China's Rise and Structural Adjustment in NIEs and ASEAN
-Competitors or Complements-

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China's economic rise has led to an increase in demand for NIEs and ASEAN exports, but has also increased competition for these countries' exports to third countries. It has also generated the side effect of industrial structural reform. It is, however, difficult to quantify the extent to which China acts like a competitor towards NIEs and ASEAN with respect to trade and the degree to which industrial structural adjustment has taken place. This article tries to give some insight on these issues by analyzing detailed trade data. In addition, export functions for the NIEs and ASEAN countries are estimated to determine whether China's growing global presence is having an adverse or beneficial impact on neighboring countries' export performances.

Introduction

Since joining the WTO at the end of 2001, China's share of world exports has risen sharply and the country has experienced rapid economic growth and industrialization. China's economic rise has led to a large increase in demand for NIEs and ASEAN exports and has encouraged structural reform of industry, but has also created competition for these countries' exports. This article examines the degree to which competition from China towards NIEs and ASEAN exports exists, how it has changed over time and the extent to which structural adjustments have taken place. These issues are relevant when considering the region's medium-to-long term economic prospects.

The study includes Korea, Singapore and Taiwan from NIEs, and Thailand, Malaysia, Indonesia and the Philippines of the so-called ASEAN4.[1] Calculations regarding the degree of export competition are based on detailed trade data from the United Nations International Trade Centre which uses the Standard International Trade Classification (SITC). An export function for each country is estimated to examine whether China's growing share of the world export market has had a beneficial or adverse effect on the region's exports.

Changes in China's Trade Structure

China's emerging global presence can be seen in both the remarkable increase in its share of world trade and in changes to the structure of its exports. China's export growth has averaged roughly 20% per year since 1998 despite the collapse of the IT bubble and the slowdown in global growth during the period. As a result, China's share of world exports climbed to 7.8% in Q3 2004, up from 3.3% at the start of 1998 - a 2.5-fold increase (Chart 1).


Chart 1: China's Share of World Exports
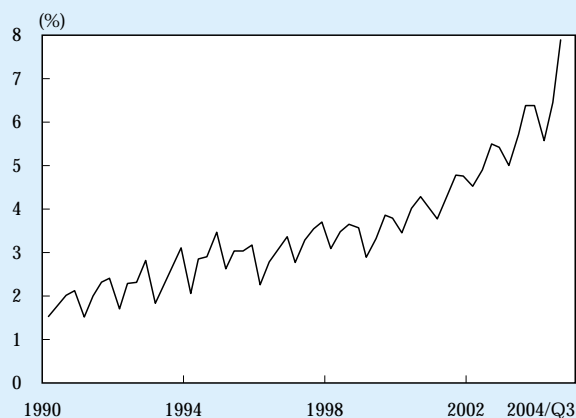
Over the same period, China's export structure changed noticeably (Chart 2-1, 2-2). China's export mix, reflecting industrial development, shifted rapidly from apparel, toys and other miscellaneous manufactured articles to machinery centered on IT products (e.g., personal computers). By 2001, machinery's share of total exports exceeded the share of miscellaneous goods, and by 2004 it stood at almost half the total. Relatively labor-intensive finished goods, however, still make up the bulk of IT exports.

China's import structure, meanwhile, has also shifted to reflect this increase in the assembly of IT products (Chart 2-3, 2-4). Imports of semiconductors, for example, have grown rapidly and their share of total imports has also grown quickly. China's rapid pace of economic growth and increasing consumption of natural resources have also driven up the share of primary product imports, particularly in 2003 and 2004.[2]

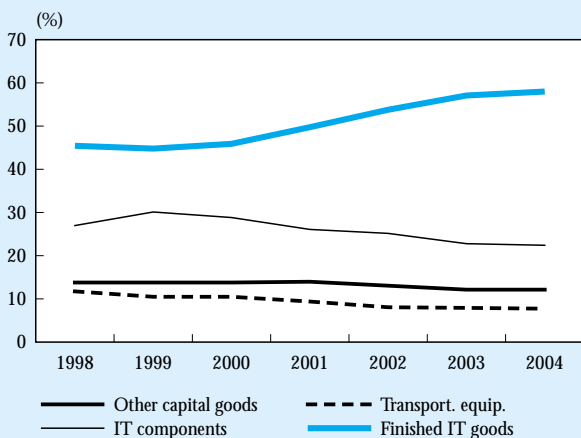**Chart 2-1: China's Export Structure**
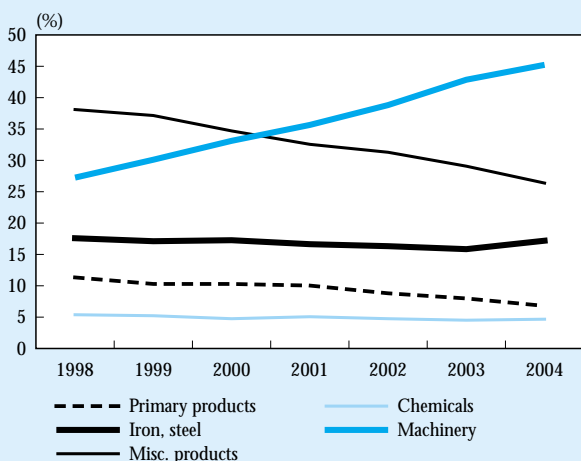
China 2-2: China's Exports of Machinery

Chart 2-3: China's Import Structure

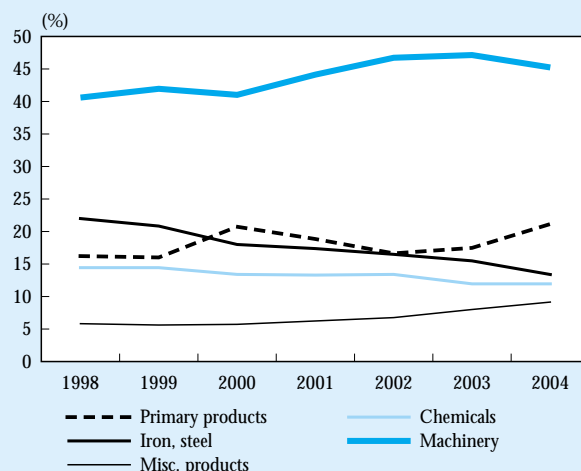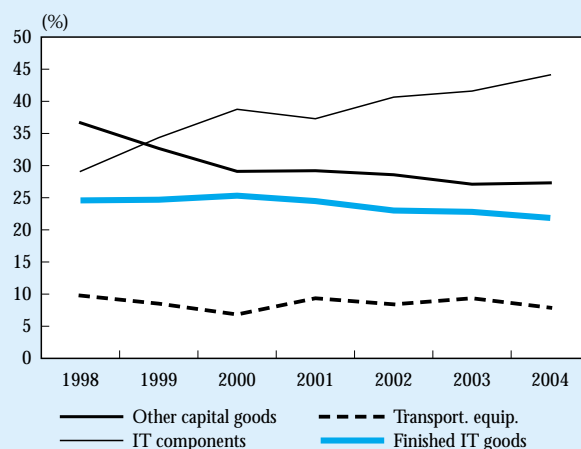**Chart 2-4: China's Imports of Machinery**

A simple index defined as: (exports less imports) / (exports plus imports), and calculated with trade data separated by type of good, can be used to further examine China's trade structure as well as gauge the extent to which it competes with other countries. The index ranges between -1 and +1, with +1 indicating that the country is a strict exporter of the specific good and -1 implying that the country is a pure importer.

The above index is large and positive for textiles and other miscellaneous goods, suggesting that China is relatively competitive in these products. Calculated for the category of machinery and transportation equipment, which includes finished IT goods (e.g., keyboards, displays), the index has steadily moved from negative territory into positive (Chart 3-1, 3-2). This indicates that China now runs a surplus in this category of good. The index also reveals that China is not competitive (i.e., yields a negative reading) in primary

products, IT components (e.g., semiconductors) and other capital equipment. The index, in fact, is strongly negative for IT components, mineral fuels and raw materials excluding fuel, and the readings for each of these products have grown increasingly negative in recent years.

Chart 3-1: China's Competitiveness Measured by Product

Code	Primary products					Manufactured goods			
Code	0	1	2	3	4	5	6	7	8
Product	Food and live animals	Beverages, tobacco	Inedible crude materials	Mineral fuels lubricants	Animal and vegitable oils	Chemicals	Manufact. goods by material	Machinery and transport.	Misc. products
1994	0.52	0.87	▲0.29	▲0.02	▲0.57	▲0.32	▲0.09	▲0.40	0.76
1998	0.47	0.69	▲0.51	▲0.13	▲0.66	▲0.32	0.02	▲0.06	0.78
2002	0.47	0.44	▲0.68	▲0.40	▲0.89	▲0.44	0.04	▲0.04	0.67
2004	0.35	0.38	▲0.81	▲0.54	▲0.93	▲0.43	0.15	0.03	0.51

Chart 3-2: China's Competitiveness Measured by Product (Machinery)

Code	75, 76	77	78, 79	71-74
Product	IT finished goods	IT components	Transportation equipment	Other capital goods
1994	0.03	▲0.13	▲0.58	▲0.73
1998	0.25	▲0.09	0.05	▲0.48
2002	0.37	▲0.27	▲0.06	▲0.40
2004	0.48	▲0.30	0.03	▲0.35

Comparing China's Export Structure with NIEs and ASEAN

The main points of comparison between the export structures of China, NIEs and ASEAN are listed below.

First, the level of industrialization in the NIEs, while not as high as in Japan, is higher than in China. This can be seen in the low share of labor-intensive goods, such as apparel and other miscellaneous manufactured goods, in NIEs exports relative to China (Chart 4-1). Around 30% of China's exports in 2003 consisted of these products while comparable figures for Korea and Singapore are around 6% and 10% respectively. The share of these types of goods in ASEAN exports is high relative to NIEs, but low in comparison to China.

Additional evidence can be seen in the high share of capital- or knowledge-intensive products in NIEs exports. Korea, for example, has a high share of transportation goods (e.g., motor vehicles, ships) in its exports, while Singapore has a high proportion of chemicals (e.g., pharmaceuticals) (Chart 4-2). China's presence in the IT product market, meanwhile, is growing rapidly, but these exports are largely labor-intensive finished IT goods (Chart 4-3). In NIEs and

ASEAN export structures, capital-intensive IT products such as semiconductors continue to remain more prevalent than in China.[3]

Second, within ASEAN, Malaysia and Indonesia are both resource rich and significant crude oil producers, with Malaysia being the world's largest exporter of palm oil. Combined with the fact that China is a large importer of primary products - fuels in particular - these ASEAN countries' export mixes tend to be skewed towards these types of products (Chart 4-4). Primary products accounted for about half of Indonesia's exports in 2003 and about 20% of Malaysia's. In both cases this was entirely due to mineral fuels, suggesting that these countries export structures are complementary with China. Primary products also make up a large share of Thailand's exports, but the majority of these products are foodstuffs, in which China is also a net exporter.

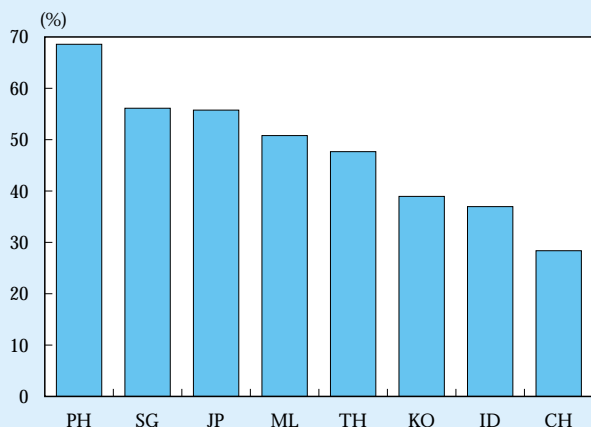**Chart 4-1: Share of Miscellaneous Manufactured Goods in Exports**
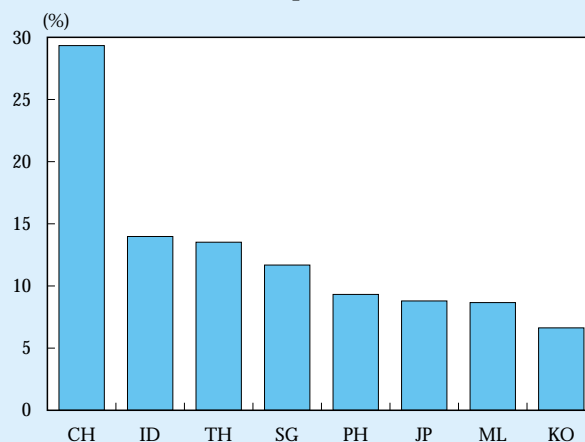
1. Data is for 2003.
2. CH, ID, TH, PH, SG, JP, ML, KO stand for China, Indonesia, Thailand, Philippines, Singapore, Japan, Malaysia and Korea. The same abbreviations are used for the remaining charts.

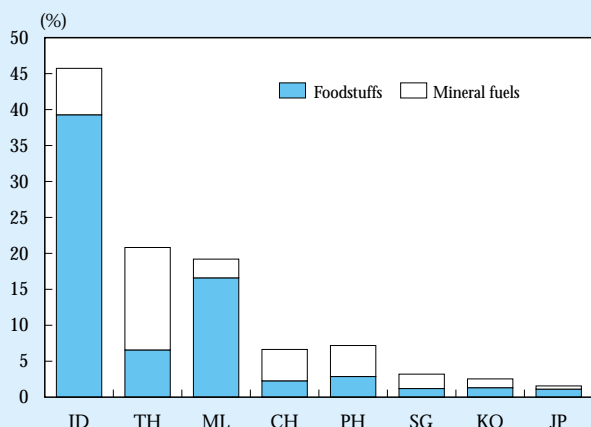**Chart 4-2: Share of Manufactured Goods in Exports**
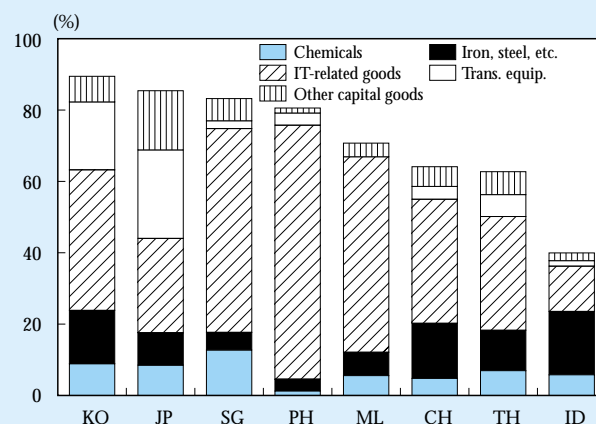
1. Data is for 2003.

Chart 4-3: Share of IT Components in Exports

1. Data is for 2003.

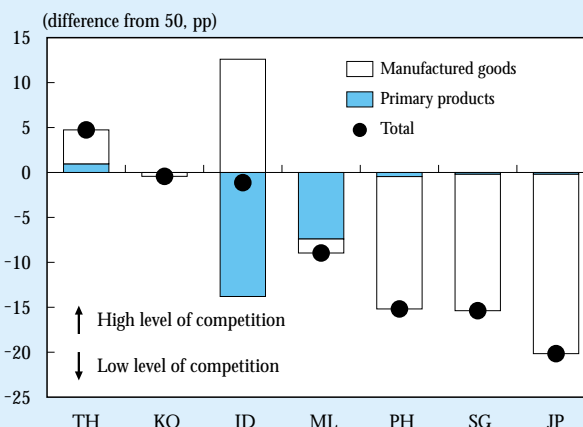**Chart 4-4: Share of Primary Products in Exports**

1. Data is for 2003.

An assumption of the following analysis is that when the share of products in competition with China exceeds 50%, a highly competitive relationship is considered to exist. Even at the SITC 4-digit level, however, it is often hard to distinguish between products, suggesting that some caution should be taken when interpreting the results. The main findings of this analysis are listed below.

First, the data suggests that Thailand has the most competitive relationship with China while the remaining countries are all below the 50% level (Chart 5-1). This implies that, except for Thailand, the countries in our study do not have a clear competitive relationship with China.[4]

Chart 5-1: Level of Competition with China

1. Data is for 2003.
2. Manufactured goods and primary products contribution are defined as: (product's degree of competitiveness) × (product's share of exports). The same definition is used for the remaining charts.

The Degree of Competition between China and NIEs and ASEAN

The degree of export competition between China and NIEs and ASEAN can be evaluated using the above-described index. Each product for which China has a positive reading can be considered a product in which China is competitive. The share of such products in NIEs and ASEAN exports is defined as the level of competition with China.

The most recent data available is for 2003, and the 4-digit level in the SITC hierarchy provides a finely detailed breakdown of products. This level of detail is necessary for investigating trade involving the increasingly important IT sector.
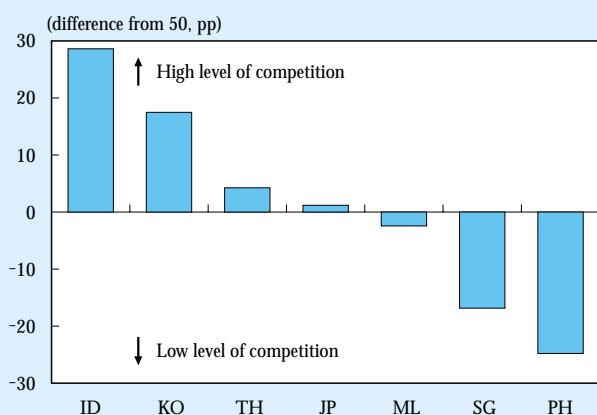
Second, breaking down exports into manufactured goods and primary products reveals distinct patterns (Chart 5-1). Manufactured products of Singapore and the Philippines, for example, are highly complementary with China, while Korean manufactured goods, along with Korean primary products, show no clear sign of competition with China. Malaysia and Indonesia, meanwhile, have a low level of competition with China in primary products due, in part, to China's great demand for natural resources. Finally, Thailand's competitive relationship with China in both primary products and manufactured goods makes the overall relationship the most competitive in the sample.

Third, Indonesia and Korea have a strongly

competitive relationship with China in IT goods (Chart 5-2). The level of competition involving Singapore and the Philippines, however, is extremely low. Dividing IT products into finished goods and components indicates that China maintains a high level of competition with all countries in labor-intensive finished goods, but the level of competition in capital-intensive IT parts is much lower (Chart 5-3). The overall low degree of competition in IT components ranges from extremely low in the case of Singapore and the Philippines to moderately low for Indonesia. The differences in the levels of competition in IT components drive the differences in the overall level of competition in IT.

Fourth, changes in the level of competition between 1998 - when China began preparing to join the WTO - and 2003 point to increased competition versus Korea, Indonesia and Malaysia, while pointing to a lower degree of competition versus other countries such as the Philippines and Singapore (Chart 5-4). This is largely due to the difference in the competitiveness in IT related goods among these countries (Chart 5-5). Between 1998 and 2003, the level of competition in finished IT goods between China and each country increased. In terms of IT component, however, some countries, notably the Philippines and Singapore, became more complementary with China, while Korea became more competitive.

Chart 5-3: Level of Competition with China in IT (Finished Goods and Components)
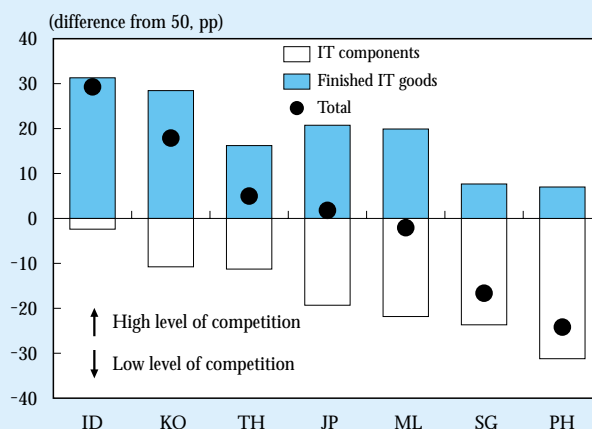
Chart 5-4: Change in Level of Competition between 1998 and 2003

Chart 5-2: Level of Competition with China in IT

1. Data is for 2003.

Chart 5-5: Change in Level of Competition in IT between 1998 and 2003

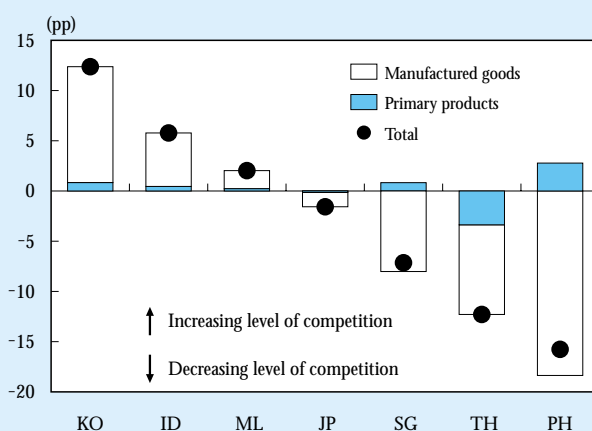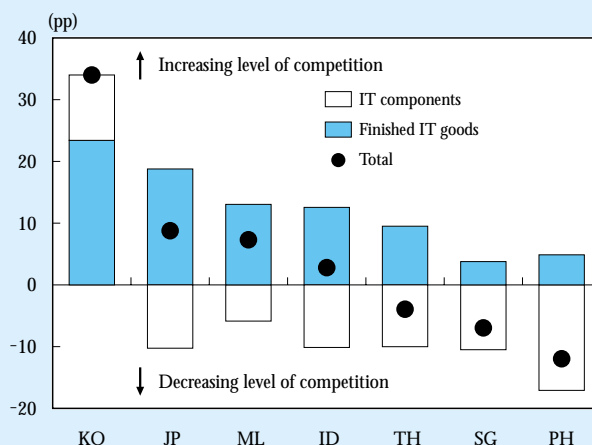## Gauging the Level of Competition through an Export Function

The approach used to this point, despite generating useful insights, is somewhat limited. Several limitations of the preceding analysis are listed below.

First, trade data at the 4-digit SITC level may not sufficiently capture divisions in international production with sufficient precision. For example, at the 4-digit SITC level the category of "semiconductors" cannot be subdivided further. However, within "semiconductors" there are many products which are not perfect substitutes (such as DRAM and MPU). Without narrower product definitions, the estimates of the degree of competitiveness are likely to be biased upwards.

Second, when a particular product is deemed to be in "competition" with China, a distinction is not made regarding the degree. In other words, if China posts a small positive figure in the competition index, it is treated equivalently to a reading of +1, the highest level.

Third, a 50% cut-off point is used, above which is considered "competitive" territory. This parameter, however, is just a rough benchmark.

Using a separate methodology, one similar to that used in a paper published by the Federal Reserve, the potential competitive effect of China's exports on NIEs and ASEAN exports can be examined further.[5] Specifically, export functions incorporating China's share of world exports, real foreign demand and the real effective exchange rate can shed light on China's impact on NIEs and ASEAN export growth. [6, 7, 8]

If the coefficient before China's world export share is negative and significant in a particular country's export function, that country's exports are being depressed because of China's growing global presence. In other words, a competitive relationship with China's exports is said to exist on average over the sample period. Conversely, in the case of a positive and significant reading of the coefficient before this variable, an increase in China's exports acts to boost the exports of the country in question. This can be thought of as a "win-win" relationship, and suggests that the country supplies intermediate goods necessary for China to export final goods. However, if the parameter is neither significantly positive nor negative, the nature of the relationship is not clear and may result from offsetting positive and negative effects.

The results of these regressions are in Chart 6 and the notable features are discussed below.

Chart 6: Export Functions

	α	$\beta1$	$\beta2$	$\beta3$	Adj.R2	D.W.
Korea	-0.13 ** (-2.92)	7.68 ** (5.74)	-0.25 * (-1.89)	0.26 (1.43)	0.63	1.05
Singapore	-2.44 ** (-4.61)	7.93 ** (5.01)	-0.09 (-0.29)	0.41 ** (2.43)	0.64	1.37
Indonesia	-0.14 ** (-3.06)	3.38 ** (2.55)	-0.01 ** (-3.55)	0.20 (1.28)	0.42	0.96
Philippines	-0.14 ** (-2.76)	5.65 ** (4.01)	-0.03 (-0.22)	0.18 (1.04)	0.39	1.35
Thailand	-0.06 (-0.99)	3.69 ** (2.14)	-0.58 (-1.68)	0.21 (1.11)	0.28	0.98
Taiwan	-0.14 ** (-2.64)	5.89 ** (3.68)	-1.00 ** (-2.42)	0.06 (0.43)	0.68	1.65

Export = α + $\beta1$Foreign Demand + $\beta2$ER + $\beta3$China's Share + ε

Export : Real exports (in y-o-y terms, as are all other variables)
Foreign Demand : Global GDP growth less home country
ER : Real effective exchange rate
China's Share : China's share of world exports

(1) Export function estimated by OLS.
(2) t values are in parenthesis, with ** representing significance at the 5% level, and * at 10%
(3) The sample period is 1998 Q1 to 2004 Q3, except fo Indonesia which is 1999 Q1 to 2004 Q3.
(4) The lags for the real effective exchange rate are 5 quarters for Korea, 4 for Singapore, 0 for Indonesia, 1 for the Philippines, 3 for Thailand and 5 for Taiwan.
(5) Data limitations prevent Malaysia from being included.

First, none of the regressions resulted in significant, negative coefficients in front of the variables for China's world export share. This indicates that none of the countries' exports (looked at in aggregate) have a clear competitive relationship with China.

Second, the coefficient before China's world export share is significant and positive in the case of Singapore. This suggests that much of Singapore's exports are likely intermediate goods necessary for the production of China's exports. Semiconductors and other IT components, in fact, make up a large share of Singapore's exports.

Third, except for Singapore, no other country's exports are positively and significantly affected by China. This result, in conjunction with the results from the analysis using the detailed trade data, suggests that China's growing share of world exports may be creating a positive effect (i.e., a boost to the region's intermediate-product exports) as well as a negative effect (i.e., the gaining of market share by Chinese exports in finished goods markets) which are canceling each other out.

Fourth, in order to gauge the structural adjustments of each country at different intervals over the sample period, the movements in the coefficient for the China world export share variable are examined. For example, this coefficient in Singapore's export function is becoming more significantly positive over time as additional data points are added. This indicates that the complementary relationship with Chinese exports is deepening (Chart 7). For the remaining countries, however, such a clear trend is not visible; suggesting that structural adjustment with respect to China's increasing global presence may not be going as smoothly.

Chart 7: Changes in the China Export Share Parameter in Singapore's Export Function
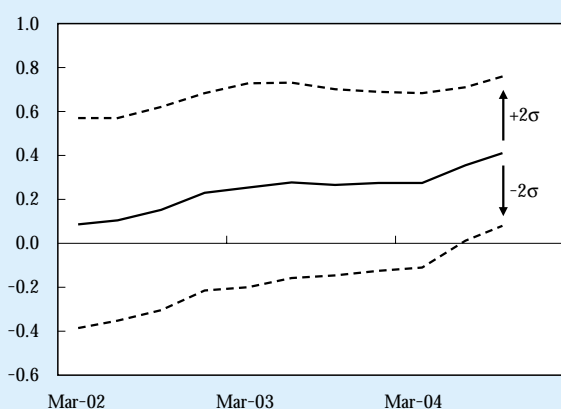
1. The above chart represents changes in the parameter of the China demand factor. The dotted lines are ±2 standard errors around the estimate.

The results from the export functions are generally consistent with the analysis of the detailed trade data excluding the competitive relationship found to exist between China and Thailand in manufacturing and the low level of competition in manufacturing between China and the Philippines. Based on the regression results, Thailand holds neither a competitive nor a complementary relationship with China. The inconsistency could arise from the limits of the detailed trade data, or because this data is examined at two specific points (1998 and 2003) while the regression yields the average relationship over the period and also captures the structural adjustments made through Q3 2004.

Conclusion

The main findings of this article are discussed below.

First, trade data broken down by product for 2003 suggests a clear competitive relationship between Thailand and China. However, while a distinct competitive relationship with China cannot be seen in any of the remaining countries, the level of competition with Singapore can be described as very low.

Second, the level of competition divided into manufactured goods and primary products reveals a complementary relationship between China and Singapore and the Philippines in manufactured goods. For Malaysia and Indonesia, meanwhile, the fact that China is a large importer of primary products pulls down the overall level of competition between these countries.

Third, between 1998 and 2003, Korea, Indonesia and Malaysia developed a more competitive relationship with China while other countries, such as the Philippines and Singapore, saw the level of competition decline. This appears to be a reflection of the difference in the competitiveness in IT related goods among these countries. Competition with China increased in finished IT goods versus each country, but the level of competition in IT components declined for each country except Korea.

Fourth, export functions using data between 1998 and the present suggest that Singapore has a "win-win" trade relationship with China. That is to say, rising Chinese exports are linked to rising Singaporean exports. As for other countries, China's rising share of the world export market seems to offer both a beneficial and an adverse effect. Rising Chinese exports lead to increases in imports of intermediate goods (which support the region's exports), but also reduce exports to third countries.

Finally, for structural reform in NIEs and ASEAN to progress smoothly along with China's industrialization, and for industry in these countries to move into production of more sophisticated goods, direct investment of foreign capital seems to be a key. To this point, however, it is unclear if this structural adjustment is taking place smoothly. It is therefore important and desirable for these economies to promote a good environment for business investment.

1 The share of manufacturing in Hong Kong's output is quite low, so Hong Kong has been left out of the analysis. Taiwan, however, has been included in the regression analysis, but the absence of SITC trade data has caused it to be excluded from the first part of the analysis. Malaysia, on the other hand, has been excluded from the regression analysis due to lack of data. Japan is included in the first part of the analysis for reference.

2 Primary products' share of imports has risen from 16.7% in 2002 to 17.6% in 2003 to 20.9% in 2004.

3 Even among components, however, the factor intensities of production is very different. Semiconductors serve as a representative example, as the pre-production of silicon wafers is very capital intensive, but the assembly and testing (post-production) is very labor intensive.

4 Around 30% of Japan's exports are in competition with China, making it the lowest ranked country included in the analysis.

5 Ahearne, Alan G., John G. Fernald, Prakash Loungari and John W. Schindler [2003], "China and Emerging Asia: Comrades or Competitors?" International Finance Discussion Papers, No. 7898, Board of Governors of the Federal Reserve System. In this paper, the authors construct and estimate export functions use pooled annual data including foreign demand, real effective exchange rates and Chinese real exports to capture the impact of China's rising global presence. All variables are in annual terms. The results indicate that the coefficient related to China is neither negative nor significant, suggesting that the relationship between China and NIEs and ASEAN is more like "comrades" than "competitors".

6 The definitions of each country's real exports are as follows. For Korea, Taiwan and the Philippines, the national account component of real exports is used, for Thailand that country's published real export volume figures were used and for Singapore the published measure of real exports was used. For Indonesia US dollar-based exports were converted into local currency and then deflated by the wholesale price index for exports.

7 There are two differences between this article and the above-mentioned Fed paper. The first is that in the Fed paper the variable used to measure the emergence of China's presence is growth in China's real exports. The growth in China's share of world exports is used here. Growth in China's share of world exports seems to capture China's rise more purely than the simple growth of its exports. The second is that the previous paper uses pooled annual data from 1983 to 2003. This paper uses quarterly data and estimates individual export functions for each country.

8 For Indonesia, the wholesale price index for exports begins in 1Q 1999.