CHAPTER 2

China's Export of Sophisticated Products to MRBC: The Case of Machinery and Electronic Appliances

Xingmin Yin

This chapter should be cited as:

Xingmin Yin, 2010. "China's Export of Sophisticated Products to MRBC: The Case of Machinery and Electronic Appliances." In *Japan and Korea with the Mekong River Basin Countries*, edited by Mitsuhiro Kagami, BRC Research Report No.3, Bangkok Research Center, IDE-JETRO, Bangkok, Thailand.

China's Export of Sophisticated Products to MRBC: The Case of Machinery and Electronic Appliances

Xingmin Yin

INTRODUCTION

The financial crisis has weakened the world economy since September 2008. Global trade has been affected adversely by a sharp decline in credit to finance imports and exports. Although world trade grew by two percent in volume terms over the course of 2008, world economic growth measured by total production, or gross domestic product (GDP), slowed abruptly in 2008 and in the first half of 2009. It is a notable aspect of the current slowdown in world trade due to the synchronized nature of the decline in exports and imports of major developed and developing countries. Asia's economic growth in GDP terms in 2008 was only two percent. By contrast, developing Asia grew by 5.7 percent, led by China at nine percent, the strongest growth of any major economy.[1]

Throughout the global recession in 2008-2009, China has led the economic recovery in East Asia through an unprecedented stimulus fiscal policy. This stimulus fiscal policy has raised and strengthened domestic demand and rapidly increased trade turnover between China and its Asian trading partners, including MRB countries, since April/May 2009.

Against this background, the first aim of this paper is to evaluate the recovery of trade between China and MRBC. The second is to investigate the special features of China's trade of sophisticated machinery and electronic products with Myanmar, Thailand, and Vietnam over the period 2007-2009. The third is to present the major factors of China's exports of sophisticated products and provide further explanations on

Xingmin Yin is Professor of International Economics at Fudan University, Shanghai, China. His correspondence email:yin1953@fudan.edu.cn

[1] China Statistical Bureau, *2009 China Statistical Yearbook*, Beijing, 2009, p.40.

the export role of sophisticated products in the regional industrialization of low-income countries with special reference to MRBC. The fourth and last aim is to present the conclusion and provide implications for the trade of sophisticated products between China and the MRBC region in the next 10 years.

1. THEORETICAL DISCUSSION ON THE SOUTH-SOUTH TRADE OF SOPHISTICATED PRODUCTS

It is argued by many international economists that China's trade pattern cannot be explained solely by factor endowments. But others propose some counterarguments to defend the traditional trade theory.[2] Manifestly, this study takes a preferential point of view to support the idea of technological sophistication in South-South trade. It is, however, necessary to review the theoretical discussions on the trade patterns for developing countries.

1.1 Traditional Trade Theory

The principle of comparative advantage dictates that trade patterns are determined by how relative costs of production within a country differ from those in the rest of the world. According to the neoclassical model, the basis for trade arises not because of inherent technological differences in labor productivity for different commodities between different countries but because countries are endowed with different factor supplies. Given different factor supplies, relative factor prices will differ, and so too will domestic commodity price ratios and factor combinations. Countries with cheap labor will have a relative cost and price advantage over countries with relatively expensive labor in commodities that make abundant use of labor. They should therefore focus on the production of these labor-intensive products and export the surplus in return for imports of capital-intensive goods. Conversely, countries well endowed with capital will

[2] UNIDO, *Industrial Development Report 2009 --Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries,* Vienna, 2009, Chapter 2.

have a relative cost and price advantage in the production of manufactured goods, which tend to require relatively large inputs of capital compared with labor. They can thus benefit from specialization in and export of capital-intensive manufactures in return for imports of labor-intensive production from labor-abundant countries.[3]

Therefore, countries have different endowments of factors of production. Some countries, like Japan, have large amounts of capital per worker and are thus designated capital-abundant countries, which will tend to specialize in such products such as automobile, machinery, sophisticated electronic goods, and computers. Others, like China, Myanmar, Thailand, and Vietnam, have little capital and much labor and are thus designated labor-abundant countries, which should specialize in textiles, garments, toys, and wood products. This model predicted that all countries gain from trade and world output is increased.

This theory, which played a predominant role in the literature on trade and development, encouraged developing countries to focus on their labor- and land-intensive primary product exports. Actually, there are still many publications supporting this theory over the last decade.[4]

1.2 Arguments for Trade of Sophisticated Products in Developing Countries

It was surprisingly discovered, however, that labor-abundant developing countries, with the exports of sophisticated products, have experienced higher economic growth rates and income per capita in the past three decades. This poses a big challenge to the traditional trade theory. As announced by United Nations Industrial Development Organization (UNIDO) in 2009, "The growing complexity of exports from developing countries can be captured in part by two ratios: the share of manufactured exports in total exports, and the share of medium- and high-technology exports in total manufactured exports." Furthermore, East Asia, which by far has the most complex

[3] Michael P. Todaro, *Economic Development*, Longman, sixth edition, 1997, pp.431-432.
[4] Prema-chandra Athukorala, "The Rise of China and East Asian Export Performance: Is the Crowding-Our Fear Warranted?" *The World Economy*, Vol.32, No.2 (February 2009), pp.234-266.

export structure among the developing regions, contributed to the high-technology boom in the South-South trade.[5]

As more and more evidence shows, successful developing country exporters have taken multiple paths in terms of the sophistication of their exports. For instance, Malaysia—

a resource-rich country—began its industrial transition in 1976 with a manufactured export structure that was substantially less sophisticated than the level predicted by its income per capita. By 2003, it had achieved one of the most sophisticated export structures among developing countries, well above the level predicted, based on its income. Singapore moved in a very similar fashion.[6] Furthermore, China is perhaps another interesting case for the exports of sophisticated products. It was widely recognized that China's exports of electronics and machinery has generally been in the low value-added category with the labor-intensive portion of the production process being conducted in China.[7] Actually, China has experienced the most rapid rate of growth in the sophistication of its exports since 1992. Through its unprecedented industrialization and integration into the world economy in the past three decades, China is by far the largest manufacturer in the developing world. The growth of China as a manufacturing powerhouse is rapidly reshaping the opportunities in global markets, particular in East Asia. The evolution of China's manufacturing sector and the strategy it took to attain scale and competitiveness and produce a wide range of products is a point of interest of many developing countries. The growth of manufactured exports from China has steadily increased over the years, which shows the different features of its successful story that undeniably challenges the traditional trade theory.

Recently, Harvard economist Dani Rodrik pointed out a significant characteristic of

---

[5] UNIDO *Industrial Development Report 2009 --Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries,* Vienna, 2009, p.40.
[6] UNIDO *Industrial Development Report 2009 --Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries,* Vienna, 2009, p.47.
[7] Prema-chandra Athukorala, "The Rise of China and East Asian Export Performance: is the Crowding-Out Fear Warranted?" *The World Economy*, Vol.32, No.2 (February 2009), pp.234-266.

China's trade strategy: while labor-intensive exports have always played an important role in its export basket, China also exports a wide range of highly sophisticated products. Indeed, China is an outlier in terms of the overall sophistication of its exports. Its export bundle is that of a country with an income-per-capita level three times higher than China's. China has somehow managed to latch on to advanced, high-productivity products that one would not normally expect a poor, labor-abundant country like China to produce, let alone export. Although there were a few studies that proposed the role of technology in China's export dynamics in the late 1990s,[8] the contribution of sophisticated exports to the economic growth of developing countries was not widely recognized until recent publications such as "What's so special about China's exports?" A major argument to the exports of sophisticated products from China can be summed up as follows: Once investors in a country "discover" a number of higher productivity products that can be exported, this sets off a powerful demonstration effect. Other investors are drawn in, and as the sector and its suppliers expand, resources get pulled from low-productivity activities into higher productivity activities. This kind of growth driven by differential productivity across sectors and structural change lies at the root of China's economic performance. Thus, the productivity gains associated with producing a set of sophisticated exportable is spread around the economy as labor moves across industries and across space to the higher productivity exportable activities. [9] With the evolution of this kind of activities to industries, a nation's comparative advantage will be fundamental changed.

Matching the results of recent empirical studies, the conclusions made by UNIDO seem to be very powerful in terms of the increasing trade propensity toward sophisticated products: greater export sophistication was leading the economic growth in the fast-growing middle-income countries.[10] Therefore, China's case reveals that the

[8] Lo, Dic and Thomas M.H. Chan, "Machinery and China's nexus of Foreign Trade and Economic Growth," *Journal of International Development*, 29(1), 2001.
[9] Rodrik, Dani. "What's So Special about China's Exports?" *National Bureau of Economic Research Working Paper*, No.11947.
[10] UNIDO *Industrial Development Report 2009 --Breaking In and Moving Up: New Industrial*

exports of sophisticated products are not a special privilege for the developed economies. In the next section, we turn the discussion to the new features of China's trade with MRB countries over the previous two to three years.

2. TRADE RECOVERY BETWEEN CHINA AND MRBC IN 2009

There are many opinions regarding the recovery of the world economy. Results suggest that recession associated with financial crisis tends to be unusually severe and recovery is typically slow in the developed countries. One question is, can countercyclical policies help shorten recessions and strengthen recoveries? Obviously, countercyclical monetary policy can help shorten recession, but its effectiveness is limited. By contrast, expansionary fiscal policy seems particularly effective in reducing the duration of recessions and boosting recoveries.[11]

Compared to any large economy, China seems on the road to quick recovery and is expected to pave the way for a more robust economic performance over the medium term under the unprecedented expenditure of its fiscal stimulus package worth US$586 billion. The country's GDP is expected to grow to about 8.5 percent in 2009 and to 10.5 percent in 2010. Compared with the developed countries, the strong recovery of the Chinese economy has a positive impact on the trade performance of China and MRB countries over the previous months.

2.1 Overview of Trade Performance across MRB Countries

Table 1 shows a comparison of GDP and trade growth performance across the MRB countries and China in 2007-2008. China has a better performance both in GDP and trade indicators than any MRB country during the period. GDP grew slower in 2008 than in 2007 for MRB countries. Thailand experienced the worst drop, from 7.7 percent to 1.2 percent, given its heavy dependence on exports to developed countries.

Challenges for the Bottom Billion and the Middle-Income Countries, Vienna, 2009, p.48.

[11] World Trade Organization (WTO), *World Economic Outlook: Crisis and Recovery*, Geneva, April 2009, pp.125-126.

Table 1 Economic and Trade Performance across MRBC and China, 2007-2008

	Real GDP Growth Rates, %		Current Account Balance % of GDP		Trade Growth, % Exports		Imports	
	2007	2008	2007	2008	2007	2008	2007	2008
Cambodia	10.2	7.0	-3.0	-7.7	10.7	11.5	14.2	19.5
Lao, PDR	7.9	7.5	2.6	..	5.2	26.0	33.0	25.8
Myanmar	5.5	2.0	..	..	35.5	-0.3	26.5	21.1
Thailand	7.7	1.2	6.1	-0.1	17.2	16.9	8.7	27.6
Vietnam	8.5	6.2	-9.9	-14.1	16.1	16.3	21.9	37.0
China	13.0	9.0	11.5	10.2	25.7	17.3	20.7	18.4

Sources: United Nations, ESCAP, *Economic and Social Survey of Asia and the Pacific 2009*, pp.174-182.

Nevertheless, the high price of commodities during the first half of the year benefited some countries such as Vietnam. The general slowdown in exports as a result of the deepening international financial crisis in the second half prevailed, and current account balances deteriorated across MRB countries. Until 2008, most MRB countries continued their current account deficits. For instance, Cambodia's current account deficit increased from 3 percent of GDP in 2007 to 7.7 percent in 2008. In Vietnam, the current account deficit deteriorated from 9.9 percent to 14.1 percent compared to the previous year, with most of the decline coming during the first half of the year. [12]

In Thailand, the trade balance became -0.1 percent of GDP in 2008, a far cry to the 6.1 percent of GDP registered in 2007.

Based on these figures, it is quite clear there was a significant difference between China's huge amount of trade surplus and the trade deficits of the MRB countries during the period 2007-2008.

[12] United Nations, ESCAP, *Economic and Social Survey of Asia and the Pacific 2009*, New York, 2009, p.136.

2.2 A Sign of Recovery in MRB Countries

The outlook for MRB countries has darkened since the fourth quarter of 2008, as the economic setback deepens. The export sector is expected to be hardest hit by the shrinkage of import demand of the developed countries. When output growth is declining in MRB countries, trade growth falls even more as it is evident in the first half of 2009. Further intra-regional trade flows should be triggered to induce some shock-absorbing effects on the regional economy. The trade development between China and MRB countries seems to be on the road to recovery from April to September 2009. China's exports expanded by 36.14 percent and imports grew by 34.57 percent between December 2008 and September 2009. For instance, China's exports to Vietnam significantly increased by 40.33 percent, 39.22 percent to Thailand, and 9.67 percent to Lao PDR. China's imports from Myanmar increased by 47.11 percent, 49.75 percent from Thailand, 55.36 percent from Lao PDR, and 19.87 percent from Vietnam, and only decreased by 21.60 percent from Cambodia.

The share of China in MRBC's merchandise trade set new records in September 2009, with the volume of exports rising to US$6448.17 million, from US$5561.13 million in August, and from US$4627.43 million in December 2008. Furthermore, the volume of China's exports to the MRBC increased by 36.14 percent over the previous nine months, rising from US$2502.26 million in December 2008 to US$3406.61 million in September 2009. At the same time, China's imports from the MRBC rose from US$2096.11 million to US$2820.73 million, or a growth of 34.57 percent.

The high growth rate of trade is changing the overall picture of China's position in MRBC trade turnover. In most cases, China keeps its position with the MRBC's share in merchandise trade. For instance, China accounted for 33.94 percent of Myanmar's exports in August 2008 and 43.42 percent in March 2009. As for Vietnam, China actually increased its share of exports from 17.81 percent in August 2008 to 27.13 percent in June 2009. China kept its share with Thailand's exports relatively stable, from 8.67 percent in August 2008 to 8.59 percent in June 2009. Surprisingly, the

China-Thailand merchandise trade in volume terms expanded by 45.87 percent over the previous nine months. In general, China-MRBC trade development has rapidly recovered since March/April 2009.

2.3 A Steady Growth of Bilateral Trade

It has been theoretically analyzed that the evolving pattern of global trade in manufactures reflects some important trends.[13] First, trade in manufactures continued to grow much more rapidly than manufacturing output. Second, most MRB countries are capturing China's increasing domestic demand for manufacturing goods as well as agricultural goods. And thirdly, Thailand and Vietnam dominate the success story in regional trade integration between China and MRB countries.

As an emerging large economy, China has global trading interests particularly in Asia. In 2008, Asian countries accounted for 46.62 percent and 62.04 percent of China's total exports and imports, respectively. The European Union (EU-15) took 15.11 percent and the USA had 13.02 percent. Together, these regions accounted for 81.45 percent of China's total trade. China's trade with the ASEAN region is significant, reaching US$231.32 billion in 2008, accounting for 9.02 percent of China's total trade, up by 14.22 percent over the 2007 levels (US$202.53 billion). Thus, ASEAN turns to be the fourth largest trading partner of China after EU, US, and Japan.[14]

A simple analysis using data on category composition of exports and imports may throw some light on the trends of these changes. Table 2 shows the trend of trade between China and MRB countries over the past two years.

China's merchandise trade with MRBC was valued at US$70.50 billion in 2008, or 2.75 percent of China's total world trade. China-Thailand trade was valued at US$45.03 billion in 2008, increasing 29.99 percent year to year, while China-Vietnam trade totaled US$20.96 billion, up from US$15.12 in 2007, growing at 38.62 percent. Looking at

[13] WTO, *World Trade Report 2008 – Trade in a Globalizing World*, Geneva, 2008.
[14] China Statistical Bureau, *2009 China Statistical Yearbook*, Beijing, 2009, pp.733-736.

small trading partners in MRB countries, China's trade with Myanmar increased from US$2.08 billion to US$2.85 billion, increasing at 37.02 percent, while its trade with Cambodia increased at 26.26 percent, from US$934 million to US$1179.31 million at the same period. In contrast, China's trade with Lao PDR was smaller than the other members of MRBC, valued at US$476.96 million in 2008, increasing at 80.75 percent year to year.

Table 2 China's Trade Balance with MRB Countries, US$ million

	Jan.-Sept. 2009			2008		
	Exports	Imports	Balance	Exports	Imports	Balance
Cambodia	672.32	23.02	649.34	1135.48	43.83	1091.65
Lao. PDR	250.33	232.01	18.32	297.82	179.10	118.72
Myanmar	1536.45	446.73	1089.72	2134.48	718.10	1416.38
Thailand	9294.07	17396.39	-8102.32	16959.59	28070.24	-11110.65
Vietnam	10979.56	3323.17	7655.79	16240.20	4719.66	11520.54
Total	22732.77	21421.92	-1310.85	36767.57	33730.93	3036.64

Source: Compiled from the UN Comtrade database.

Among MRB countries, Thailand and Vietnam are China's major trading partners in the entire region up to the present day. The share of Thailand in China's merchandise trade was 66.44 percent in August 2008 and 60.82 percent in September 2009, while Vietnam accounted for 26.99 percent and 32.95 percent of the total trade turnover between China and MRB countries at the same period, respectively. Together, these two countries accounted for 93.77 percent of China's trade to MRB countries in September 2009.

Figure 1 shows the fluctuation of export-import volume between China and all members in the region from 2007 to the first half of 2009. Figure 1(a) covers the trade with Myanmar, followed by Figure 1(b) on Thailand. Figures 1(c) and (d) describe the trade to Vietnam and Lao PDR, respectively. Overall, Figure 1 shows that all these countries significantly experience trade movement going down and up to some degree.

Some are certainly to be affected more than others given their higher dependence on the US market such as Cambodia, while Myanmar has not be affected so much, since it has not been able to effectively export its manufactured products.

Data from the last few months of 2008 show a marked deceleration in manufacturing exports and imports between China and MRB countries. In October, China's exports to Myanmar fell by 60 percent from US$310.59 million to US$129.04 million. Exports to Cambodia contracted the most for two months, from US$215.18 million to US$64.31 million. China's exports to other MRB countries also dramatically declined. Its exports to Thailand fell by 50 percent and to Vietnam by 68 percent. This trend worsened, and by January 2009, total exports plummeted 25 percent from US$2907.37 million of the previous year to US$2182.25 million.

Figure 1: Trend of China's Trade with MRB Countries

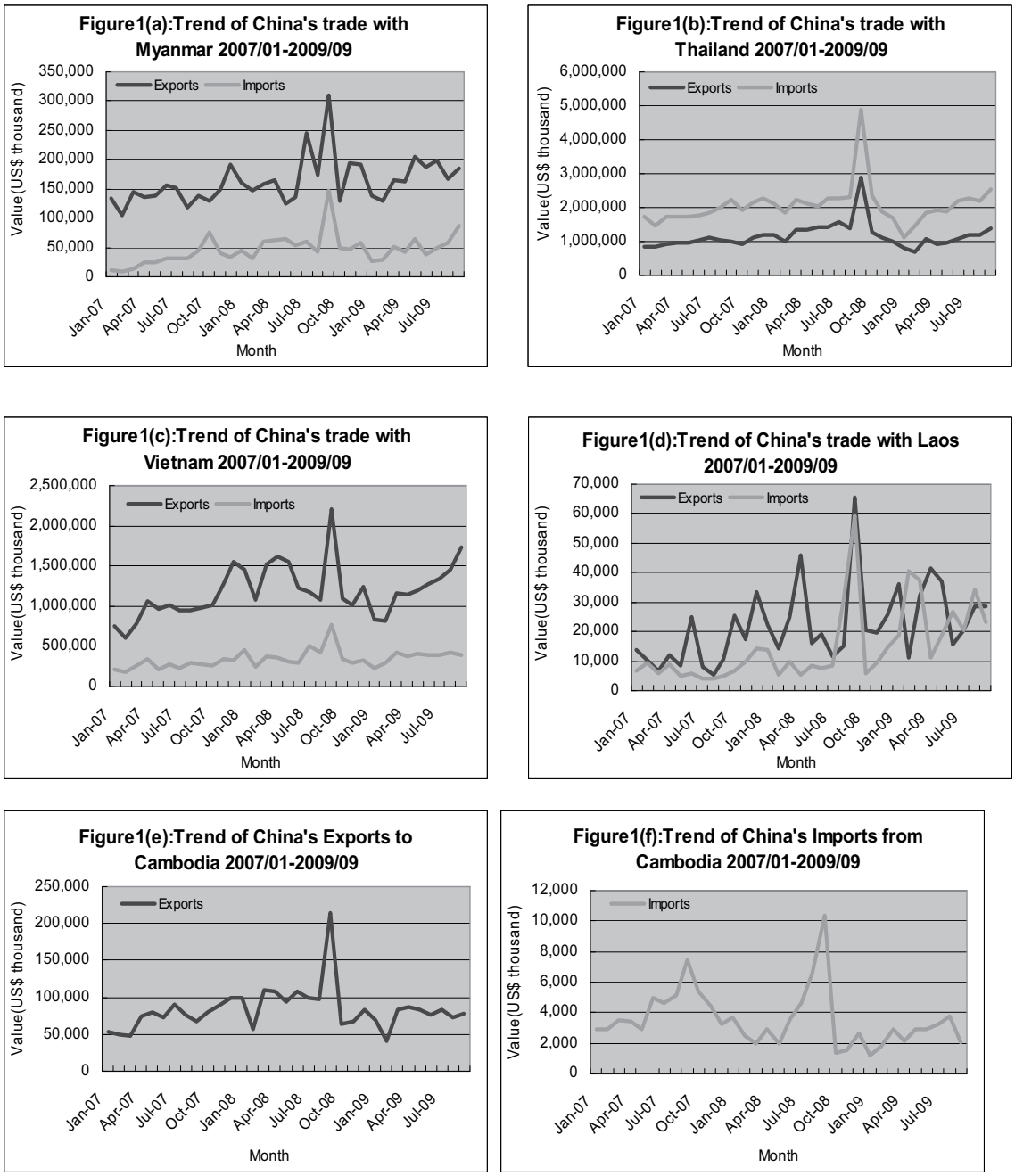


Figure 1 (e) and (f) show the unusual turbulence of China's exports to and imports from Cambodia during the surveyed period. In contrast with other MRBC trade, Cambodia has not recovered well in its trade with China. China-Cambodia trade dropped by 7.44 percent from US$86.60 million to US$80.16 million in September 2009. It is not only product concentration that Cambodia is facing in its exports but also

market concentration. About 85 percent of the exports of Cambodia are destined to developed countries and the magnitude of market concentration has not changed over this period. Among the developed countries, the US (about 55%) has been the largest market for Cambodia. Therefore, it is understandable that China-Cambodia trade will not be fully recovered as long as Cambodia cannot increase its exports to the US market.

However, the trade performance between China and MRBC has not been so bad over the period of January-September 2009 except for Cambodia. For instance, the volume of China's imports from Lao PDR increased to US$232.01 million during that period in comparison with the US$179.10 million worth of imports for the whole year of 2008. More importantly, China's trade balance with MRBC turns to be a deficit of US$1310.85 million for the previous nine months, while China was in a surplus position of US$3036.64 million in 2008. Vietnam's rapid export growth to China primarily reflects the production chain expansion between the two countries. Here again, China's exports have fluctuated for a number of years, while imports from Thailand have exhibited a revival since April 2009 due to the strong recovery in China's industry. It can be seen from Figure 1, in general, that China's trade turnover with MRBC has shown a recovery trend since March/April 2009.

The three case studies below will discuss the export sophistication of trade between China and Myanmar, Vietnam, and Thailand.

3. CASE STUDIES ON CHINA'S TRADE SOPHISTICATION WITH MRBC

The growth of China as a manufacturing powerhouse is rapidly reshaping the opportunities in regional economies. The ranking of manufacturing activities according to product sophistication generally uses a narrower classification of industrial activities into high-, medium- and low-technology categories by process technology. According to the IDO, over the entire 25-year period, six sectors stand out consistently as highly sophisticated: paper and paper products, fabricated metals, machinery, electric

machinery, transport, and other equipment. Richer countries are intensive exporters of these products. Poor countries intensively export food, tobacco, textiles, apparel, leather, wood, and furniture.[15] It is important to know how the sophisticated nature of China's export products to MRB countries is associated with its industrial growth and restructuring in the past decades.[16]

3.1 A Simple Story of China' Trade Sophistication

China is now the third largest trader after the US and Germany in 2009. The structure of China's exports has been changing rapidly, away from clothing, footwear, other light manufactures, and fuels that dominated its trade in the 1980s and early 1990s, and toward office machinery, telecommunications, furniture, and industrial supplies in the late 1990s and automated data processing equipment and consumer electronics in recent years.[17] Actually, the largest manufacturing sector is machinery, which accounted for 49.78 percent of China's total manufacturing exports in 2008.[18] Besides, China's share in the world market for machinery and electronic appliances has also been consistently increasing that by 2008, its exports of machinery and electronic appliances accounted for about 8 percent of the world market. For instance, telecommunications equipment and integrated circuits and electronic components accounted for 26.1 percent and 8.5 percent of the total world exports in 2007, respectively.[19]

Along with the growth of Chinese exports comes the rapid growth of Chinese imports of sophisticated products, which has the effect of diffusing technology thereby improving industrial capacity. The effects of industrial restructuring are likely to be felt

---

[15] UNIDO *Industrial Development Report 2009 --Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries*, Vienna, 2009, p.45.
[16] Barry Naughton, *The Chinese Economy: Transition and Growth*, The MIT Press, 2007, Chapter 14. Loren Brandt and Thomas G. Rawski, *China's Great Economic Transformation*, Palgrave Macmillan, 2008, Chapter 15. Xingmin Yin, "China's Integration into the World Economy: An Assessment of Industrial Development," *China Report* 40:4 (2004), pp.391-405.
[17] Barry Eichengreen, Yeongseop, and Hui Tong, "China and the Exports of Other Asian Countries," *Review of World Economics*, Vol.143:2 (2007), p.202.
[18] China Statistical Bureau, *2009 China Statistical Yearbook*, Beijing, 2009, p.726.
[19] WTO, *2008 International Trade Statistics*, Geneva, 2008, pp.73-103.

especially intensively by China's Southeast Asian neighbors. Geographical proximity, shared borders, and existing networks of overseas Chinese are among the reasons why large amounts of trade between China and MRB countries are to be expected.

The following cases discuss the bilateral flows of major commodities based on the sophistication of products between China and Myanmar, Vietnam, and Thailand. Cambodia and Lao PDR would not be covered due to unavailable data.

3.2 The Case of Myanmar

According to recent data, China-Myanmar bilateral trade amounted to US$1983.18 million in the previous nine months of 2009. Myanmar shows quite a different pattern in terms of trade structure. Not surprisingly, there was a fall in global exports of all manufactured goods to Myanmar in the fourth quarter of 2008. After early 2009, there was some growth in China's exports to Myanmar due largely to the tariff refund program that increased the propensity to export to Myanmar. .

Regarding the trade relationship between China and Myanmar, Myanmar does not have a comparative advantage for many of the manufacturing products. China imports from Myanmar a considerable amount of mineral and agricultural goods such as ores, wood and articles of wood, oil seed, grain, edible fruit, pears, precious stones, and edible vegetables. The value of these eight categories of goods was US$482.40 million in 2008, which accounted for 81.10 percent of China's imports in 2008. Table 3 presents the top five exports to Myanmar for 2007 and 2008.

Table 3 Major Sectors of China's Exports to Myanmar, 2007-2008

Products	2007		2008	
	Value	Percentage	Value	Percentage
Machinery	277.63	16.33	370.56	17.36
Electric and electronic	183.27	10.78	217.65	10.20
Vehicles	336.54	19.80	206.60	9.68
Articles of iron and steel	125.01	7.36	118.90	5.57
Iron and steel.	155.22	9.13	104.44	4.89
Sub-total	1077.67	63.40	1018.15	47.70

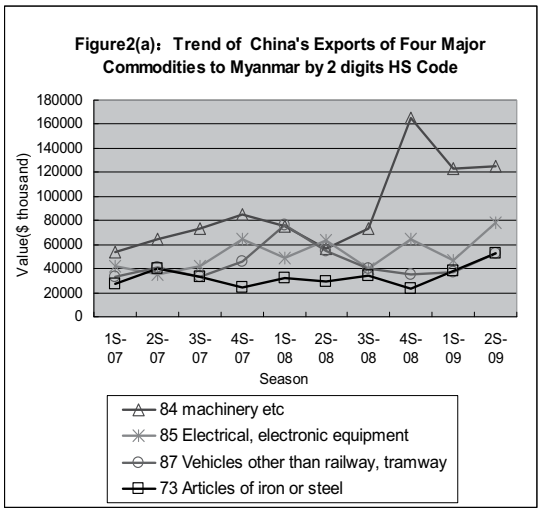
Note: Value unit: US$ million.

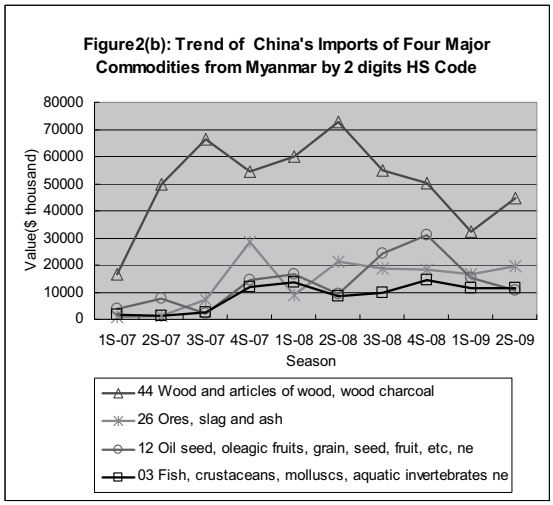
Source: Compiled from the UN Comtrade database.

In contrast, when looking at the ranking of exporting composition in 2008, the value of machinery increased to US$370.56 million in 2008 from US$277.63 million in 2007, or a growth of 33.47 percent, while the exports of vehicle decreased to US$206.60 million from US$336.54 million at the same period. Another winner in China's exports to Myanmar was electric and electronic products, of which the value increased from US$183.27 million to US$217.65 million, or a growth of 18.76 percent. The exports of machinery and electronic products are an important way of technology transfer from China to Myanmar.

The major sectors of China's exports to Myanmar during the period 2007-2009 are presented in Figure 2. All of these products were machinery, electric and electronic goods, vehicles, and steel products. The value of vehicles was US$336.54 million, which has the largest share of China's exports to Myanmar, or more than 16.33 percent of machinery exports in 2007. This can be seen from Figure 2 (a), which covers the trade trend for every quarter, from the first quarter of 2007 to the second quarter of 2009. The exports of China's electric and electronic goods, vehicles, and articles of iron and steel have increased since the end of 2008, while the exports of machinery has registered a big drop and then became relatively stable in the first half of 2009. They are all sophisticated products in terms of value and technology.

Figure 2 Trend of China's Trade with Myanmar by Major Sectors





Turning to the technology sector, Figure 2 also shows a different analysis of machinery and electric and electronic equipment. The first striking result is the sharp recovery in electric and electronic products in the second quarter of 2009. The second is the export recovery of vehicles other than railway in the first quarter of 2009. In the case of articles of iron and steel, this is strongly supported by China's export propensity in the steel industry. It is also notable that, unlike the sector of electric and electronic products, there has not yet been a full recovery of China's export to Myanmar in machinery since between the fourth quarter of 2008 and the second quarter of 2009.

Figure 2 (b) provides the plotted curve of imported major commodities from Myanmar between the first quarter of 2007 and the second quarter of 2009.

The fact that the manufacturing sector in Myanmar is still in its infancy adversely affects not just its growth but also its trade prospects. It is generally assumed that industrialization by way of increasing manufacturing output leads to more trade in industrial products. What needs to be recognized, however, is that manufacturing exports will boom only if capacities for the same are created in Myanmar. In this context, China's exports of sophisticated products could be of considerable relevance to Myanmar's industrial development.

In the case of Myanmar, because of its lower level of industrial capacity, it would have no future in exporting capital goods. It is therefore important for the economic growth of less-developed countries such as Myanmar to upgrade their low level of industrialization, which may be facilitated by importing sophisticated products for the different sectors or industries which are unable to produce these. This will help in the diffusion of technology—whether low, intermediate, or high—across sectors and industries. This is an important implication for the exports of sophisticated products to Myanmar that may propel its economic growth through technology learning effects from imported technological products.

3.3 The Case of Vietnam

China's volume of export to Vietnam is rapidly growing. Somehow, the two countries are complementary in industrial structure. During 2007-2008, foreign trade turnover between China and Vietnam grew at 38.65 percent, from US$15117.58 million to US$20959.86 million, in which exports to Vietnam increased 36.57 percent, while imports from Vietnam rose 46.29 percent.

China's exports to Vietnam were worth US$16240.20 million in 2008 and US$10979.56 million in January-September 2009. These primarily included machinery, electric and electronic goods, vehicles, iron, and steel products which accounted for 53.22 percent and 38.94 percent of total export turnover for 2008 and January-September 2009, respectively. All these sectors are well equipped to export and at competitive prices. Despite China's strong overall trade performance, its exports in some product categories declined dramatically towards the end of 2008. The export of machinery fell at 23 percent in the first quarter compared with the same period in the previous year. Table 4 lists the eight sectors of China's exports to Vietnam in the past three years. In the second quarter of 2009, the volume of these products reached US$2241.37 million, accounting for 34.78 percent of total exports.

Table 4 also shows the real exports of the top five products to Vietnam. The general trend can be summarized as follows. Firstly, China's basket of exports to Vietnam expanded in 2008 with items of capital goods like machinery (US$2109.59 million), electric and electronic equipment (US$1565.28 million), vehicles (US$690.83 million), and articles of iron and steel (US$369.51 million). Secondly, the items of sophisticated products imported from Vietnam were electric and electronic equipment (US$351.37 million) and machinery (US$315.40 million). Thirdly, in terms of shares, the major commodities exported to Vietnam during 2008 were machinery (12.99%), iron and steel (9.78%), electric and electronic equipment (9.64%), mineral fuels (5.32%), and vehicles (4.25%). These sectors together accounted for 41.98 percent.

Table 4 Major Sectors of China's Trade with Vietnam, 2007- June 2009

	2007		2008		2009, Value	
	Value	%	Value	%	S1	S2*
Top 5 export products						
84.Machinery	1687.48	14.19	2109.59	12.99	462.69	603.31
85.Electric and electronic	1345.03	11.31	1565.28	9.64	493.71	580.03
87.Vehicles	638.20	5.37	690.83	4.25	75.37	215.56
73.Articles of iron and steel	347.78	2.93	369.51	2.28	103.70	112.21
72.Iron and steel	2308.75	19.42	1588.91	9.78	103.58	99.10
Sub-total	6327.24	53.22	6324.12	38.94	1239.05	1610.21
Other major products						
27.Mineral fuels	793.37	6.67	863.82	5.32	261.28	389.71
60.Knitted fabrics	342.84	2.88	353.83	2.18	84.40	137.50
52.Cotten	371.44	3.12	355.83	2.19	85.96	103.93
Imports of sophisticated goods						
85.Electric and electronic	286.61	8.88	351.37	7.45	83.49	154.80
84.Machinery	250.06	7.75	315.40	6.68	35.54	47.29

Notes: The value of unit is US$ million. S1: the 1st quarter; S2: the 2nd quarter.
Source: Compiled from the UN Comtrade database.

Contrary to popular belief, there has not been a market decline in the value of sophisticated goods traded between China and Vietnam in the previous months of 2009

as can be seen in Table 4. The exports of machinery reached US$462.69 million in the first quarter of 2009, 14.54 percent higher than those of the third quarter of 2008. In the second quarter of 2009, the exports of machinery increased to US$603.31 million, growing at 78.9 percent year to year. The exports of electric and electronic equipment increased at 14.91 percent year to year, from US$429.66 million to US$493.71 million. The largest drop of China's exports to Vietnam was in iron and steel, from US$850.39 million to US$103.58 million, or a contraction of seven times year to year. Another loser was vehicle exports, which contracted three times, from US$310.63 million in the first quarter of 2008 to US$75.37 million in the first quarter of 2009.

In terms of machinery and electric and electronic equipment as a whole, China has a stronger competitive advantage than Vietnam, as shown in Table 4. As for China's imports from Vietnam, mineral products and agricultural goods are major areas as Table 5 shows. Items exported by Vietnam to China are almost all low-technology, labor-intensive manufactures, aquatic products, and minerals. The share of sophisticated manufacturing products remains relatively small. For instance, the share of electric and electronic products in China's imports from Vietnam slightly decreased from 8.88 percent in 2007 to 7.45 percent in 2008 (Table 4). The share of machinery imports had fallen to 6.68 percent of total import turnover from 7.75 percent in 2007. Clearly, mineral products dominate Vietnam's exports to China. They constitute a very large share of China's total imports from Vietnam. The topmost mineral imports are mineral fuels, oils, and distillation products. Next are agricultural goods such as edible vegetables, edible fruit, nuts, peel of citrus fruit and melon. The volume of imports of edible vegetables and fruits has increased from 6.43 percent in 2008 to 17.04 percent in the first half of 2009. Together, mineral products, edible vegetables, and edible fruits make up 56.18 percent of total imports in the first half of 2009. Not surprisingly, most of these imported products reflect the low level of industrial manufacturing in Vietnam.

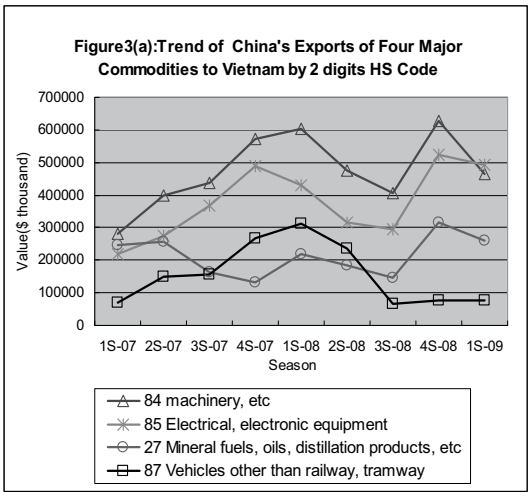
Table 5 Major Commodities of China's Imports from Vietnam, 2007-2009, US$ million

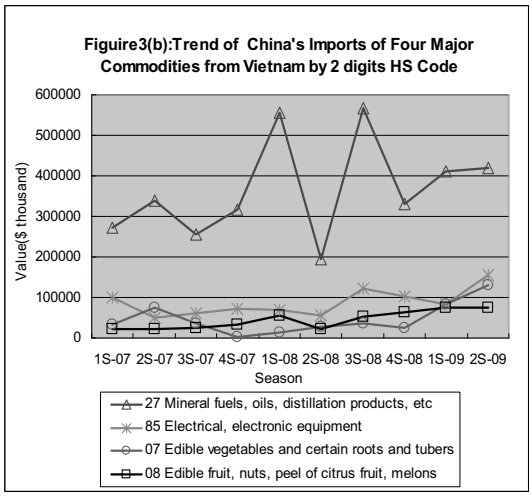
	2007		2008		January-June 2009	
	Volume	%	Volume	%	Volume	%
Mineral products	1184.51	36.71	1649.78	34.96	830.02	39.14
Edible vegetables	147.97	4.59	105.93	2.24	212.62	10.03
Edible fruits	100.81	3.13	197.50	4.19	148.65	7.01
Total	1433.29	44.43	1953.21	41.39	1191.29	56.18

Source: Compiled from the UN Comtrade database.

As Figure 3 shows, there was a slowdown of exports of commodities to Vietnam in early 2009. The total turnover of China's imports from Vietnam was US$3323.27 million over the previous nine months of 2009. Looking closely at Figure 3(a), the exports of electric and electronic equipment and machinery declined not so rapidly as compared to iron and steel products. This indicates that China's sophisticated products, whether in terms of the production chain between the two countries or in terms of the competitive prices of China's machinery, are still strong in Vietnam's market. Figure 3(b) shows the trend of China's imports from Vietnam. One can observe that the import of commodities declined dramatically in the fourth quarter of 2008 and grew steadily in the second quarter of 2009 with a few exceptions. Mineral products have been a key component of China's imports from Vietnam, accounting for 34.96 percent in 2008 and 39.14 percent in the first half of 2009. It seems to be not so easy for Vietnam to accelerate its export of machinery goods to China in the short term to reduce its trade deficit with China.

Figure 3 Trend of China's Trade with Vietnam by Major Sectors





However, it is important to note that the exports of electric and electronic equipment to China increased from US$83.49 million in the first quarter of 2009 to US$154.80 million in the second quarter of 2009, or a growth of 85.41 percent, while the exports of machinery increased from US$35.54 million to US$47.29 million, or a growth of 33.06 percent in the same period. Machinery and electronic appliances are capital goods. Vietnam's exports of these two kinds of products to China are likely to rise under the CAFTA scheme as they recorded high growth rates over the past two years. These two sectors together accounted for 14.13 percent of total exports from Vietnam to China in 2008. This case supports the concept of exports of capital goods for low-income developing countries.

In this regard, an important recommendation that may be valuable for Vietnam's industrial policy includes building a suitable industrial structure for Vietnam through the manufacture and trade of sophisticated products. It is essential that Vietnam not only establishes its labor-intensive industry but also form favorable conditions for the production of machinery and electronic appliances which will change its industrial structure and export composition in the medium and long run. It is predicted that Vietnam will follow China's footsteps in exporting sophisticated products through

intra-industrial trade with China's higher productivity sectors. Therefore, in the case of Vietnam, technology upgrading and other capacity-building measures should be intensively pursued so as to expedite catching up in the technology ladder by way of industrial development.

3.4 The Case of Thailand

The China–Thailand trade pattern features a wider variety of sophisticated products compared to other MRB countries. The share of trade within industrial sectors has increased in overall terms and for all categories of goods. This explosion in intra-industry trade is driven by two very distinct processes. The first is exchange of similar final products, reflecting consumers' search for variety and product differentiation, often due to branding. The second from intra-industry trade is "trade in tasks". Actually, one of the major trends in global manufacturing is fragmentation of production into geographically dispersed, discrete tasks. This task-based production offers a potential for developing countries that have not yet succeeded in breaking into global markets for products to enter global production chains through exporting tasks.[20]

The value of China's exports to Thailand has increased at 41.64 percent in 2008 year to year, while imports increased at 23.85 percent. China's exports to Thailand were worth US$6733.67 million in January-July 2009, while imports were worth US$12673.13 million. The sizeable expansion of Thailand's trade with China is attributable to China's increasing status as an important production base for many multinational enterprises.

For instance, Table 6 clearly reflects China's evolving role as a production base of machinery and electric and electronic sectors within the East Asian region. This is why China is also an important importer of machinery, which is used as intermediate products in the production and export of machinery goods.

[20] UNIDO, *Industrial Development Report 2009 --Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries*, Vienna, 2009, p.49.

Table 6 China's Trade of Sophisticated Products with Thailand, 2007-2009, US$ million

	2007	2008	January-July 2009
84 Machinery			
Exports	2723.07	3002.79	1634.94
Imports	7075.34	8838.63	4401.86
Balance	-4352.27	-5835.84	-2766.92
Ex/Im Ratio	38.49%	33.97%	37.14%
85 Electric & Electronic			
Exports	2539.32	2725.95	1352.34
Imports	5582.89	5980.23	2863.34
Balance	-3043.57	-3254.28	-1511.00
Ex/Im Ratio	45.48%	45.58%	47.23%
Total Trade			
Exports	11973.4	16959.59	6733.67
Imports	22664.7	28070.24	12673.13
Balance	-10691.3	-11110.65	-5939.46
Ex/Im Ratio	52.83%	60.42%	53.13%

Source: Compiled from the UN Comtrade database.

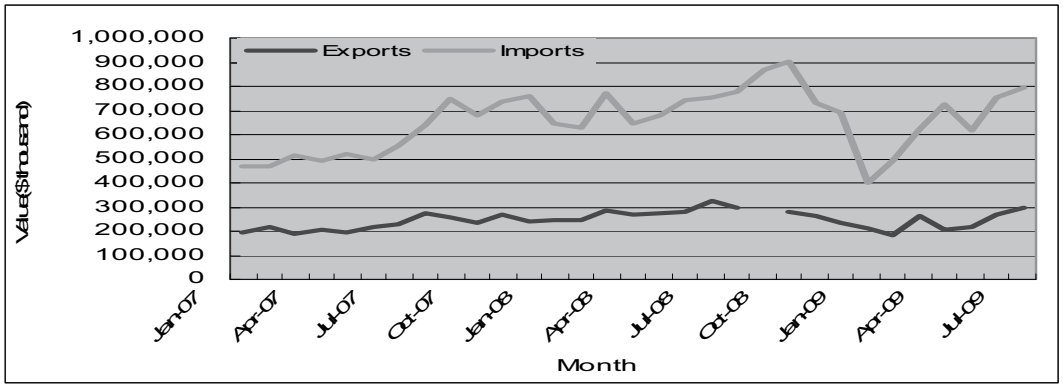
The exports of machinery and electric and electronic equipment to Thailand, which accounted for 22.74 percent and 21.21 percent in 2007 and 17.71 percent and 16.07 percent in 2008, respectively, grew to over 24 percent and 20 percent between January and July 2009. These two sectors together accounted for 44 percent of China's exports to Thailand over the previous seven months of 2009. However, Thailand has a higher coverage of exports of machinery and electric and electronic equipment than China, which accounted for 31.22 percent and 24.63 percent in 2007, and 31.49 percent and 21.31 percent in 2008, respectively. The combined share of these two sectors to China has been increasing, which together accounted for over 57 percent during the period of January-July 2009.

Unlike Vietnam, Thailand has been able to better utilize the global production chain through its higher level of industrial capacity, making it more capable to face regional competition in the area of production and trade of sophisticated products. The total value of exports of machinery and electronic appliances was US$1634.94 million and

US$1752.34 million, respectively, in the first seven months of 2009, while the turnover of imports was US$4401.86 million and US$2863.34 million, respectively, in the same period. The results for machinery imports, disaggregated into components and final goods, confirm the findings of other studies about China's heavy reliance on parts and component inputs from the Asian region for its domestic output and export expansion.[21]

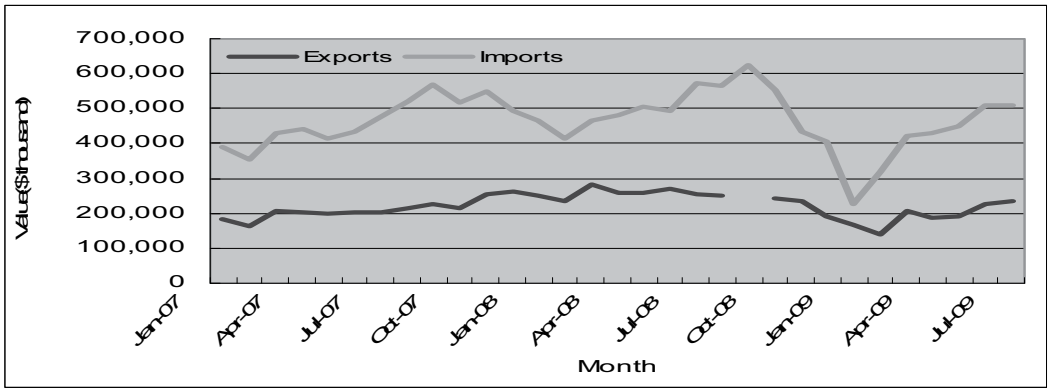
Figures 4 and 5 summarize the findings of this case study. They show the trade balance of machinery and electric and electronic equipment between 2007 and July 2009. The reported value of machinery is observed to very low in comparison with the import value for China. Specifically, the export-to-import ratio for machinery is 33.97 percent in 2008 and 37.14 percent in the first half of 2009. In terms of trade balance, China's deficit reached as high as US$5835.84 million, growing at 34.09 percent. The export value of electric and electronic products is US$2725.95 million, which is much lower than that the import value of US$8838.63 million in 2008. Therefore, the export-to-import ratio for electric and electronic products is 45.58 percent. This ratio only slightly increased to 47.23 percent in the first half of 2009.

Figure 4 Trend of China's Trade of Machinery with Thailand, 2007-2009



[21] Prema-chandra Athukorala, "The Rise of China and East Asian Export Performance: Is the Crowding-Out Fear Warranted?" *The World Economy*, Vol.32, No.2 (February 2009), pp.234-266.

Figure 5 Trend of China's Trade of Electric and Electronic Equipment with Thailand, 2007-2009



Comparing these two sectors, there is not much of a difference with the sophisticated products: the ratio of export to import is 37.4 percent for machinery and 47.23 percent for electric and electronic equipment in the first seven months of 2009.

As can be observed, these two figures show an increasing trend over the previous nine months after a sudden drop in January 2009 due to the financial crisis that seriously affected the global trade scene. Relatively, China's exports to Thailand had been smooth except during the fourth quarter of 2008. It is generally flat although with a significant downward trend over the second half of 2008. However, a more careful examination would show that the imports of these two categories have been rapidly increasing since February 2009, and slightly decreasing in March or April, then increasing again since May 2009. No doubt, an increasing trend means that the demand for intermediate products and resources has increased due to the strong recovery of the Chinese economy since March 2009.

Along with this economic resurgence on China's part, Thailand's economy has also regained its momentum during the previous nine months of 2009 since the rapid drop it experienced in late 2008. In January 2009, China's exports to Thailand only accounted for 9.96 percent of the total trade; by June 2009, this has increased to 13.61 percent. On the other hand, Thailand's exports to China's have increased rapidly in the first half of 2009, from 12.22 percent of total exports in January to 18.97 percent in June 2009. All

of these became possible even in the face of the most serious recession in the developed countries caused by the American financial crisis since the Great Depression.

3.5 Brief Summary

Obviously, the degree of effect of China's sophisticated trade experienced by each of the MRB countries vary depending on the stage of each country's industrial advancement. Among them, Vietnam recorded a persistent increase in exports of machinery and electronic appliances reflecting the rise of trade in tasks.

A positive impact was visible in the trade of sophisticated products between China and the MRB countries, but this impact seems to be country specific or dependent on a given country's comparative advantage in manufacturing production. In machinery and electronic exports, China's superiority reflects its capacity for sophisticated production within regional industrial development stages. There are distinct differences between the patterns of industrial capacity and export sophistication in lower-income and middle-income countries. The results suggest that broadening the industrial base and moving up the product sophistication ladder are important drivers of export sophistication for lower-income countries.

All in all, there appears to be a clear complementarity, rather than competition, in the export performance between China and the MRB countries.

4. CATCHING UP IN THE TECHNOLOGY LADDER

As discussed, China is increasingly exporting more medium- and high-technology products in terms of its process technology. Why should producing exports that embody levels of productivity above an economy's level of income generate growth? This section aims to analyze the real factors of China's exports of sophisticated products to the world market, particularly to the MRB countries, by calculating its global market shares of major sophisticated sectors.

4.1 Impact of CAFTA on China-MRBC's Trade Development

Economic literature has made sensible advances on the issue of free trade areas (FTAs). There is an increasing body of literature that stems from the so-called "new trade theory" suggesting that the benefits of regional integration initiatives could be greater than what traditional economic theory has predicted.[22] Clearly, the literature has intensified other economic effects of FTAs encompassing market expansion, realization of economies of scale, greater competition, and greater diversification of products.

The new wave of regionalism that spread around the world in the past 20 years seems to have extended also in the Southeast Asian region. Most importantly, this new wave of regionalism has spawned trade of wide-ranging geographical connections. Southeast Asian regionalism has been a reaction and response to new forms of regionalism and increasing globalization. ASEAN nations are attracted by the opportunities brought about by China's economic expansion and trade liberalization. They also seek to leverage their FTA with China by forging additional FTAs with important trading partners within or outside the region. That since the free trade area in 2002 to start construction of China-ASEAN bilateral trade grew up to deepen economic integration, strengthening of business linkages. Between 2003 and 2007, China-ASEAN bilateral trade volume has grown at an average rate of over 30 percent annually. In 2008, despite the financial crisis, bilateral trade still increased by 14 percent.

That the vast majority of traded products between China and ASEAN now enjoy zero tariffs is one of the achievements of the FTA between China and ASEAN. The China-ASEAN Free Trade Agreement (CAFTA) has come to be fully implemented on 1 January 2010 for the ASEAN 6 (Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand), and will cover the newer members (Cambodia, Lao, PDR, Myanmar, and Vietnam) by 2015.[23] CAFTA covers a population of 1.9 billion and US$6 trillion worth

[22] Paolo Guerrieri and Denise Dimon, "The Trade Regionalism of the United States and the European Union: Cooperative or Competitiveness Strategies?" *The International Trade Journal*, Vol. XX, No.2, Summer 2006, pp.85-93.

[23] "'Zero-tariff' is Coming to China and ASEAN," 21st Century Report, Column Six, January 4, 2010.

of GDP to become the third largest FTA in the world, next only to the North American FTA and European FTA. In terms of population coverage, it is the largest FTA in the world. Representing the first free trade area agreement signed by China, the CAFTA provides zero tariffs on 90 percent of products traded between China and ASEAN and other favorable policies on trade and investment. In the coming years, China and ASEAN will build more roads, railways, waterways, and communication facilities to facilitate trade development and expand investment on agriculture, resource exploitation, and new industries. Industry-driven and export-driven growth pattern will be further strengthened. Despite the impact of the global financial crisis, the trade volume between China and ASEAN reached nearly US$150 billion in the first nine months of 2009. It is estimated that the trade between China and ASEAN region will grow at 20 percent annually in the coming five years because of the removal of commodity barriers.[24] The potential for further expanding these trade links is apparent if one is to consider the geographical connections between the two sides.

Against this background, MRBC's efforts to formalize regional cooperation into a workable arrangement for the promotion of trade and investment should have fruitful results. Trade volume between China and MRB countries reached US$16.57 billion in January-October 2009. MRB countries are enthusiastic about the prospect of gaining more access to China's huge market. There are two main channels by which the MRB countries can benefit from this free trade accord. China imports a significant part of its raw materials and industrial components in the production of manufactured goods. China will also continue to import more agricultural products and mineral goods. Through the CAFTA, MRB countries can now have a greater participation in the regional economy. This will pave the way to stimulate investment and growth in the region and further promote regional integration.

[24] 21st Century Report, Column Seven, 5th January 2010.

4.2 Evolution of China's Revealed Comparative Advantages

Revealed comparative advantage index (RCAI) is only used to examine the comparative advantage of a given country for different products, sectors, and industries but not to compare the comparative advantage of a given product across different economies.[25] According to recent studies, China increased its level of RCAI from 0.241 in 1992 to 0.462 in 2005, and approached the global average of 0.5.[26] As already discussed, China's export expansion has been underpinned by a shift in the commodity composition of exports away from labor-intensive products and towards the manufacture of sophisticated products. The share of sophisticated manufactures in China's total merchandise exports increased from less than 37 percent in 2000 to nearly 44 percent in 2005 and further to 50 percent in 2008.

Meanwhile, China is increasing its share of the global markets for high-value manufactured goods, including some sophisticated information technology products that are considered technology intensive. Thus, at the aggregate level, the China effect is clearly visible in technology-intensive exports, particularly in the electric and electronic sector. Based on world market shares in Table 7, China's share of capital goods has been rapidly increasing in comparison to that of Japan, the Republic of Korea, and Thailand between 2000 and 2007. China's world market share of telecommunications recorded a four-fold increase from 6.8 percent to 26.1 percent, while the market share of its integrated circuits (IC) and electronic components has dramatically increased from 1.7 percent to 8.5 percent, which is higher than that of the Republic of Korea (7.9 percent), but slightly lower than Japan's 10.8 percent. Besides, China rose as a major player in the world iron and steel industry, yielding a notable increase from 3.1 percent to 10.9 percent in global market share in the same period. However, the share of China's automotive products has remained much smaller compared to Japan's although China's

[25] Yeats, A., "Just How Big is Global Production Sharing?", in S.W.Arndt and H.Kierzkowski (eds.), *Fragmentation: New Production Patterns in the World Economy*, New York: Oxford University Press, 2001, pp.108-43.

[26] Zheng Zhao-yang and Meng Meng, "Comparative Analysis of Change in China and ASEAN's Export Technical Level, " *Asian-Pacific Economy (in Chinese)*, No. 6, 2009, pp.33-37.

share has significantly increased from 0.3 percent to 1.9 percent of the world market.

Thailand's share in the world export markets has been much lower than that of China for all sophisticated products in the period 2000-2007. In the export of electronic data processing machines and office equipment, the share of China's exports to the world market increased from 5 percent to 30.7 percent, while Thailand's share increased only from 2.4 percent to 3.1 percent. China is more competitive compared to Thailand. The larger share of exports of sophisticated products coming from China compared to the share of those from Thailand is consistent with actual data.

Table 7 Exports of Sophisticated Products across Major East Asian Countries, Million US$ and Percentage

Products	2007	Share in World Exports	
	Volume	2000	2007
Telecommunications equipment			
China	146.3	6.8	26.1
Japan	34.7	10.6	6.2
Republic of Korea	40.2	5.0	7.2
Thailand	6.3	1.4	1.1
EDP* and office equipment			
China	165.9	5.0	30.7
Japan	23.8	9.5	4.4
Korea	19.7	5.3	3.6
Thailand	16.6	2.4	3.1
Integrated circuits (IC) and electronic equipment			
China	35.0	1.7	8.5
Japan	44.5	13.8	10.8
Korea	32.7	8.0	7.9
Thailand	9.2	1.9	2.2
Iron and steel			
China	51.51	3.1	10.9
Japan	34.40	10.4	7.3
Korea	18.80	4.7	4.0
Thailand	3.84	0.6	0.8
Automotive Products			
China	23.0	0.3	1.9
Japan	158.8	15.3	13.4

Korea	49.5	2.6	4.2
Thailand	12.7	0.4	1.1

Note: *EDP: Electronic data processing machines.

Source: WTO: *International Trade Statistics 2008,* pp.73-103.

Today, China is the world's largest producer as well as consumer of personnel computers, automobiles, and many high-technology products. There has been a heated debate on China's capacity to produce sophisticated products and its global competitiveness on this area. As mentioned above, some scholarly writings argue that China is rapidly becoming an advanced-technology nation and the sophistication of its export basket is rapidly approaching the levels of the most advanced industrial nations.[27] Theses arguments can also be supported by the improvement of China's innovative intensity.

4.3 Contribution of Innovative Intensity to China's Export Sophistication

What kind of factors can be used to explain China's export sophistication? Developing the capacity to innovate, raising product quality, and boosting technical efficiency would mainly depend on one's level of education and technological progress. We simply pick up a couple of measures to show the changes of China's technology capacity. Among the numerous measures of research and development (R&D) effort, those for which coverage is most comprehensive and consistently reported are the ratio of R&D expenditure to GDP and the number of scientists and engineers graduating each year.

China's R&D as a ratio to GDP has increased significantly from 1.0 percent in 2000 to 1.49 percent in 2007 and 1.54 percent in 2008. China's R&D intensity is more than one-half that of the United States and substantially greater than what should be expected given a country's level of per capita income. Among the world's low- and

[27] Yusuf, S., K.Nabeshima and D.Perkins, "China and India Reshape Global Industrial Geography," in A.L.Winters and S.Yusuf (eds.), *Dancing with Giants: China, India, and Global Economy,* Washington, DC: World Bank, Chapter 3.

low-middle-income countries, China has been the only country whose level of R&D intensity has risen beyond 1.5 percent. As Albert G.Z.Hu and Gary H. Jefferson pointed out, the scale of technology transfer and the opportunity to move up the technology ladder are combining to offset tendencies to diminishing returns to R&D in China.[28]

Table 8 also shows a sharp increase in patents granted between 2000 and 2008. Invention patents (from domestic sources), which are required to meet a higher standard of novelty than utility design and applied patents, rose from 6,177 to 46,590, or a growth of 5.5 times. Because of its large population, the sheer number of scientists and engineers in China exceeds the number of all countries except the United States whose total China is also likely to surpass soon.

Table 8 Measures of Innovative Intensity, 2000-2008

	2000	2006	2007	2008
R&D Expenditure/GDP Ratio	1.00	1.42	1.49	1.54
Patents granted*	95236	223860	301632	352406
Invention	6177	25077	31945	46590
Full-time Equivalent of R&D Scientists and Engineers, 1,000 man-year	675	1224	1423	1592
Post-graduates in Science & Engineering	n.a	158921	193637	212951
Bachelor degree in Science & Engineering	318318	1003131	1276474	1386495

Notes: *It refers three kinds (invention, utility models and designs) of patents granted in domestic source.
Source: *China Statistical Yearbook,* various issues.

The accumulation of human capital is also related to the potential growth of high-technology exports. As Table 8 shows, the annual number of university graduates with degrees at the Master's level or above and undergraduates with degrees at the Bachelor's level in science and engineering exceeded 200,000 and 1.3 million in 2008, respectively.[29] These degrees include science, engineering, agriculture, and medicine which are run by regular institutions of higher education. The new data confirm that

[28] Albert G.Z Hu and Gary Jefferson, "Science and Technology in China,"in Loren Brandt and Thomas G. Rawski, *China's Great Economic Transformation*, Palgrave Macmillan, 2008, p.329.
[29] The number of students graduated in internet-based courses by science and engineering is not included.

China's technological capacity has risen rapidly since the early twenty-first century. Thus, all MRB countries cannot compete with China in the manufacture of technology-intensive products given China's increase of R&D funds and increasing supply of scientists and engineers in recent years.

China is facing a golden opportunity to achieve technological leveling with the industrialized countries. Its fast-growing domestic economy, coupled with a globalizing world economy that encourages the flow of capital and diffusion of technology and China's rich endowment of human talent, are contributing to the prospects of China's technological takeoff. Therefore, it is not impossible to believe that China will emerge as a global technology power in the coming years.[30]

4.4 MRBC's Moving Up the Technology Ladder

China is increasing its share of the global market for intermediate manufactured goods and high-technology products. One can draw from this income comparison that MRB countries except Thailand can compete with China in the production of labor-intensive products, such as low-end textiles and garments, for the export markets. Therefore, successful MRB countries' exporters have taken multiple paths in terms of the sophistication of their exports. Clearly, China led this moving-up-the-ladder direction in the regional industrialization. Furthermore, the fast-growing countries have already increased their already high export intensity in low-sophistication sectors to well above the global average. The increase in export intensity of low-sophistication products might well be appropriate for low-income countries. Among the low-income countries, Myanmar, a resource-rich country, is notable for its very low level of resource exports. This is reflected in its heavy concentration on exports of agricultural and mining goods to China. In contrast, Vietnam had levels of export sophistication that exceeded its predicted levels over the past decade. By June-2009, it had achieved one of

[30] Albert G.Z Hu and Gary Jefferson, "Science and Technology in China,"in Loren Brandt and Thomas G. Rawski, *China's Great Economic Transformation*, Palgrave Macmillan, 2008, p.332.

the most sophisticated export structures among the MRB countries, except for Thailand, which has a higher income relative to China, well above the predicted level. Thus, for low-income countries such as Myanmar and Vietnam, this study suggests gradually moving up the ladder of export sophistication.

What matters for China's trade growth with the MRB countries is not the volume of trade but the steady growth of the market shares of these sophisticated products. Indeed, what is so special about China's trade with the MRB countries is not the latter's exporting of mineral products but the intra-industry trade of both labor-intensive and technology-intensive products. Clearly, Thailand benefits from its intra-industry trade with China. Data for the first nine months of 2009 indicate that Thailand generated a trade surplus of US$8102.32 million with China. Vietnam may probably follow the same trade pattern. Due to its size and industrial capacity, China's potential in the production of skilled intensive products and its ability to increase the value-added of its exports by expanding production for components is greater than any of the MRB countries. MRB countries can therefore make use of China' huge market by supplying the intermediate goods China needs. However, MRB countries will have to strengthen their ability in manufacturing production as well as improve their technology levels.

China will manage to latch on to higher-income products over time. There has been a dramatic reduction of labor-intensive goods exports over the last decade, which suggests that MRB countries are likely to expand their intra-industry trade of more sophisticated products with China in the near future.

5. CONCLUSIONS AND IMPLICATIONS

China seems on the road to quick recovery and is expected to pave the way for a more robust economic performance over the medium term. For instance, the volume of China's exports has reached US$1.20 trillion. A key conclusion on China's trade with the MRB countries in the previous three years is that China remains to have a feature of export sophistication, which supports the argument proposed by some international

economists. The evidence presented in this paper supports the view that, in terms of trade with Myanmar and Vietnam, China has displayed a rapid increase in exports of sophisticated products in recent years. When the trade pattern between China and Thailand is considered, the results show a much greater propensity for importing intermediate goods from Thailand, but as already noted, this probably reflects the regional production chain initiated and controlled by multinational enterprises in East Asia. What are the important implications of China's emergence as an exporter of sophisticated products for the MRB countries? Three sets of implications are proposed for developing China-MRBC trade of sophisticated products.

Most obviously, the first has to do with the need to understand better the technology capacity of China's exports to this region. As argued in this paper, China's pattern of exports is significantly more sophisticated than would normally be expected. Thus, it is better for the MRB countries to increase their exports of labor-intensive goods to China considering their low level of industrialization.

The second implication is that the intra-industry trade between China and Vietnam should be continuously strengthened. This is, of course, also a lesson from the experience of Thailand's success story. This should provide the incentives for low-income countries such as Myanmar and Vietnam to move up the technology ladder along with China's industrial restructuring.

The third implication has to do with the policy pursued by the MRBC governments in the new regionalism under the implementation of CAFTA beginning 1 January 2010. Indeed, China sells products that are associated with a productivity level that is much higher than a country at China's level of income. MRB countries can learn from China's story of gradually shifting their exports to the sophisticated sectors and ultimately enjoying this privilege which is conventionally associated only with the industrialized countries. But whether the exports of MRB countries will move up the technology ladder or not, they really need to accept the challenges of industrialization and raise their manufacturing productivity. China's experience shows that a strong domestic

production base and innovative intensity have been important ways in diffusing imported technology and harnessing the domestic supply chain, which should be regarded as core factors to successfully export sophisticated products to the world markets in the coming 10 years.

If this trend continues, it could be that the direct positive impact of China's exports of sophisticated goods will soon create many fruitful results on the industrial capacity and export composition improvements in the MRBC region. This is the right way to think about the regional integration across China and MRBC.

REFERENCES

Brandt, Loren and Thomas G. Rawski, *China's Great Economic Transformation*, Palgrave Macmillan, 2008.

China Statistical Bureau, *China Statistical Yearbook,* Beijing, China Statistical Press, various issues.

Barry Eichengreen, Yeongseop, and Hui Tong, "China and the Exports of Other Asian Countries," *Review of World Economics,* Vol.143:2 (2007), pp.201-226.

Paolo Guerrieri and Denise Dimon, "The Trade Regionalism of the United States and the European Union: Cooperative or Competitiveness Strategies?" *The International Trade Journal*, Vol. XX, No.2, Summer 2006, pp.85-93.

Dic Lo and Thomas M.H. Chan, "Machinery and China's nexus of Foreign Trade and Economic Growth," *Journal of International Development*, 29(1), 2001.

Michael P. Todaro, *Economic Development*, Longman, sixth edition, 1997.

Barry Naughton, *The Chinese Economy: Transition and Growth*, The MIT Press, 2007.

Prema-chandra Athukorala, "The Rise of China and East Asian Export Performance: is the Crowding-Out Fear Warranted?" *The World Economy*, Vol.32, No.2 (February 2009), pp.234-266.

Dani Rodrik, "What's So Special about China's Exports?" *National Bureau of Economic Research Working Paper,* No.11947.

UNIDO, *Industrial Development Report 2009: Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries*, Vienna, 2009.

United Nations, ESCAP, *Economic and Social Survey of Asia and the Pacific 2009*, New York, 2009.

WTO, *2008 International Trade Statistics*, Geneva, 2008.

WTO, *World Economic Outlook: Crisis and Recovery*, Geneva, April 2009.

Xingmin Yin, "China's Integration into the World Economy: An Assessment of

Industrial Development," *China Report* 40:4 (2004), pp.391-405.

Xingmin Yin, "China's Trade and FDI to MRB Countries: An Advocacy Document," in Mitsuhiro Kagami ed., *A China-Japan Comparison of Economic Relationships with the Mekong River Basin Countries,* IDE-JETRO, Bangkok Research Center, 2009, pp.17-69.

Yeats, A., "Just How Big is Global Production Sharing?," in S.W.Arndt and H.Kierzkowski (eds.), *Fragmentation: New Production Patterns in the World Economy,* New York: Oxford University Press, 2001, pp.108-43.

Yusuf, S., K.Nabeshima and D.Perkins, "China and India Reshape Global Industrial Geography," in A.L.Winters and S.Yusuf (eds.), *Dancing with Giants: China, India, and Global Economy,* Washington, DC: World Bank, 2007.

Zheng Zhao-yang and Meng Meng, "Comparative Analysis of Change in China and ASEAN's Export Technical Level," *Asian-Pacific Economy* (in Chinese), No. 6, 2009, pp.33-37.