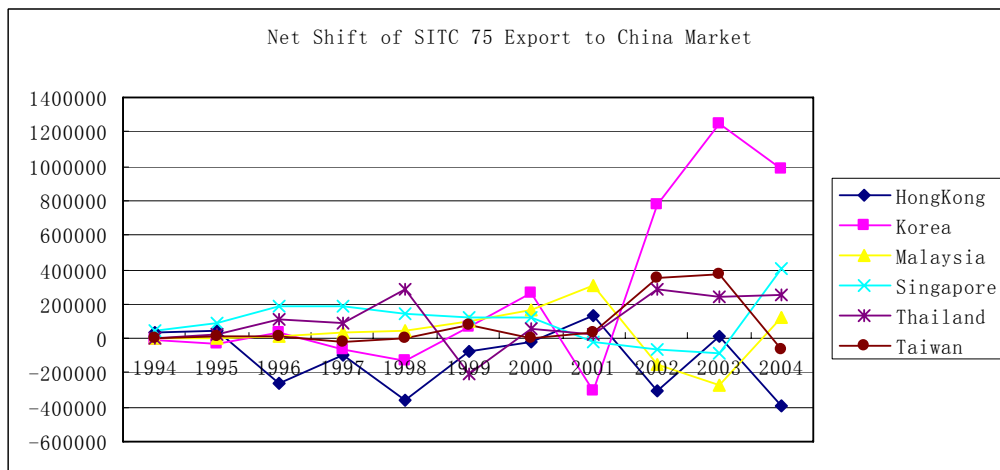
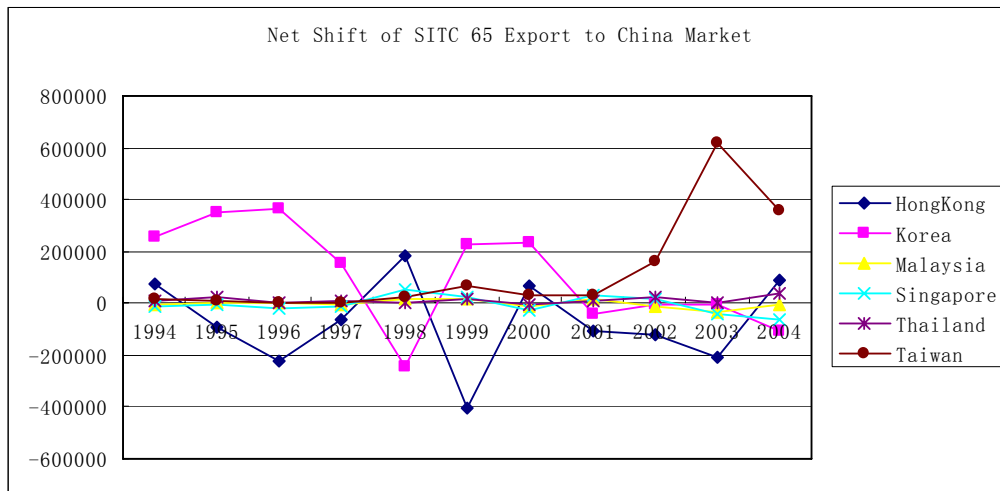


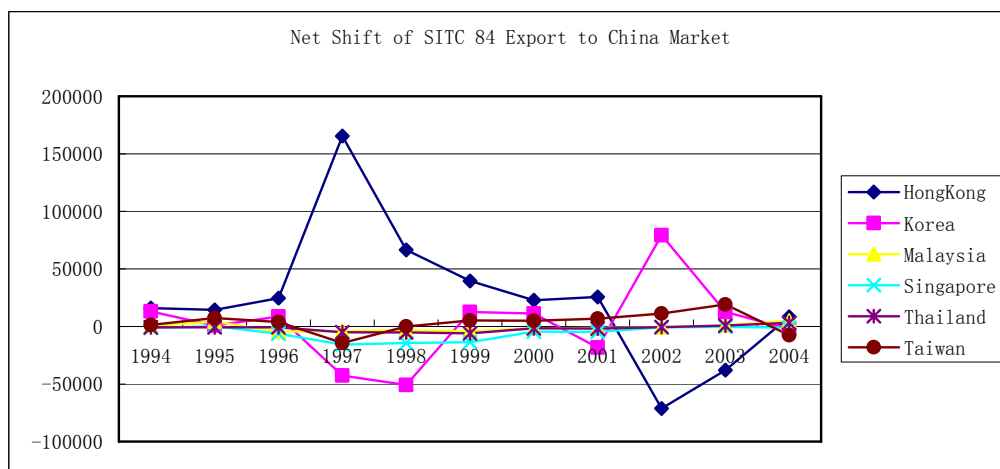
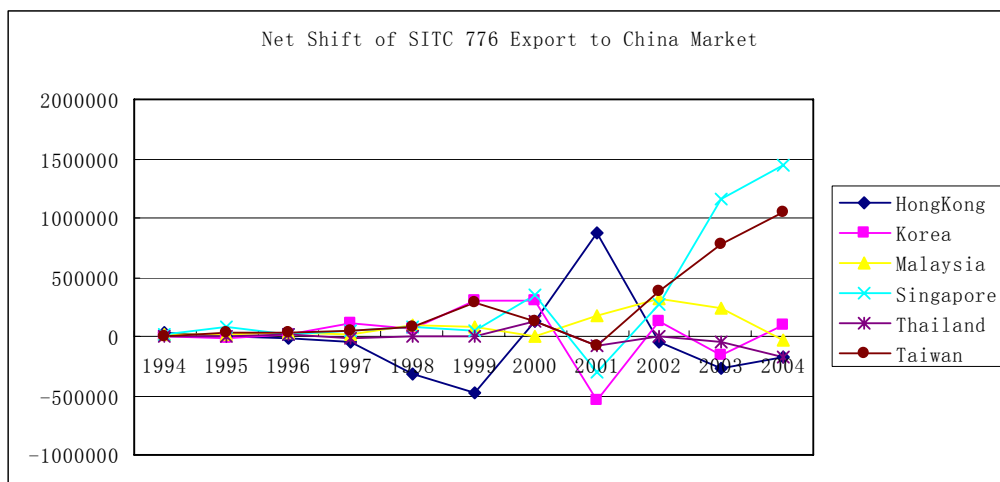
## 6. Without China (to Japan market)





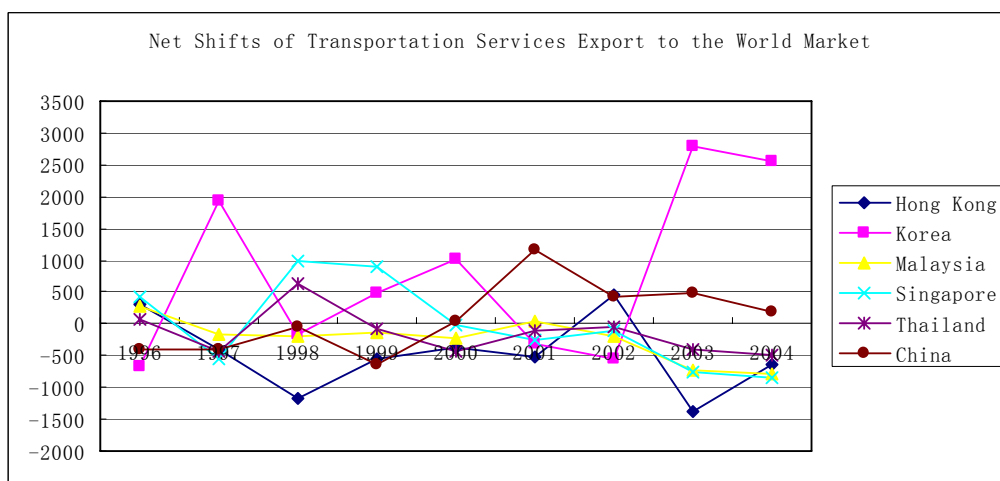
## 7. Export to China market

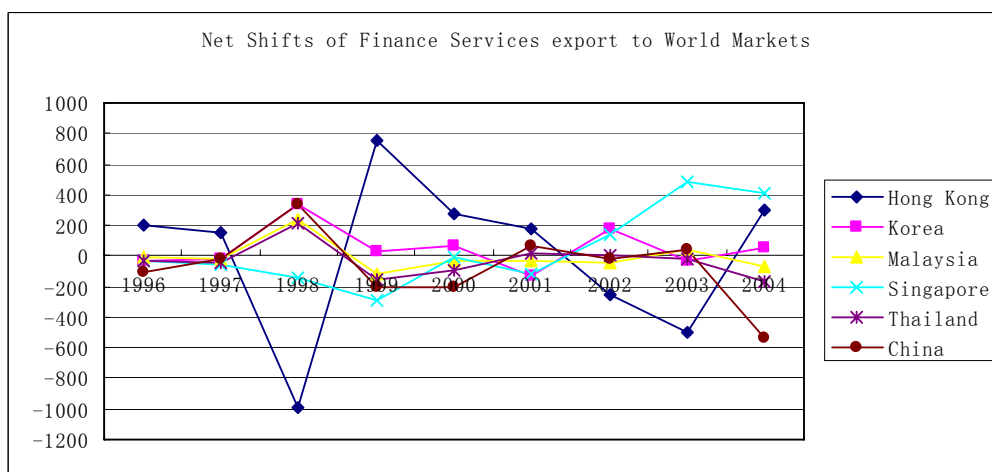
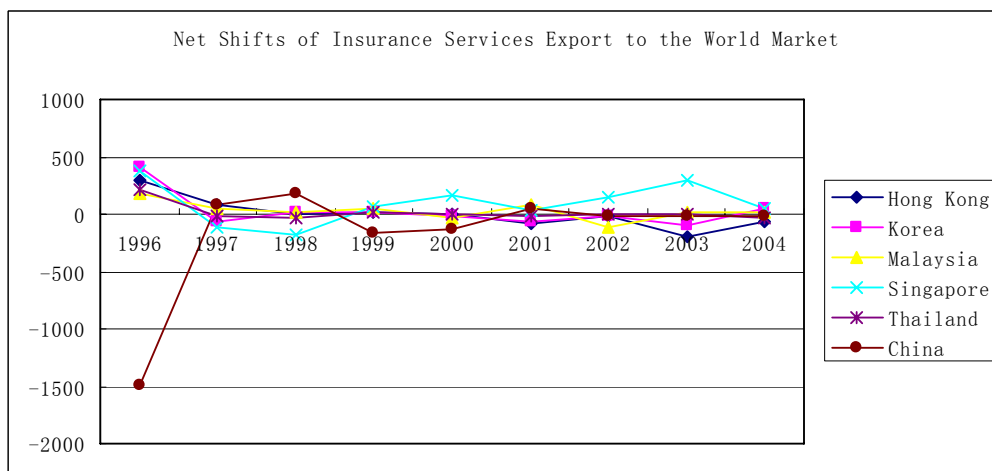
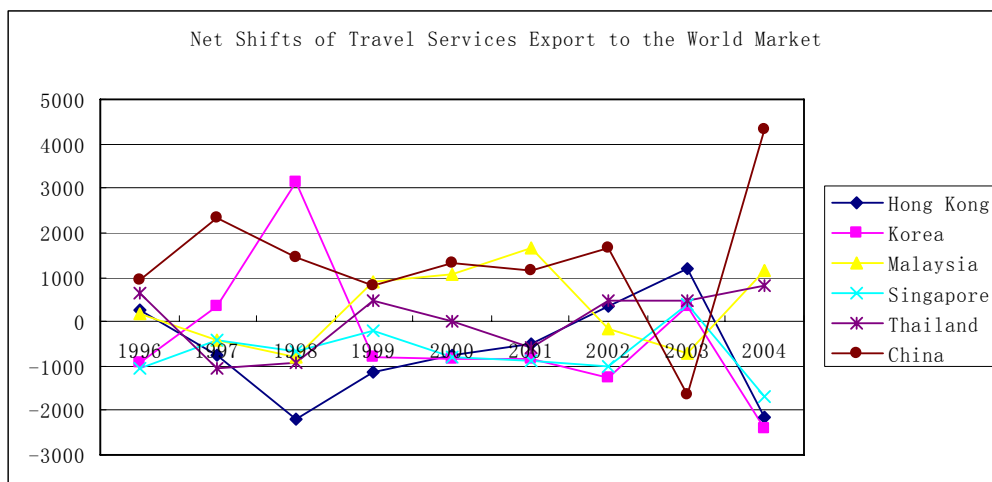


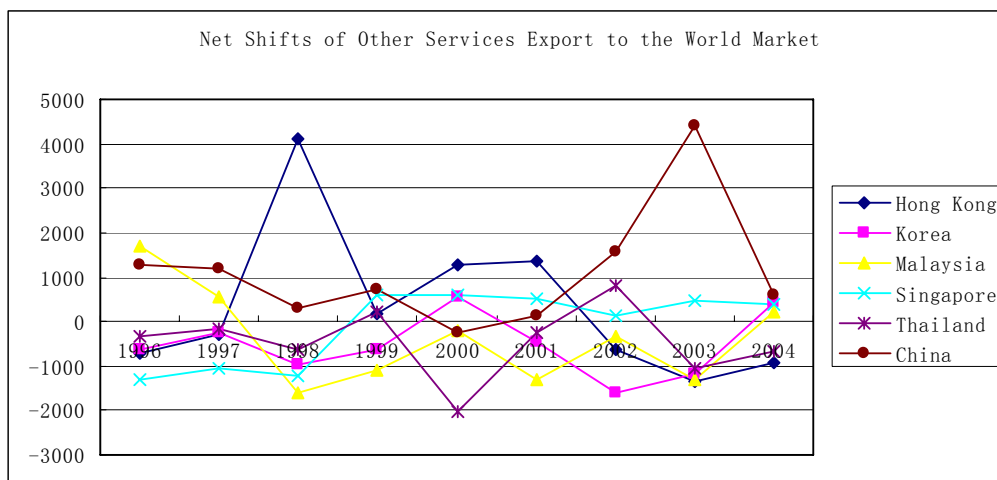


## Service Export to the World Market

### 1. With China







## 2. Without China

