China Perspectives

TRADE OPENNESS AND CHINA'S ECONOMIC DEVELOPMENT

Miaojie Yu

ROUTLEDGE

Trade Openness and China's Economic Development

With the expansion of globalization, international trade has played an increasingly significant role, especially for developing countries. As the largest developing country, China has made a lot of efforts to integrate to the global market since its Open and Reform Policy in 1978 and has become the second largest economy in world. So what is the effect of China's trade-oriented strategy for the country and the world? How did it improve the country's economic development? These are some critical questions this book discusses.

This book utilizes classic Western economic models to examine how China's openness policies have affected the manufacturing upgrading and economic development of the country. A large amount of micro-level empirical evidence is added to support the conclusion.

Scholars and students in economics and business will benefit from this book. Also, it will appeal to readers interested in policy making and Chinese studies.

Miaojie Yu is the University Liberal Art Chair Professor, China's Chang-Jiang scholar, and Deputy Dean of National School of Development, Peking University. His research interests include international trade and Chinese economy. He has published more than 100 peer-reviewed papers and won the prize of Royal Economic Society (2015).

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1.1 Introduction

In the three decades of economic reforms since 1979, China has successfully maintained a 9.9-percent annual gross domestic product (GDP) growth rate and registered a 16.3-percent annual growth rate for international trade (Lin, 2010). China has already taken over Japan as the second largest economy in the world, and it will become the largest economy by the 2020s in terms of purchasing power parity (PPP).[2] Despite being negatively affected by the recent global financial crisis, China still surpassed Germany as the largest exporter in the world in 2009, and it is currently recognized as the largest "world factory." China has also succeeded in reducing poverty. In 1979, China was one of the poorest agrarian countries in the world, with a per-capita annual income of US$243 at 1979's exchange rates,[3] which was about one-third of the average in sub-Saharan countries. Only three decades later, China's per-capita GDP increased to approximately $5,000 in 2011, and China became an upper-middle income country, according to the classification of the World Bank.

China's rapid growth was achieved through a dramatic structural transformation, which can be observed from changes in the sectoral composition of GDP. In 1978, primary goods accounted for 28.2 percent of GDP, and agricultural exports for around 35 percent of China's entire exports. In sharp contrast, the proportion of primary industry in China's GDP today has shrunk to 11 percent, and agricultural exports only account for less than 3.5 percent of China's total exports. With the declining share of agricultural goods, manufacturing exports have increased dramatically in the last three decades, increasing from 65 percent in 1980 to approximately 96.5 percent in 2009 (Yu, 2011a). Similar changes occurred in the composition of employment. The share of the labor force in primary industry declined from 70.5 percent in 1978 to 38.1 in 2009 whereas the labor force in secondary industry increased from 17.3 percent to 27.8 percent in the same period.

Industrial upgrading is also a remarkable feature of China's economy since its economic reform. As discussed later, China's industrial upgrading exhibits four clear phases. In the first phase (1978 to 1985), China still relied on producing and exporting resource-based goods, such as oil and gasoline. The second phase (1986 to 1995) witnessed a fast growth of labor-intensive exports. In

the third phase (1996 to 2000), the main export from China was electrical machinery and transport equipment. At the same time, China also imported a large volume of machinery. The increasingly important role of intra-industry trade can mainly be attributed to China's successful industrial upgrading and the prevalent processing trade that aligned production with China's comparative advantage. The latest phase, which began in 2001, has recorded a fast export growth in high-technology products, such as life-science equipment.

China's successful structural transformation and industrial upgrading beg the question of how it developed from a backward, closed, and agrarian economy to an open, competitive world factory. In this chapter we will discuss what happened to China's production structure and industrial upgrading. How did China successfully upgrade its manufacturing structure in the last three decades? What are the fundamental driving forces behind the transformation? Furthermore, to what extent did the rapid structural transformation and industrial upgrading help to foster employment and reduce poverty in China? Finally, what lessons can be learned from China's successful structural transformation and industrial upgrading?

Our basic argument is that China's rapid industrial upgrading and its consequent poverty reduction are mainly attributed to the adoption of an appropriate development strategy, which is a comparative-advantage-following (CAF) development strategy, driven by its factor endowments (Lin, 2003, 2009, 2012, Lin et al., 2004). As China is a labor abundant country, the labor-intensive industries can be competitive and viable if the market is not distorted. The latent comparative advantage of the Chinese economy was suppressed before its economic reform because China's government adopted a heavy industry-oriented development strategy. As such the development strategy was comparative-advantage-defying (CAD), and China's government set up an organic but deeply distorted system to support economic development, with priority on heavy industries. Under this system, the prices of input factors and output were set by a planned administration system and were hence distorted. Firms were deprived of production autonomy and lacked incentives. Efficiency was low. Accordingly, the industrial structure could not be upgraded. As heavy industries are capital intensive and incapable of absorbing more labor, employment opportunities in the industrial sector were limited in spite of large investment. Finally, as the state required its puppet-like state-owned enterprises (SOEs) to squeeze as much profit as possible out of production, wages for workers were suppressed at a low level, and the prices of agricultural products were set with unfavorable terms of trade against peasants. Both forces made the Chinese people maintain a low living standard, and severe poverty could not be alleviated.

After its economic take-off, China adopted a CAF development strategy. The two main aspects of this strategy are both the adoption of the dual-track reform to provide temporary protection or subsidies to the traditional and old sectors and the encouragement to develop new viable sectors aligned with its comparative advantage driven by its factor endowments. The dual-track reforms, including price reform of output and input factor markets as well as foreign trade and

exchange rate reforms, were essentially Pareto optimal. All reforms started by allowing the existence of two tracks, that is, one dominated by the state and the other oriented to the market. The two tracks subsequently converged and unified to a market track only. Similarly, to avoid the collapse of SOEs due to the shock of rapid reform, SOE reform began with granting management autonomy and then moved to institutional transitions. More importantly, new firms and industries aligned with China's comparative advantage were greatly encouraged. The growth of China's town village enterprises (TVEs) serves as an excellent example. The government's successful growth identification and facilitation played a vital role in transforming its economic structures and upgrading its manufacturing structures because they overcame asymmetric information, coordination failure, and even externality appropriateness that are associated with market mechanism (Lin, 2012).

The structural transformation and industrial upgrading also have significant effects on employment generation and poverty reduction. With structural transformation, the share of the primary sector in GDP declined dramatically, and the shares of the secondary sector and, especially, the tertiary sector consequently increased. As a result, laborers moved out of the primary sector and earned higher wages in the secondary and tertiary sectors. With the correction of the distortion in input factors, the unfavorable terms of trade against the peasants were redressed. The boom of TVEs also provided more employment opportunities for rural people with high-income earnings. The government's forceful facilitation in the rural area also improved both hard and soft infrastructures. The three factors mentioned earlier improved the living standard and dramatically reduced poverty in the rural area. The industrial upgrading also improved the living standards of workers in the urban area. With a CAF development strategy, labor-intensive industries developed rapidly, which in turn created new working opportunities. After three decades of reforms, SOEs were downsized in terms of numbers and output, but their performance was in a much better shape after efficiency increased and workers' initiatives were stimulated. As a result, workers' living standards were improved in the urban area, along with structural transformation and industrial upgrading.

Other developing countries can learn two main points from China's economic miracle. First, to upgrade industrial structure successfully, a developing country must adopt a CAF development strategy based on its factor endowment. Second, despite a free, fair, and competitive market mechanism, governments of developing countries are suggested to play a proactive role in facilitating structural transformation and industrial upgrading. A useful framework for growth identification and facilitation with several key suggestions is provided and discussed in this study, as policy makers usually find identifying growth opportunities difficult.

The remainder of this chapter is organized as follows. Section 1.2 introduces the conditions faced by China's manufacturing industry before China's economic reform in 1978. Section 1.3 discusses the trends and characteristics of China's industrialization and manufacturing structural upgrading since its take-off.

Section 1.4 examines the main factors, namely, policy setting, accounting for rapid industrial growth, and structural upgrading. Section 1.5 investigates the effect of industrial growth and manufacturing structural change on employment generation, following a careful scrutiny of the relationship between shifts in manufacturing employment and poverty reduction. Based on China's experience, Section 1.6 discusses the main points that other developing countries can learn from China. Finally, Section 1.7 concludes and provides some suggestions for China's further reform.

1.2 China's economy before the reform

Before its economic reform, China was a poor, agrarian economy. In 1952, agriculture accounted for 57.7 percent of China's GDP and absorbed 83.5 percent of China's employed labor. Per-capita GDP was very low. In particular, per-capita agricultural and industrial output was RMB143 (or equivalently $65 at 1952 price).[4] Before the economic reform, a distorted industrial structure suppressed the development of China's economy, which in turn generated a closed economy and deep poverty, and a distorted income distribution.

Similar to the leaders in many other developing countries established after World War II, China's leaders adopted a heavy-industry oriented development strategy after gaining political independence in 1949. However, heavy industries are capital-intensive, and China was essentially a capital-scarce agrarian economy. Such stark difference between factor endowments and development strategy made allocating resources through the market mechanism impossible for China. Instead, a development strategy that prioritized heavy industry, which is a CAD strategy, distorted product and factor prices, and it had to rely on a highly centralized planned resource allocation mechanism. Correspondently, the government had to set up a puppet-like micromanagement system. These three elements in China's economy before its reform are referred to as the trinity of the traditional economic system (Lin et al., 2004) and introduced as follows.

First, China's government had to distort macroeconomic policies that suppressed interest rates, exchange rates, wages, prices of raw materials and intermediates inputs, and even agricultural prices to perform its heavy industry-oriented development strategy (Lin, 2003). Projects in heavy industries require much capital, which was scarce in China. In response to the strong demand for capital, the government had to control interest rates to reduce the cost of capital. In addition, heavy industries also require capital-intensive intermediate goods and equipment, which had to be imported because China, an agrarian economy, could not produce such goods at that time. Therefore, sufficient foreign exchange reserves are a priori for projects on heavy industries. However, foreign exchange in China was also scarce because China's exports, if any, were limited to natural resources and low value-adding agricultural products before the economic reform. China's government had to overvalue its own currency against the dollar to lower the cost of imported intermediate inputs.

China appreciated its currency (RMB) from RMB4.2 per dollar in 1950 to RMB1.7 per dollar, a 250 percent appreciation during this period.

Raising sufficient funds to support heavy industries was difficult because China was an agrarian economy. The only way to accumulate capital for heavy industries is to reduce the cost of various input factors. In accordance with the suppression of the interest rate, the government also set low nominal wages for urban workers. The wages were independent of the workers' effort, but the wages varied by rank and seniority. Before 1978, the average annual wage was approximately RMB550 (or equivalently $223 at 1971's exchange rate). The artificially low wages held down the purchasing power of urban workers. If prices of agricultural goods and necessities were set by the market, urban workers would not have been able to afford most of the products. Therefore, the government had to generate "price scissors" in favor of urban workers against rural peasants by setting very low prices on agricultural goods (Lin and Yu, 2008). Simultaneously, China's government also adopted a very rigorous residency control system, known as *hukou*, to prevent rural workers from migrating to urban areas in search of jobs. This control system was enforced starting in 1958.

Second, a highly centralized planned resource allocation mechanism was established. Excess demand occurred in each factor market because the government artificially distorted the prices of products and various input factors. Hence, a market-based resource allocation mechanism was unable to clear the market given that prices were fixed. In response to such excess demand, the government had to ration resources through a series of planned administrative means. A good example is the foreign trade system. Given an artificially high exchange rate, firms found exporting impossible because they were uncompetitive in the international market. However, if no firms exported, limited foreign reserves would soon dry up. Hence, China could not import necessary equipment and intermediate inputs. To avoid this situation, the government was forced to impose a monopoly over foreign trade by setting up the Ministry of Foreign Trade, which in turn authorized 12 nationwide specialized foreign trading companies. These trading companies served as an "air-lock" to isolate China from the world economy and to monopolize the entire country's foreign trade. In addition, the government also established the People's Bank of China to ration funds and set up the State Planning Commission to manage raw materials and natural resources.

Finally, in accordance with such a distorted institutional arrangement, China's government also adopted a corresponding micromanagement system. In particular, SOEs were established in urban areas even though People's Communes were established in rural areas. Price distortions of input and output factors were set to accumulate capital, which is essential for the success of the heavy industry-oriented development strategy. If firms were private-owned, they could allocate profits among owners but not accumulate much capital, which could ruin the heavy industry-oriented development strategy. Hence, the type of ownership must be state owned. Moreover, even if an SOE were granted autonomy in

management, its workers would also deviate from the heavy industry-oriented development strategy, as the objective of a firm is to maximize profit. Therefore, the state had to deprive SOEs of any autonomy and adopted a puppet-like management. Agricultural production in the rural area was mandated through the People's Communes to guarantee that the state could monopolize purchasing and marketing of agricultural products. This was done to ensure further that the state could accumulate sufficient capital for heavy industries (Lin, 1990).

Thus, an economic system for the heavy industry-oriented development strategy was established. The distortions of factor prices enabled the enterprises to reduce their input cost and to realize profits as much as possible, which in turn were used to accumulate capital. The highly centralized planned resource allocation mechanism guaranteed that limited natural resource would flow into the heavy industries. Correspondingly, a puppet-like micro management system was used to make such arrangements smooth and successful.

However, as mentioned previously, the heavy industry-oriented development strategy is CAD given that China was an extremely capital-scarce country before its economic reform (Lin, 2003). A CAD strategy can lead to a distorted industrial structure and can make it difficult for the economy to upgrade its manufacturing structure. Clearly, the CAD strategy cannot create sufficient employment and leaves the workers with a very low standard of living.

It is interesting to ask to what extent the CAD development strategy laid the foundations for the later successful transformation of the Chinese economy. Due to data restrictions before 1978, few studies, if any, provide a direct answer to that question. Yet, as found by Hsieh and Klenow (2009), even today, there still exist sizable distortions in the factor markets caused by the CAD strategy (Lin, 2003). If such distortions were corrected, total factor productivity (TFP) of Chinese manufacturing firms would increase at least 25 percent. The answer to such an empirical question is far from conclusive. Still, we are able to capture the distortions before the economy reforms indirectly. For example, Figure 1.1 suggests a severe distortion occurred in China's industrial structure from 1952 to 1978. The GDP share of the manufacturing sectors increased dramatically from 19.5 percent in 1952 to 49.4 percent in 1978. Simultaneously, agricultural sectors exhibited a declining trend from 57.7 percent in 1952 to 32.8 percent in 1978. However, both tertiary sectors and non-manufacturing secondary sectors declined during the same period, suggesting that the share of manufacturing increased at the expense of the primary sector, the non-manufacturing secondary sector, and the tertiary sector. Of course, the fact that industry increases its share of GDP and agriculture reduces its share is in itself not an indicator of distortion. However, given that China's per-capita GDP was still at the extremely low level (US$243 at 1979's exchange rates), the high manufacturing share of GDP suggest that China's economy was distorted. This can be verified from two perspectives. First, within the manufacturing sector, the proportion of heavy industries increased from 35.5 percent in 1952 to 56.9 percent in 1978. Second, the investment allocation within manufacturing sectors was also skewed toward infrastructure investment. In particular,

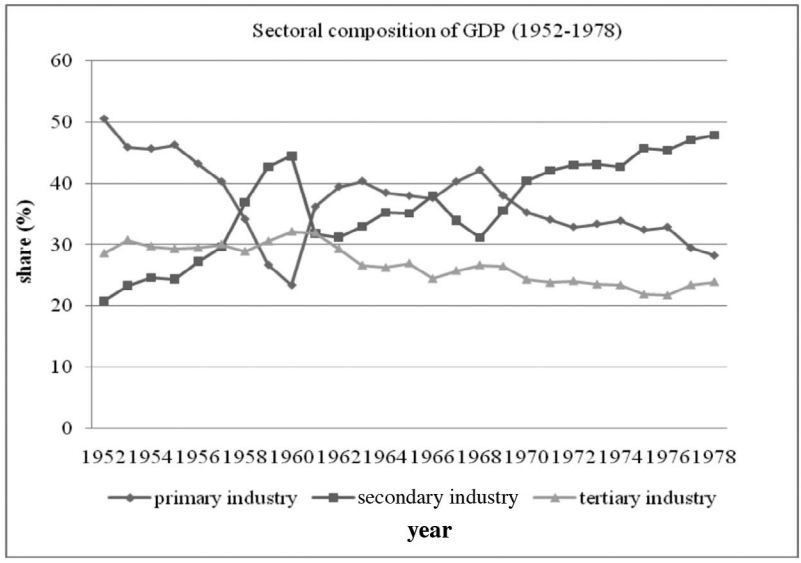

Figure 1.1 Sectoral composition of GDP measured at current prices (1952–1978)
Source: National Bureau of Statistics of China, China Statistical Yearbook

the infrastructure investment ratio (i.e., investment in heavy industries divided by that in light industries) increased from 5.7 percent during the First Five-Year Plan period (1953 to 1957) to 8.5 percent during the Fourth Five-Year Plan period (1971 to 1975).

Heavy industries are incapable of absorbing additional labor because these industries are capital intensive per se. Although heavy industries accounted for a quarter of China's GDP in 1978, employment in such sectors only accounted for 7.9 percent. In contrast, light industries can usually absorb more labor because they are labor intensive. Light industries absorbed 4.6 percent of labor employed in 1978 and accounted for 3 percent of China's GDP. Simultaneously, more than 73 percent of the labor force was still in the agricultural sectors before the economic reform. Moreover, because prices of agricultural goods were artificially suppressed by "price scissors," rural peasants were not able to increase their income with the growth of heavy industrialization. Accordingly, even after two decades of implementation of the heavy industry-oriented development strategy, China was still the least developed country in the world, with a per-capita GDP of RMB381 (equivalently $221 at the 1978 exchange rate) in 1978.

In summary, China adopted a heavy industry-oriented development strategy before 1978, which was inconsistent with China's latent comparative advantage based on its factor endowments. As a result, the implementation of the CAD strategy not only distorted China's industrial structure but also did not improve the people's living standards.

1.3 China's industrial growth and structural upgrading

Since its economic reform in 1978, China abandoned the heavy industry-oriented development strategy, adopting the CAF development strategy based on its factor endowments. Given that China is a labor-abundant but capital-scarce country, China will gain from trade if it follows its comparative advantage by exporting labor-intensive products and importing capital-intensive products according to the Heckscher-Ohlin theory. However, China's government had to increase its efforts to correct existing distortions, as China had a highly distorted industrial structure due largely to the adoption of a CAD strategy. This will be discussed in the next section. In this section, we instead focus on the trends and characteristics of China's structural transformation and industrial upgrading since its take-off.

We begin by examining the pattern and evolution of China's sectoral composition, in which special attention is given to the dynamic structural transformation over time. We also explore the revealed comparative advantage (RCA) for each manufacturing sector. We then discuss the value-chain upgrading across and within manufacturing sectors. Given that international trade plays a dominant role in the Chinese economy since its take-off, a careful scrutiny of intra-industry trade suggests that China's intra-industry trade is the result of processing trade, which refers to importing raw materials to be assembled in China, indicating that the high intra-industry trade essentially follows China's comparative advantage.

1.3.1 Structural transformation

The GDP sectoral composition of China witnessed an industrial structural change before and after the economic reforms in the last three decades. By insisting on a CAD development strategy, secondary industries such as the manufacturing sectors could maintain their fast upward trend as cases before 1978 shown in Figure 1.1. However, this changed after 1978, as shown in Figure 1.2. The share of secondary industry in GDP remained the same but the share of the manufacturing declined slightly in the last three decades. In sharp contrast, the share of tertiary industry increased from 23.9 percent in 1978 to 42 percent in 2010. Moreover, the GDP share of the primary industry declined from 28.3 percent in 1978 to only 11 percent in 2009.

For the components of the manufacturing sectors, the share of labor-intensive light industries increased from 43.1 percent in 1978 to 48.9 percent in 1991. Correspondingly, the infrastructure investment ratio (i.e., investment in heavy industries divided by that in light industries) declined from 8.5 percent during the Fifth Five-Year Plan period (1978–1982) to 6.5 percent in 1991. These results suggest that China is moving away from a heavy industry-oriented development strategy to a CAF strategy. Since 1978, China has placed its development priority on labor-intensive industries based on their comparative advantage in factor endowments. This strategy is similar to the development strategies of the four "Little Dragons," that is, or Korea, Taiwan, Hong Kong, and Singapore. In this way,

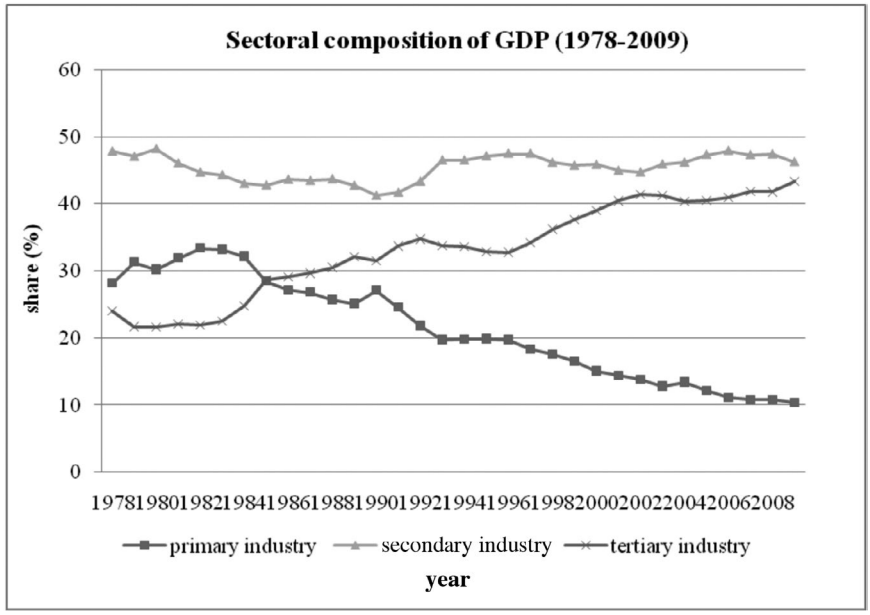

Figure 1.2 Sectoral composition of GDP, 1978–2010 (at current prices)
Source: National Bureau of Statistics of China, China Statistical Yearbook

China was able to explore its latent comparative advantage and increase its export volumes of labor-intensive products.

It is evident to observe China's structural transformation from changes in shares of manufacturing sectors in manufacturing GDP. As shown in Figure 1.3a, in 1999 the extraction of petroleum and natural gas is the industry with largest share in manufacturing GDP (12.3 percent). After a decade, China' shares of manufacturing sectors in manufacturing GDP are changed dramatically. In 2009, the share for extraction of petroleum and natural gas is reduced to only 1.47 percent, the share for communication equipment instead becomes the largest manufacturing sector, registering 8.7 percent of China's manufacturing GDP, as shown in Figure 1.3b.

1.3.2 Value-chain upgrading

The growing foreign trade of China is an ideal window to examine its value-chain upgrading. Before its economic reform, China was a closed and backward economy. The trade dependence (or ratio), defined as the sum of exports and imports over GDP, was only 10 percent. However, it increased by more than six times in three decades. In 2008, the openness ratio of China reached 67 percent, compared to 25 percent in the US. Despite the negative demand shock of the recent financial crisis, China surpassed Germany as the largest exporter in 2009 and became the second largest importer in 2011.

Figure 1.3a Shares of manufacturing sectors in China's manufacturing GDP (1999)
Source: China's Statistical Yearbook (2000), authors' calculation

The fast growing foreign trade of China is an economic consequence of adopting the CAF strategy (Lin et al., 2004). This argument can be clarified further by the dynamic evolution of manufacturing upgrading. Given that China transformed into an open and outward-looking economy since its reform, the composition of its exports is an appropriate reflection of manufacturing upgrading. In the last three decades, China's exports exhibited four different phases.

Table 1.1 shows that the most important export was still agricultural products with 50.3 percent in 1980. Strikingly enough, in the first phase (1978–1985), the most important industrial exports of China were low value-added mineral fuels, such as petroleum, oil, and other natural resources. The key reason behind this situation is that such petroleum products milled from one of its main field in Daqing, Heilongjiang, increased during the period of 1978–1980. The government was aware of the importance of promoting labor-intensive industries, such as textiles and garments, but the magnitude of exports from light industries was still small. Mineral fuels, lubricants, and related materials accounted for 23.6 percent of the export market in China by 1980. This number climbed to 26

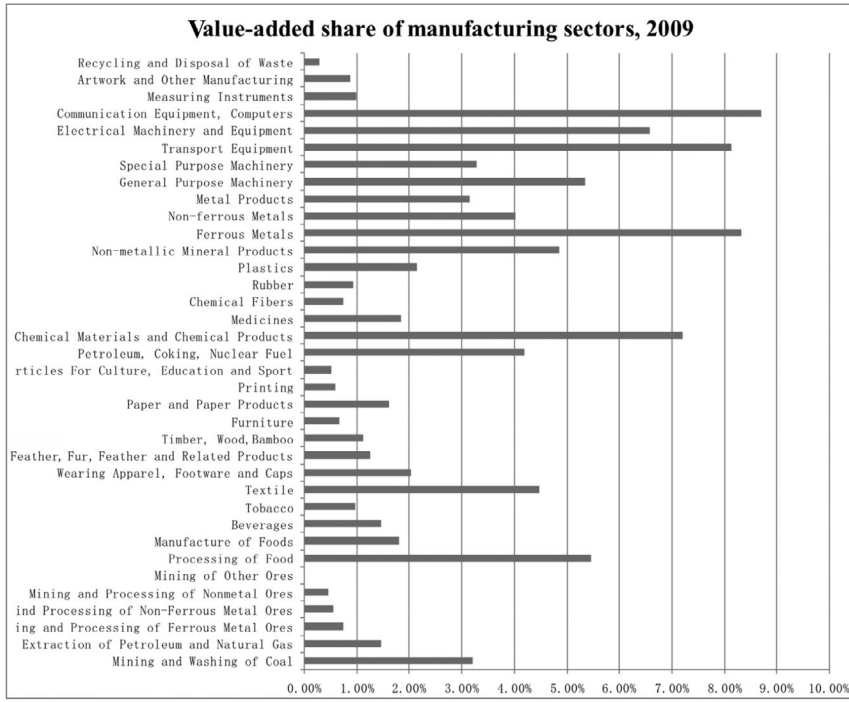

Figure 1.3b Shares of manufacturing sectors in China's manufacturing GDP (2009)
Source: China's Statistical Yearbook 2010, authors' calculation

Table 1.1 China's export and import composition by sector (at current prices) export composition by sector

Year	*Agriculture*	*Industry*	*Mineral fuels, & lubricants*	*Light manufacturing*	*Machinery & transport equipment*
1980	50.3	49.7	23.62	22.07	4.65
1985	50.56	49.44	26.08	16.43	2.82
1992	20.02	79.98	5.53	19	15.56
1995	14.44	85.56	3.58	21.67	21.11
1996	14.52	85.48	3.93	18.87	23.38
2001	9.9	90.1	3.16	16.46	35.66
2009	5.25	94.75	1.7	15.38	49.12
			Import composition by sector		
Year	*Agriculture*	*Industry*	*Mineral fuels, & lubricants*	*Light manufacturing*	*Machinery & transport equipment*
1980	34.77	65.23	1.01	20.75	25.57
1985	12.52	87.48	0.41	28.16	38.43
1992	16.45	83.55	4.43	23.92	38.86
1995	18.49	81.51	3.88	21.78	39.85
1996	18.32	81.68	4.95	22.61	39.45
2001	18.78	81.22	7.17	17.22	43.94
2009	28.81	71.19	12.33	10.71	40.54

Source: National Bureau of Statistics of China, China Statistical Yearbook 2010. Numbers in the last three columns are obtained by the sectoral trade (i.e., export or import) value over total industry trade value.

percent in 1985, higher than the 16 percent of light textile and rubber products, which were the second largest export category.

From 1985 to 1995, China produced and exported labor-intensive products such as textile, garments, and other light manufacturing goods as the CAF development strategy was implemented. In the second phase, textiles and rubber products took up a dominant proportion in the export package of China. Table 1.1 shows the 20 percent proportion during this period, with a peak at 21.6 percent in 1995.

Interestingly, China exported US$35.3 billion of transport equipment machinery in 1996, which is larger than the US$28.5 billion of light manufacturing goods for the same year. This finding indicates that China came to its third phase of exports. In the third phase, the most important exports were capital-intensive products such as machinery and transport equipment. Table 1.2 provides more evidence on the structural upgrading experiments of China in the new century. The difference between the second phase and the third phase is that the main exports of China shifted away from the standard labor-intensive products, such as textiles and garments. By the beginning of the twenty-first century, low value-added and labor-intensive products were no longer in the top 10 exports of China. Currently, the top exports of China are electrical machinery and equipment, followed by machinery and mechanical appliances. Although mineral fuels and mineral oils made their way back into the top ranks of exports, they were different from their counterparts three decades earlier. The current mineral fuel industry had a very high value-added output ratio of 77.7 percent in 2007, higher than its counterpart of 26.2 percent in 2007 for textiles. These top three industries account for more than a half of the entire exports of China.

Perhaps the most interesting observation comes from the fourth phase. In 2001, China joined the World Trade Organization (WTO). In the latest phase, China exported a high volume of high-technology products, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. By 2007, high-technology product exports accounted for 30 percent of the

Table 1.2 Top 10 exports by HS 2-digit of China (2000–2008)

Rank	*HS 2-digit category*	*Code*	*percent of total Exports*
1	Electrical machinery & equipment	85	25.45
2	Machinery & mechanical appliances	84	14.37
3	Mineral fuels & mineral oils	27	10.66
4	Optical & photographic instruments	90	6.67
5	Plastics and articles thereof	39	4.95
6	Ores, slag & ash	26	4.44
7	Organic chemicals	29	3.86
8	Iron & steel	72	3.29
9	Vehicles other than railway	87	2.24
10	Copper and article thereof	74	2.20

Source: COMTRADE, authors' compilation

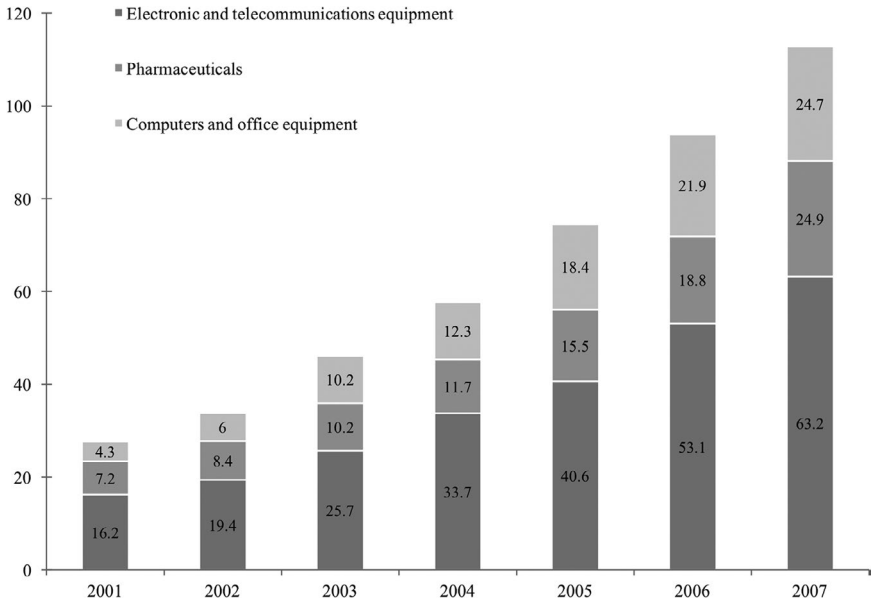

Figure 1.4 Value-added ratios for high-technology industries

Source: National Bureau of Statistics of China, China Statistical Yearbook

entire manufacturing exports of China and 18.1 percent of the world's high-technology exports (Yu, 2011a). Such high-technology industries are associated with a high value-added output ratio, which is defined as the difference between final output and intermediate inputs divided by the final output. Figure 1.4 shows the value-added ratios for all three high-technology industries that exhibit fast growth rates. In particular, the value-added ratio of computer and office equipment increased from 4.3 to 24.7, a more than five-fold increase.

Therefore, the four phases of the economic reform in China demonstrate how a manufacturing goods experiment led to a value-chain upgrading of exports, that is, from primary goods to machinery, transport equipment, and even high-technology products.

1.3.3 Dynamic evolution of comparative advantage

Given that China exports huge volumes of machinery and transport equipment, questions have emerged about its comparative advantage in such products. An affirmative answer about comparative advantage supports the argument that China has adopted a CAF development strategy. Otherwise, one may argue that such a CAF development strategy is not evident in China.

Table 1.3 provides the indices of the RCA at the HS 1-digit level for China in the new century. If an industrial RCA index is greater than one, the industry has a comparative advantage in the world market. In 1996, China had a comparative

Table 1.3 The revealed comparative by industry, 1996–2008

Code	*Description*	*1996*	*2001*	*2006*	*2008*
0	Animals & vegetable	0.210	0.364	0.284	0.29
1	Foodstuff & beverages	1.310	0.977	0.894	1.254
2	Tobacco & mineral	0.710	0.872	0.999	1.16
3	Chemical & plastics	1.439	1.218	0.877	0.802
4	Leather, woods, & papers	1.080	1.201	0.945	0.95
5	Textiles & apparel	3.692	2.637	1.905	1.512
6	Footwear & glass	0.365	0.265	0.17	0.165
7	Metals	1.080	1.259	0.867	0.78
8	Machinery & transport equipment	1.014	1.085	1.231	1.149
9	Miscellaneous manufactured	0.667	0.604	0.829	0.886

Source: COMTRADE, authors' compilation

advantage on industries such as foodstuff and beverage, chemical and plastic, leather, wood and paper, and metal. Among these categories, textiles and apparel had the strongest comparative advantage at 3.692. The comparative advantage of this industry declined in the new century. However, it maintained significant comparative advantage in 2008 with a RCA of 1.512. Equally important were machinery and transport equipment, which began to exhibit a slight comparative advantage in 1996. In contrast with that of textiles and apparel, the comparative advantage of machinery and equipment increased over time. Currently, China boasts of significant comparative advantage in the following industries (in descending order): textiles and apparel, foodstuff and beverages, tobacco and minerals, and machinery and transport equipment. Nevertheless, main idea of Table 1.3 is that China experimented on the dynamic evolution of comparative advantage. By producing and exporting more goods in accordance with its dynamic comparative advantage, China successfully upgraded its industrial structure.

Also, it is worthwhile to stress that successful economic transformation and manufacturing upgrading also requires a country to adopt a CAF development strategy based on its current comparative advantage (Lin et al., 2004). Note that the government provides a very important role to identify the industries that is consistent with a country's comparative advantage. Without the appropriate role of the government, following static comparative advantage has the risk of freezing a country into a certain stage of development, as suggested by Amsden (1989) from Korea's experience. By contrast, if the government can facilitate and identify the industries that follow a country's comparative advantage, the CAF development strategy also automatically follow a country's dynamic comparative advantage (Lin, 2012).[5]

1.3.4 Intra-industry trade and processing trade

Owing to its successful economic reform, China maintained an annual 9.9 percent GDP growth rate in the last three decades. As its economic size

Table 1.4 Intra-industry ratio by sector (1992–2009)

Industries	*1992*	*1995*	*2001*	*2009*
Textile and apparel	0.58	0.61	0.49	0.24
Footwear	0.18	0.10	0.07	0.06
Machinery	0.64	0.74	0.94	0.81
Transport equipment	0.53	0.87	0.97	0.83
Optical and photographic	0.88	0.98	0.89	0.77

Source: China Statistical Yearbook, various years

increased, its factor endowment changed. At present, China is the second largest economy in the world. Its GDP per capita reached US$5,000 in 2011, which is slightly higher than the threshold for higher-middle income countries. Therefore, understanding how China can produce and export larger volumes of capital-intensive products, such as machinery and transport equipment, compared with other countries with similar per capita income levels is difficult (Rodrik, 2006).

A hypothesis attributes this phenomenon to the prevalence of intra-industry trade. Compared with textile and apparel, machinery and transport equipment generate more intra-industry trade. The intra-industry trade index is commonly used to measure the level of intra-industry trade. It is defined as 1-|X-M|/(X+M), where X is the industrial exports, and M is the industrial imports. If the index equals one, then there is a huge volume of trade within this industry, as exports equal imports. Conversely, a zero index indicates that no intra-industry trade occurs in the industry. Table 1.4 illustrates that industries such as machinery, transport equipment, and optical and photographic products have high levels of intra-industry trade. In particular, the index of intra-industry trade for machinery and transport equipment increased to 0.94 and 0.97 in 2001, respectively. In sharp contrast, intra-industry trade in labor-intensive industries, such as textile and footwear, was not so prevalent.

However, it is questionable whether the prevalence of intra-industry trade in capital-intensive industries, such as machinery and transport equipment, is the consequence or the cause of economic development. After its economic reform, China adopted a CAF development strategy. The government realized that processing trade is an ideal way to implement the CAF strategy given that China is a labor-abundant country. Indeed, processing trade is one of the main causes of the high level of intra-industry trade among the capital-intensive industries mentioned earlier.

In processing trade, a domestic firm initially imports raw materials or intermediate inputs from a foreign firm. After the materials undergo local processing, the domestic firm exports the value-added final goods. Figure 1.5 shows how processing exports have accounted for half of the entire export of China since 1995. Among the 20 types of processing trade in China, the two most important types are processing trade with assembly and processing trade with purchased inputs. For processing with assembly, a domestic firm obtains raw materials and parts from its foreign trading partners without any payment. After local

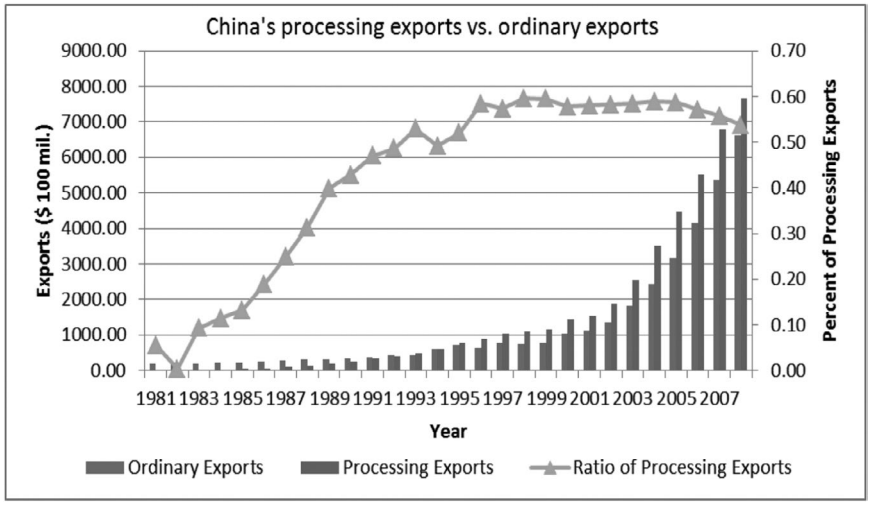

Figure 1.5 China's processing trade (1981–2008)
Source: China' Statistical Yearbook 2009

processing, the firm "sells" its products to the same firm by way of an assembly fee (Yu, 2011b). This type of processing trade was popular in the 1980s because of the lack of capital to pay for the intermediate imports among Chinese firms. The local firms took advantage of the abundant and cheap labor in China. Hence, industries engaged in processing trade are mostly labor intensive. Clearly, such type of processing trade is a typical CAF activity.

In the 1990s, processing exports with purchased inputs became more popular. A domestic firm imports and pays for the raw materials and intermediate inputs. After local processing, the local firm sells its final goods to other countries or foreign trade partners. Industries that typically engage in this type of processing trade are capital-intensive industries such as machinery and transport equipment. Chinese processing firms import complicated intermediate inputs and core parts from Japan and Korea. They assemble the final export goods using the comparative advantage in labor of China. As a result, a large proportion of China exports consists of machinery and transport equipment. Concurrently, China imports a large volume of machinery and transport equipment, as shown in Table 1.2, resulting in a high level of intra-industry trade. Therefore, processing with inputs is still in accordance with comparative advantage driven by factor endowments.

1.3.5 Industrial productivity growth

We have seen much evidence on the structural transformation and industrial upgrading of China, especially from its trading sectors. However, it remains unclear whether the structural transformation and industrial upgrading come

Table 1.5 Total factor productivity of Chinese firms (2000–2006)

Industries	*Labor*	*materials*	*Capital*	*TFP*	*TFP growth rate*
Processing of food (13)	0.043	.890	0.058	1.317	0.57
Manufacture of foods (14)	0.058	.840	0.023	1.393	2.56
Manufacture of beverages (15)	0.068	.855	0.044	1.375	2.44
Manufacture of tobacco (16)	0.048	.854	0.182	2.017	−0.57
Manufacture of textile (17)	0.056	.879	0.036	1.393	−1.27
Manufacture of apparel, footwear & caps (18)	0.096	.796	0.019	1.323	1.68
Manufacture of leather, fur, & feather (19)	0.082	.842	0.078	1.310	3.62
Processing of timber, wood (20)	0.051	.881	.045	1.608	−0.80
Manufacture of furniture (21)	0.154	.732	0.077	1.474	6.83
Manufacture of paper & paper products (22)	0.061	.849	0.048	1.537	1.59
Printing, reproduction of recording media (23)	0.063	.847	0.052	1.433	3.83
Manufacture of articles for culture (24)	0.068	.827	0.045	1.374	5.03
Processing of petroleum, coking, & fuel (25)	0.041	.906	0.061	1.459	0.01
Manufacture of raw chemical materials (26)	0.031	.857	0.074	1.465	−1.33
Manufacture of medicines (27)	0.064	.803	0.002	1.601	0.65
Manufacture of chemical fibers (28)	0.029	.923	0.032	1.402	2.22
Manufacture of rubber (29)	0.089	.729	0.142	1.519	1.96
Manufacture of plastics (30)	0.074	.816	0.051	1.482	4.13
Manufacture of non-metallic mineral goods (31)	0.038	.870	0.870	1.527	4.83
Smelting & pressing of ferrous metals (32)	0.043	.921	0.036	1.492	1.82
Smelting & pressing of non-ferrous metals (33)	0.038	.889	0.052	1.337	−0.07
Manufacture of metal products (34)	0.102	.710	0.063	1.350	−0.15
Manufacture of general purpose machinery (35)	0.049	.835	0.058	1.500	0.07
Manufacture of special purpose machinery (36)	0.029	.868	0.070	1.508	1.64
Manufacture of transport equipment (37)	0.077	.804	0.058	1.405	3.09
Electrical machinery & equipment (39)	0.068	.833	0.119	1.350	−0.94
Manufacture of communication equipment (40)	0.094	.785	0.148	1.678	3.99
Manufacture of measuring instruments (41)	0.049	.815	0.050	1.581	1.22
Manufacture of artwork (42)	0.073	.849	0.045	1.356	0.61
All industries	0.061	.828	0.075	1.454	2.43

Source: Chinese Annual Manufacturing Survey 2000–2006; detailed discussions can be found in Yu 2011b

from "extensive" growth through expansion of capital or labor inputs or "intensive" growth driven by productivity growth.[6] In theory, firms have incentives to maximize profit by increasing productivity through processed innovation under a CAF development strategy. Compatibility between this theory and the reality of China is worth verifying.

Table 1.4 presents TFP levels and growth rates for Chinese firms, with annual sales higher than RMB5 million (approximately US$770,000) from 2000 to 2006. To obtain accurate TFP estimates, we adopt an augmented Olley and Pakes (1996) approach to overcome the possible simultaneity issues and selection bias of the usual ordinary least square estimates, such as the Solow residual.[7] As expected, all manufacturing sectors exhibit positive productivity. The average TFP for all manufacturing sectors is 1.454, which supports the argument that Chinese firms experience technology improvements in the new century. Moreover, the average TFP growth rate is a high at 2.43 percent. This result suggests

that rapid productivity growth is a driving force of structural transformation and industrial upgrading in the new century. More importantly, industries such as transport equipment and communication equipment demonstrate higher TFP growth than do tobacco and textiles. This finding serves as additional evidence that China updates its manufacturing structure over time in accordance with changes in its comparative advantage.

1.4 How China realized structural transformation and industrial upgrading

The successful economic reform of China can be directly attributed to its "dual-track" strategy. On the one hand, the government provided transitional protection and subsidies to older sectors as a way of maintaining stability. On the other hand, the government adopted growth identification and facilitation to support entry to sectors consistent with the comparative advantage strategy to achieve dynamic growth. The dual-track reform strategy includes two important perspectives. One is the reform of micromanagement institutions, which aims to provide more incentives for workers and foster production efficiency. The other is the arrangement of the dual-track price reform, which protects the old heavy industries and SOEs while encouraging the entry of industries that are consistent with the comparative advantages of China. Hence, the reform is a Pareto improvement per se. As a result, China has successfully upgraded its industrial structure in accordance with the dynamic evolution of its comparative advantages.

1.4.1 Reform of micromanagement arrangement

As previously discussed, the economic system of China prior to its economic reform was an organic trinity. The government had to distort output prices and input factors to guarantee higher profits for enterprises and to help nonviable heavy industries develop. The artificially low and distorted prices created excess demand for output and input factors. Hence, the government had to adopt a planned administration system that directed the flow of limited resources into heavy industries. In addition, given that firm's objective is to maximize profits, private firms would deviate from the development strategy set by the government. To avoid this, the government had to set up state-owned non-private firms and restrict their autonomy. The result was a demoralized workforce with no incentives and low productivity.

To improve workers' incentives and foster production efficiencies, China began its reform from its micromanagement system. In the rural area, the People's Communes were replaced with the household responsibility system in which farmers were allowed to keep their production surplus after fulfilling state quotas. In this way, China successfully exploited its comparative advantage in agriculture, by providing initiatives for farmers. As a result, China achieved an annual growth rate of 6.05 percent in agriculture from 1978 to 1984 (Lin et al., 2004). Empirical studies such as Lin (1992) showed that the 46.89-percent increase in

total agricultural products could be attributed to the household responsibility system.

In the urban area, the SOE reform underwent at least four stages in the last three decades. In the first stage (1978–1984), the SOEs were granted autonomy to improve their production efficiency by sharing profits and management duties with the state. The initial reform was successful, worker incentives were improved, and higher profits were generated. However, the reform raised a "rent-seeking" problem because of the unclear boundary of SOE autonomy. In the second stage (1985–1992), the government enhanced the SOEs' vitality by reconstructing an appropriate management mechanism conducted by changing the policy of profit remittance to corporate taxes and replacing direct fiscal appropriation to indirect bank loans. Both policies were set to delineate the boundary between disposal revenue of the firm and fiscal income of the state. In 1988, the government launched a new policy to separate tax from profit. An asset contract responsibility system was adopted in 1987 to share management power between SOEs and the state. But in 1991, the SOE performance remained unsatisfactory and uncompetitive.

In an effort to improve the weak performance of SOEs, a shareholding system was established for large SOEs, and the small SOEs were privatized during the third stage of the reform (1992–2002). Since 1992, the shareholding system was regarded as the best cure to avoid any ambiguities in property rights, which was considered the root of low competitiveness among SOEs. The third phase was successful in making small SOEs more viable. The share-holding system clarified the residual rights of SOEs. However, SOEs still suffered from the existence of multiple principals from various branches of the states. In the fourth stage (2003–present), the government established the State-owned Asset Commission at the provincial level, which serves to represent the states solely. Since then, SOEs were able to concentrate on key industries, such as communications, energy, mining, and heavy equipment. The government pushed further price reforms to mitigate distortions in output and input factor markets. As a result, SOE performance improved considerably.

From 2003 to 2006, the number of manufacturing SOEs was reduced from 3.61 thousand to 2.61 thousand, but their average annual profit growth rate reached 21.7 percent. Prior to this, their average sales annual growth rate was 20.2 percent. As shown in Figure 1.6, several key SEO financial indices, such as the gross profit to equities ratio, the total profit to assets ratio, the net profit to assets ratio, and the net profit to equities ratio, all increased dramatically in 1998. The recent performance of SOEs provides more evidence to interpret the surge of production and exports on machinery and transport equipment in the new century; as such, activities are mainly performed by SOEs.

An interesting question arises: Why do SOEs become viable and have a better performance in the new century? There are at least three interpretations. First, the rapid accumulation of capital over time, especially in the last three decades, changed China's comparative advantages. Large-scale SOEs are more capital-intensive and are able to obtain more capital and natural resources from the

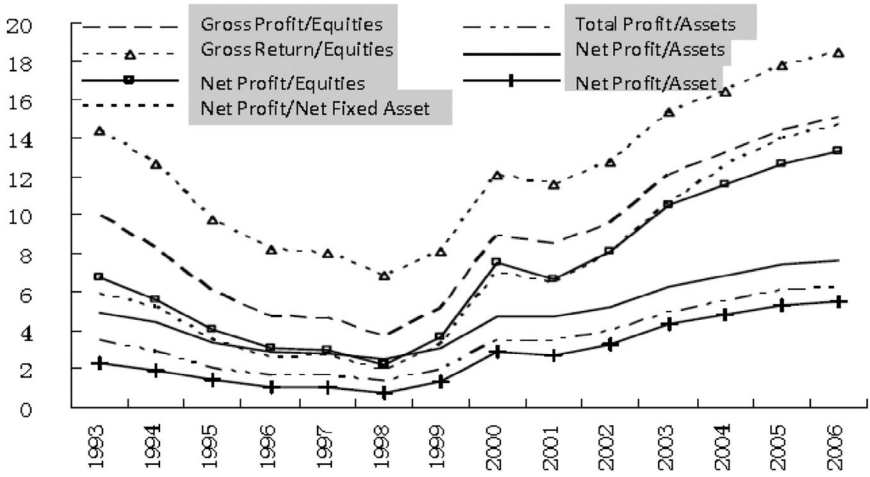

Figure 1.6 The profit rate of Chinese SOEs

Source: CCER Research Team 2007, cited in Yao and Yu 2009

state, which in turn put them in a favorable position in the market economy. Second, SOEs are still enjoying continuous subsidies in the form of preferential access and repressed costs of finance and other inputs. Last but not least, many SOEs are concentrated in industries that are highly monopolized such as telecommunication. Accordingly, such SOEs are able to enjoy the monopoly rents in such sectors.

1.4.2 "Dual-track" price reform on output and input factors

Essentially, many large SOEs were not viable is because they were in sectors which defied China's comparative advantages. The price distortions mentioned earlier were adopted to subsidize them. The dual-tract price reform was used as a way for the state to retain the ability to subsidize the nonviable SOEs. If the prices of output and input factors were suddenly determined by markets, all SOEs would collapse and shut down. Numerous workers would be laid off, and severe social unrest would follow.

To avoid such situation, China's government adopted a dual-track price reform involving output and input factors. The government set the prices of goods within the state plan, whereas the market set those outside the state plan. In the initial reform period (1978–1984), market mechanisms were still not allowed to exist; the government merely adjusted various prices to narrow the gap between planned prices and equilibrium prices for each commodity. However, in 1985, market mechanisms were gradually introduced. As a result, the market outside the state plan grew tremendously, and the market price track rapidly increased. Before East Asia's financial crisis in 1997, 81 percent of all commodity prices and 91.5 percent of retailed goods were set solely by

the market (Lin et al., 2004). Once output prices were primarily determined by the market, the pressure of price reform of input factors also emerged.

In response to the strong demand in factor markets, China's government also began to perform necessary reforms of exchange rates, wages and interest rates, as well as further pursuing its CAF strategies. This section discusses the reforms in exchange rates and interest rates, leaving wage reform for the next section. In the heavy industry-oriented development strategy, the exchange rate is artificially set to a very low level. However, under the CAF development strategy, the exchange rate is ideally determined by the market so that the comparative advantage of industries can be correctly revealed. In turn, this revelation serves as a signal to guide governments in identifying and facilitating manufacturing sectors with comparative advantages.

As shown in Figure 1.7, the dual-track of the exchange rate reform in China underwent four phases. In the first phase (1978–1984), a triple exchange rate system was implemented. This system included the official rate, internal settlement rate, and swap rate, with the first two types of exchange as the most important during this period. The official rate was used externally for the exchange of both commodities and services. By contrast, the internal settlement rate, which was fixed at a constant level (i.e., RMB2.8 per dollar), was used to convert the earning foreign exchange inside China to RMB. China's government gradually depreciated the official rate to converge it with the internal settlement rate. Hence, only a dual exchange rate system existed during the second phase (1985–1994): the official exchange rate represented the planned system, and the swap exchange rate represented the market system. At the beginning of the reform,

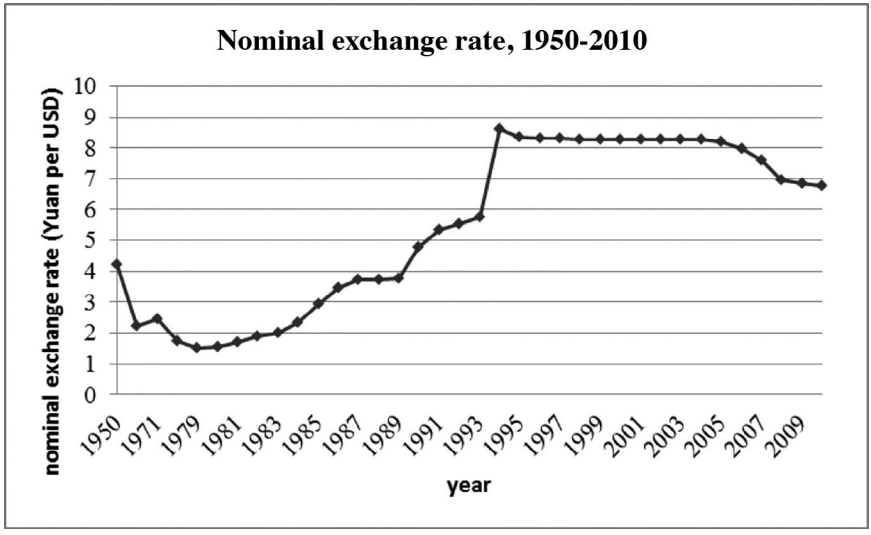

Figure 1.7 The evolution of China's exchange rate

Source: National Bureau of Statistics of China, China Statistical Yearbook

China's government facilitated a system of foreign exchange retention to encourage firms to export and earn foreign reserves. As a result, some firms were in a surplus of foreign exchange whereas others were in a shortage. The swap market was introduced for these trading firms to practice exchange. In this manner, the equilibrium swap rate indeed reflected the true cost of the RMB because it was determined by demand and supply. The market-based swap rate track grew gradually but firmly. By 1993, around 80 percent of foreign trade was settled by the swap rate (Lin et al., 2004). In the third phase (1994–2005), the dual exchange rates were merged into a single market exchange rate at RMB8.61 per dollar, which was fixed for the entire period. The last phase began in 2005, when China began to adopt a managed floating exchange rate. Within the next six years (2005–2011), China adjusted its exchange rate against the US dollar from 8.27 yuan per dollar to 6.5 yuan per dollar, an appreciation of around 20 percent. Today, it is generally believed that China is approaching to its "equilibrium" exchange rate level, if any (Ma et al., 2012). Once again, the market-based exchange rate since 1994 serves as a milestone of the reform to allow manufacturing firms to reveal their true comparative advantage.

To make firms competitive in international markets, China had to mitigate the distortion in the factor markets, such as cost of capital. Only when the interest rates were set by the market could China's government promote capital-saving technology and fully upgrade manufacturing structures. The first wave of China's interest rate increase started in 1979, when the deposit and credit rates increased. The 1980s witnessed 10 occasions in which interest rates were raised. However, interest rates were reduced from 1990 to 1992 to stimulate the economy. After 1992, the government launched a new wave of interest rate increases primarily due to the emerging non-state financial markets, such as corporate stocks exchanged in Shanghai and Shenzhen. However, compared with the exchange rate reform, the reform of interest rates has been slow and gradual. Although the real interest rates maintain positive most times, they are not determined by demand and supply even today. Instead, interest rates are still used as an instrument to subsidize the large enterprises; most of them state owned. As such, the marketization of the interest rate is still ongoing.

1.4.3 Incremental reform in the viable sectors

As mentioned earlier, two fundamental forces contribute to China's successful structural reform and manufacturing upgrading. One is the adoption of the dual-track reform, and the other is the incremental reform in the non-state viable sectors. When the reform of SOEs was stagnant in the early 1980s, China's government shifted gears to focus on the reform of the non-state economy. Such a policy is commonly referred to as an "incremental reform," which is in accordance with China's comparative advantage rooted in its factor endowments. The development of the TVEs serves as the best example to illustrate this incremental reform, which is helpful for understanding China's industrial upgrading and structural transformation.

As illustrated by Lin et al. (2004), the following reasons explain the rapid expansion of TVEs in the 1980s. First, TVEs were able to exploit fully China's comparative advantage in the rural area, that is, abundant labor, to facilitate their primitive factor accumulation. Compared with SOEs that mainly engaged in capital-intensive industries, most TVEs were involved in labor-intensive industries. A huge labor force was concentrated in the rural area as migration was strictly restricted in the 1980s. Accordingly, TVEs could obtain a cheap labor force and generate decent profits without relying on much capital. Second, TVEs could generate a stable revenue, as their products were popular in the market. The market had a severe shortage of light industrial products due to the implementation of heavy industry-oriented development strategies. The mainstream output of TVEs was labor intensive, and it could easily meet the market's requirements. Finally, as opposed to SOEs that enjoyed government protection, TVEs faced a much tougher domestic competition market, causing them to exert the best moves to improve their productivity. Putting these three factors together, TVEs were able to remain viable, generate decent profits, and accumulate sufficient capital for future development.

Note that local governments played a significant role in facilitating the development of TVEs, especially in designing the mechanism of the profit sharing between TVEs and local governments. Unlike those of the SOEs, the managers of TVEs usually came from the grassroots, where there is generally limited room for promotion. As such, their main objective was to maximize the profits retained in the TVEs. As the managers of TVEs have the advantage of have more information about the firm's operations, effective supervision was impossible for the local governments. To avoid such disadvantages caused by information asymmetry, local governments in the 1980s usually preferred the joint-stock cooperative system (i.e., hybrid firms owned by local government and enterprises of TVEs) to delineate the benefit between the government and the firms. This clear relationship on the residual claims fostered the TVEs' rapid development. Since the 1990s, most of the TVEs became private firms and paid corporate taxes to the local governments instead.

China's labor-intensive industries developed quickly in the late 1980s because of the rapid development of TVEs in rural areas. With both the capital accumulation in the TVEs and the gradual successful reform in SOEs, China was able to upgrade its manufacturing industries from labor-intensive light industries to capital-intensive industries, such as machinery and transportation equipment.

1.4.4 Opening-up policies and reform

In addition to the domestic dual-track incremental reform, China's rapid industrial upgrading and structural transformation were also attributed to its opening-up policies. Before the reform, China was an inward and closed economy with a low openness ratio of 10 percent in the 1970s. However, as shown in Figure 1.8, the sum of China's exports and imports today has increased to approximately two-thirds of its GDP. As mentioned previously, China has been the largest

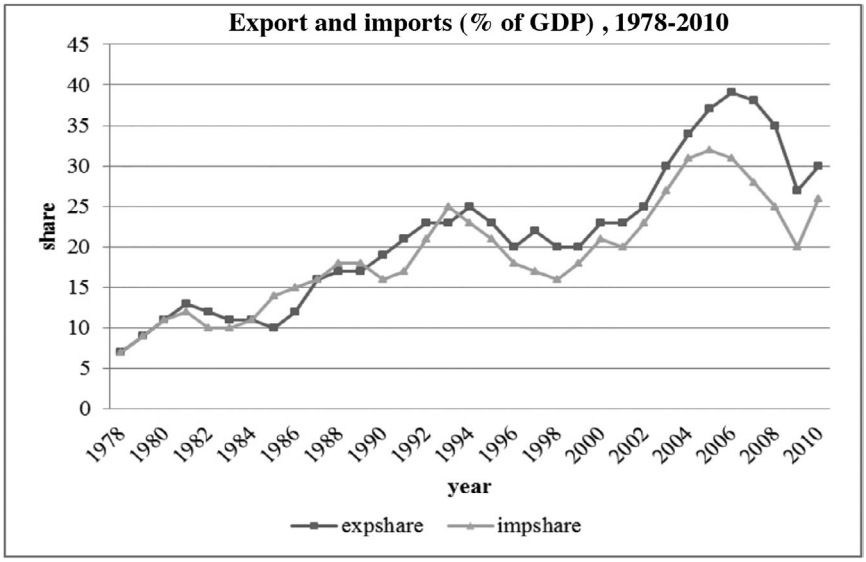

Figure 1.8 China's exports and imports as percent of GDP (1978–2010)
Source: National Bureau of Statistics of China, China Statistical Yearbook, various years

exporter in the world since 2009. The rapid growth of China's exports is indeed the economic consequence of the implementation of the CAF strategy. On the one hand, China has produced many labor-intensive and capital-saving commodities in accordance with its comparative advantage of abundant labor; such products are attractive in the international market because of their low prices and decent quality. On the other hand, China's domestic consumption market is relatively small, resulting in China exporting its products to clear the market (Lin, 2004; Yao and Yu, 2009). The huge exports generate desirable profits for firms and accumulate capital, which in turn upgrades China's overall factor endowments. China can accordingly upgrade its manufacturing products in accordance with its changing factor endowments.

China's open-door reform began from setting up various free-trade zones. This process can be summarized into three phases that started from points (i.e., some cities) to lines (i.e., eastern coastal zones) and then to an entire area (i.e., eastern and central provinces). In 1980, China selected four cities located in Guangdong and Fujian as special economic zones (SEZs). Essentially, the SEZs were used in export processing such that the imports of firms in the zones were duty-free so long as such imports were assembled for export. With the implementation of the "coastal development strategy" in 1984, China opened 14 coastal cities, as shown in Figure 1.9, and several national economic development zones and three economic delta zones were set up shortly after. In 1991, the government also opened four northern ports to trade with Russia and North Korea. At this

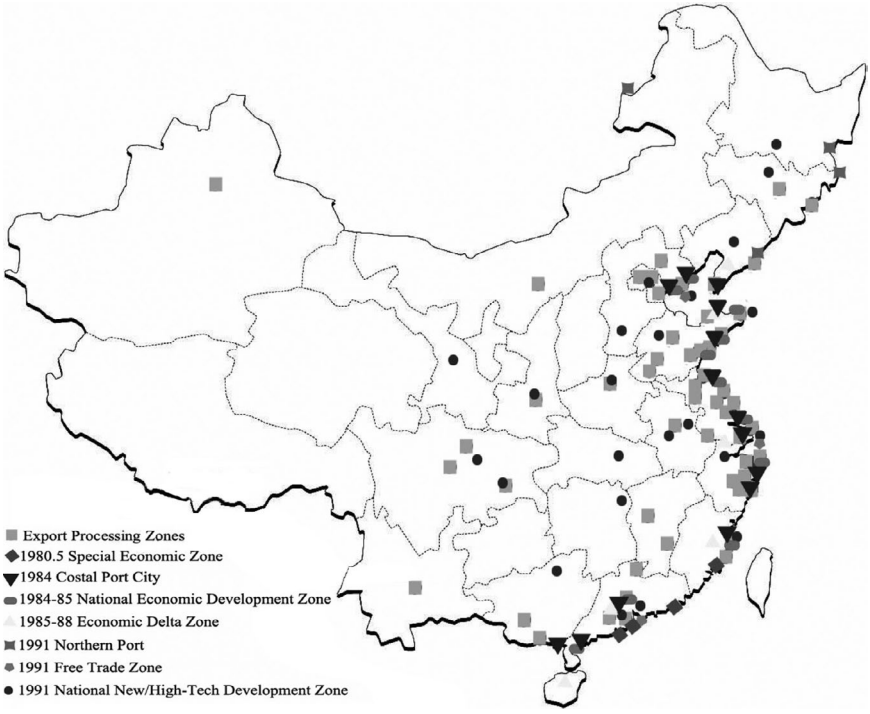

Figure 1.9 China's free-trade zones
Source: Authors' compilation

point, most of the open cities were located in eastern China. However, in 1992, China decided to open more central cities in the form of national high-technology development zones.

In 1992, China began to liberalize its import tariffs and various non-tariff barriers (NTBs). As reported by China's customs administration, the simple average of China's import tariffs declined from approximately 42 percent in 1992 to approximately 35 percent in 1994. Furthermore, to create favorable conditions to resume membership with the General Agreement on Tariffs and Trade (GATT)/WTO, China cut its import tariff from 35 percent in 1994 to 17 percent in 1997, a 50-percent phase-off in a three-year period. After China acceded to the WTO in 2001, it obeyed its commitment to reduce tariffs to around 10 percent in 2005. Although the effect of trade liberalization on economic development is still controversial (Krugman and Obsfeld, 2008), there is no doubt that it introduced tougher import competition for domestic firms including TVEs and SOEs. As opposed to low-efficiency SOEs that could still be in operation under various systems of government protection, TVEs with low efficiency would be swept out of the market. As a result, only the highly

efficient and viable TVEs remained, which in turn made further manufacturing upgrading possible.

Another significant milestone of China's open-door odyssey was the acceptance to the WTO in 2001. To gain WTO membership, China's government had to mitigate much distortion in the output and input factors to adhere to the WTO's requirements, which facilitated China's economic transition and manufacturing upgrading (Lin, 2009). Moreover, the WTO accession also made China's domestic reform irreversible, as China was required to obey the international trading rules set by the WTO (Lin et al., 2004). After China's accession to the WTO, its foreign trade, including both imports and exports, rapidly increased. With a larger international market, Chinese firms were able to expand their production along with China's dynamic comparative advantage, becoming a "world factory."

The last and perhaps the most important open-door policy is processing trade, which made China's performance in foreign trade much better than that of India. As mentioned previously, the processing trade began in the early 1980s through processing with assembly and became prevalent in the 1990s through processing with purchased inputs. Most of the processing firms were foreign affiliates, of companies in Hong Kong, Macau, and Taiwan, and were concentrated in labor-intensive sectors in accordance with China's comparative advantage. In 2000, one year before China's accession to the WTO, the policy makers decided to create export-processing zones (EPZs), whose number increased to 55 in 2010. The EPZs have the same free trade privilege as SEZs, but they also enjoy additional advantages such as sidestepping the entire complex administration and regulatory structure for processing firms within the zones. With such EPZs, China's processing trade remained at around half of its total trade volume and provided more opportunity to adopt better technologies from abroad, which stimulated the country's manufacturing upgrading.

1.5 Effect of structural transformation on employment and poverty reduction

China is a labor-abundant country. As the largest country in the world in terms of population, it had approximately 962 million people in 1978, and this number increased to over 1.33 billion in 2009. China maintained a low and declining dependency ratio during its reform era and therefore enjoyed a sizable demographic dividend (Cai, 2010). As shown in Figure 1.10, the dependency ratio of China, defined as the ratio of people not part of the labor force to those within, was 62.6 percent in 1982 and 36.9 percent in 2009, which is one of the lowest dependency ratios in the world. China has a large labor force; at the end of 2009, the number of people employed was 798 million.[8] This information can help us understand how China's structural transformation and industrial upgrading can generate more employment and alleviate poverty. In the rest of this section, we will elaborate the employment change across sectors in the wake of China's structural transition, followed by a careful scrutiny of