

**CHINA'S HIGH-TECH EXPORTS:
MYTH AND REALITY**

XING Yuqing

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Executive Summary

1. According to an OECD report, in 2006, China surpassed EU-27, the US and Japan to emerge as the largest high-tech exporting country with 16.9% of global market share in high-tech products.
2. China's high-tech exports grew 33% annually from 1995 to 2008, much faster than the growth of overall exports, and the value of high-tech exports surged to US\$416 billion (about 29% of total exports) from US\$10 billion. Computer and telecommunication products accounted for 90% of China's high-tech exports.
3. The rapid expansion of China's high-tech exports is mainly due to the relocation of production capacities by multinational enterprises into China, and the proliferation of production fragmentations and outsourcing activities in information and communication technology.
4. The high-tech exports are basically dominated by foreign invested firms, which accounted for 85% of China's high-tech exports. The dominance of foreign invested firms in high-tech exports increased from 74% in 1998 to the peak level of 88% in 2006 while the presence of Chinese indigenous firms shrank.
5. Taiwanese-owned IT companies played a very important role in nurturing the high-tech industries in mainland China. By 2007, they had relocated almost 100% of their production capacities in laptop PC, digital camera, motherboard and LCD monitor for PC into mainland China.
6. In terms of trade forms, 82% of high-tech exports belong to processing trade, i.e., "processed high-tech" exports. Under the category of high-tech products, what China actually exported is low skilled labor rather than technology. The share of processing exports in high-tech products rose from 71% in 1993 to its

peak of 93% in 2003, suggesting that in the ten-year period, China's high-tech exports became more low skilled and labor intensive.

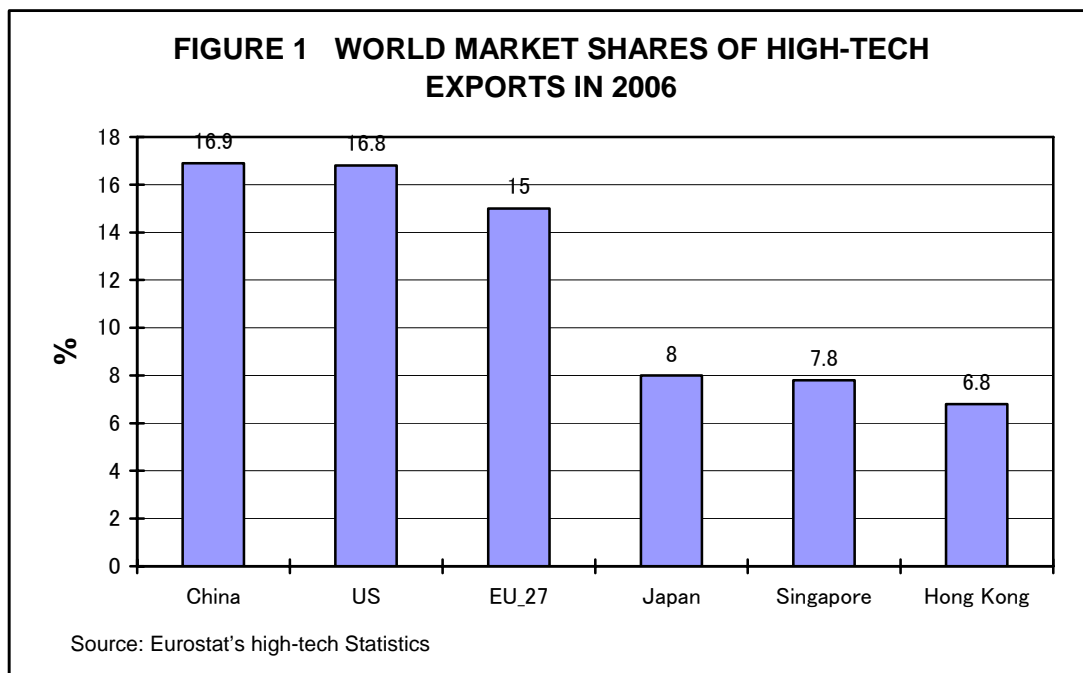
7. China is far from being a real high-tech exporter. The firms producing high-tech exports are mainly located at the lowest value added segment of the production chains: processing and assembling.
8. The experiences of Japan, Korea, Taiwan and Singapore suggest that developing indigenous technologies and building capacities to produce core parts and components is the key to becoming a real high-tech exporting country and improving the value added of manufacturing goods.

CHINA'S HIGH-TECH EXPORTS: MYTH AND REALITY

XING Yuqing*

China Surpassed EU as the Number One High-tech Exporter

1.1 According to the report of the EU,¹ in 2006, China surpassed the US, EU and Japan and emerged as the largest high-tech exporter in the world. From 2001 to 2006, global high-tech exports grew 5% annually, mostly attributable to China. Although EU-27 together remained the leader of high-tech exports in 2005, the growth of China's high-tech exports outpaced that of the EU-27, the US and Japan, and eventually pushed China into the number one slot among high-tech exporting countries.



* Dr. Xing Yuqing is a visiting senior research fellow of EAI, and a professor of the National Graduate Institute for Policy Studies in Tokyo.. He would like to thank Prof. John Wong for his valuable comments and suggestions

¹ Meri, T. (2009), "China passes the EU in high-tech exports," Science and Technology, Eurostat Statistics in focus.

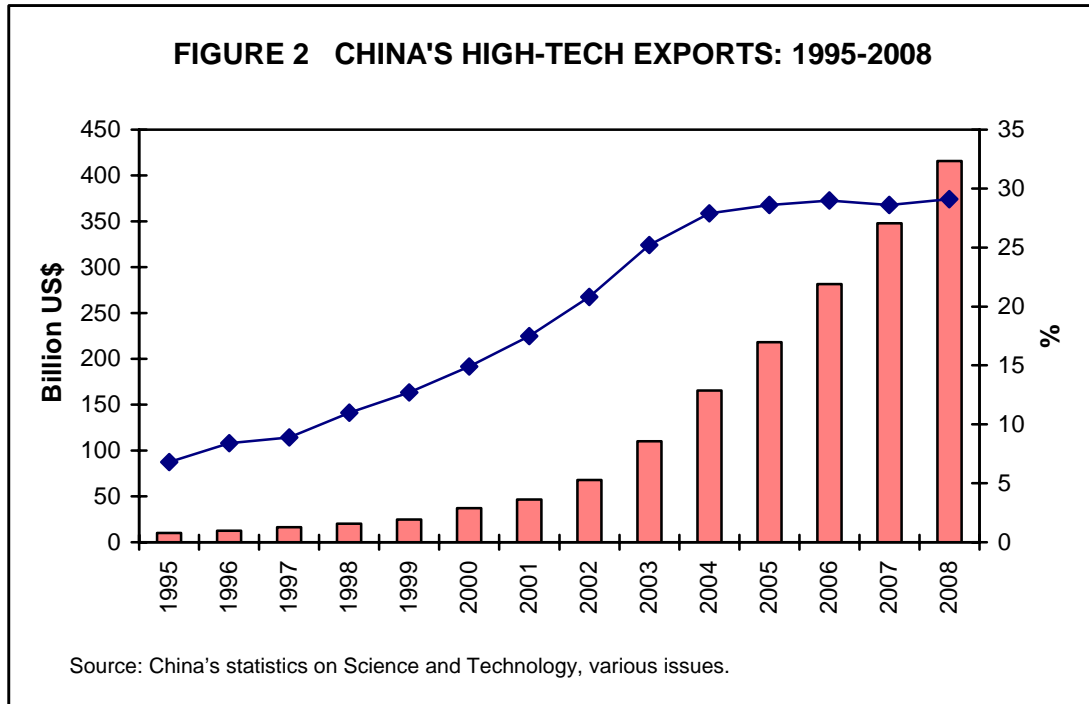
- 1.2 China was not a major player in the global market of high-tech products. Resource and low skilled labor intensive products used to dominate China's exports. In 1995, China accounted for merely 2.1% of global high-tech exports. Its total exports in high-tech products were equivalent to only 8% of the US. However, China's high-tech exports grew drastically in the last decade. By 2006, the global share of China's high-tech exports surged to 16.9%, followed by the US' 16.8%, EU-27's 15% and Japan's 8%. (Figure 1)
- 1.3 The export-led growth strategy, adopted from the beginning of the economic reform, has transformed China into the world's second largest trading economy. The rich labor endowment determines that China's comparative advantage lies in labor intensive products. Upgrading exports structures and pursuing high value added exports in high-tech products have been promoted by the Chinese government. From the perspective of China, the rising share of high-tech exports may imply a structural change to Chinese exports from low skilled labor intensive to capital intensive/human capital intensive products. It may also suggest the improvement in the value added of China's exports.
- 1.4 On the other hand, the rising global market share of China in high-tech exports has been associated with declining market shares of other major economies such as the US, EU and Japan. In the view of politicians and scholars in developed countries, the rapid growth of China's high-tech exports is threatening the competitiveness and at the cost of these industrialized countries, which have been maintaining the lead in high-tech industries, such as information and communication technology, biotech, aerospace, pharmaceutical, etc.
- 1.5 With a 1.3 billion population, there is no surprise that China has been dominating the global market for labor intensive products. However, given US\$3,300 per capita income, 1.6% of GDP R&D expenditures, and 0.7% R&D intensity,² is China a real high-tech export champion, or is it just a myth?

² Tong, S and Zhu, J. (2009), "China's Rapidly Growing Enterprise-led Innovation System, No. 461, *EAI Background Brief*.

- 1.6 A reality check suggests that the myth of China's leading position in high-tech exports has little to do with the technology advancement of the indigenous Chinese companies. The drastic expansion of high-tech exports are mainly due to the proliferation of production fragmentation and outsourcing activities of multinational enterprises (MNEs), the relocation of standardized production processes into China by MNEs, and the incorrect trade classification, which simply focuses on finished products rather than key parts and components used for assembling.
- 1.7 An analysis of the ownership of firms producing high-tech goods in China and the form of China's high-tech exports suggests that the myth of China's high-tech exports is created by foreign direct investment (FDI) inflows and the real contribution of China to more than 82% of high-tech exports is labor rather than technology.
- 1.8 Technology transfers are expected from inflows of FDI, in particular foreign investment in high-tech companies. The small share of Chinese indigenous companies and the dominance of processing trade in high-tech exports indicate that the technology transfer impact is very limited and insignificant, if any.

Growth of China's High-tech Exports

- 2.1 In China's official statistics in high-tech trade, high-tech products consist of nine product categories: computers and telecommunications, life science technologies, electronics, computer-integrated manufacturing, aerospace, optical-electronics, biotechnology materials, and other technologies. The classification of high-tech trade is jointly published by China's Ministry of Science and Technology and the Ministry of Commerce. The classification is basically compatible with that of the US for exports and imports of advanced technology products.



2.2 Figure 2 shows the trend of China's high-tech exports from 1995 to 2008. In 1995, the value of China's high-tech exports was moderate and amounted to US\$10.1 billion, about 6.8% of total exports and 7.9% of total manufacturing exports. For promoting high-tech exports, the Chinese government has provided various incentives such as lowering corporate income tax to 15% and granting 150% deduction for R&D investment.³

2.3 As a result, the value of high-tech exports grew rapidly. From 1995 to 2008, high-tech exports grew 33% annually, much faster than the growth rate of China's overall exports. In 2008, the value of China's high-tech exports surged to US\$415.6 billion, accounting for 28.6% of its total exports.

2.4 China is also one of the largest high-tech importing countries. According to the OECD, China is the third largest high-tech importer, after the US and EU. Before 2004, China was constantly running a trade deficit in high-tech

³ Xue, L. (2009), "Chinese Policies on New and High-Tech Industries," presented at the conference on "China's Increasingly High Technology Trade," Carnegie Endowment and Brooking Institution.

products trade. The rapid expansion of high-tech exports turned the trade deficit to surplus. In 2008, trade surplus in high-tech products surged to US\$74 billion, equivalent to a quarter percent of China's total trade surplus.

TABLE 1 CHINA'S HIGH-TECH TRADE BY TECHNOLOGIES, 2008

Technologies	Exports		Imports		Trade Balance
	Value (US\$ billion)	Share (%)	Value (US\$ billion)	Share (%)	Value (US\$ billion)
Computer and Telecommunications	308.5	74.2	79.7	23.3	228.8
Life Science	13.4	3.2	8.1	2.4	5.3
Electronics	55.4	13.3	161.1	47.2	-105.7
Computer-integrated manufacturing	6.3	1.5	24.7	7.2	-18.4
Aerospace	3.2	0.8	13.1	3.8	-9.9
Optoelectronics	24.6	5.9	48.5	14.2	-23.9
Biotechnology	0.3	0.1	0.3	0.1	0
Materials	3.6	0.9	5.8	1.7	-2.2
Others	0.3	0.1	0.5	0.1	-0.2
Total	415.6	100	341.8	100	73.8

Sources: Statistical Report on Science and Technology, No. 8, July 2009, Chinese Ministry of Sciences and Technology

2.5 Table 1 shows the structure of China's high-tech exports. It suggests that computer and telecommunication equipment and electronic products compose a majority of China's high-tech exports. In 2008, the export of computer and telecommunication products amounted to US\$308.5 billion, about 74.2% of total high-tech exports. Electronics ranked second with US\$55.4 billion (about 13%). Combined, the two groups accounted for 91% of the total. The rest of nine technology groups such as life science, biotech, aerospace and material science contributed less than 10% of high-tech exports.

2.6 China maintained a huge trade surplus of US\$229 billion in computer and telecommunication products, with standardized production and life cycles of new models lasting usually about 6 months. In life science, China had US\$5.3 billion surplus. On the other hand, China had trade deficits in the rest of the seven technology categories, even in electronic products.

FDI: A major driving force behind China's high-tech exports

- 3.1 What are the major reasons for such a dramatic surge in high-tech exports from US\$10 billion to \$US415 billion in just 13 years? FDI and the extension of production network of MNEs from Japan, Korea, Taiwan, Singapore, etc. into China, is the answer.
- 3.2 The advancement in production technology and transportation has greatly facilitated the spread of MNE production chains across borders. Conventional specialization of products has been replaced by the specialization on parts, components as well as production procedures. In computer, telecommunication and electronics industries, specialization on parts and production procedures and global production networks have been well developed by MNEs, in particular, Japanese MNEs in Asia.
- 3.3 China's openness to FDI and its rich endowment in labor constantly attract MNEs to relocate their product capacities, outsource labor intensive components to China and integrate China into their global production networks, thus boosting the production of high-tech goods. On the other hand, the production technology, distribution networks and brand names of MNEs function as vehicles for made-in-China products to access the global market.
- 3.4 It is well known that foreign invested firms have been driving the rapid growth of China's exports and producing more than half of China's exports. In high-tech products, foreign invested firms have been playing an even more crucial role, dominating China's high-tech exports.
- 3.5 Table 2 shows the contribution of foreign invested firms to high-tech exports. In 1998, foreign invested firms exported US\$15 billion high-tech products, about 74% of China's high-tech exports. Since then, the dominance of foreign invested firms in high-tech exports has been strengthening as more and more FDI flows into China. In 2005, foreign invested firms exported US\$192 billion

and their share rose to a record high of 88%.⁴ The share of indigenous Chinese firms in high-tech export only increased slightly from 2006 to 2008 to 14.8%. In other words, the absolute dominance of foreign invested firm in high-tech exports remains. If advanced technologies are embedded in these exports, the property rights of these technologies are mainly under the control of foreign companies.

TABLE 2 FOREIGN INVESTED FIRMS' CONTRIBUTION TO CHINA'S HIGH-TECH EXPORTS

Year	Value (US\$ billion)	As % of China's total high-tech exports
1998	15.0	73.7
1999	18.8	76.0
2000*	30.3	80.9
2001	37.9	81.5
2002	67.1	82.2
2003*	94.5	85.7
2004	144.4	87.3
2005	192.1	88.0
2006	247.8	88.1
2007	301.2	86.6
2008	353.9	85.2

Sources: Statistics on Science and Technology, various issues, China Ministry of Science and Technology.

*: Author's estimates

3.6 There are three types of foreign invested firms in China: wholly foreign owned, Sino-foreign joint ventures, and Sino-foreign cooperative ventures. A breakdown of high-tech exports by the forms of foreign invested firms indicates that wholly foreign owned firms are the major contributor to high-tech exports. In 2008, they exported US\$281 billion, accounting for more than 79% of all foreign invested firms' exports in high-tech products.⁵

⁴ "Analysis on China's High-tech Imports and Exports," China's Ministry of Science and Technology.

⁵ Statistical Report on Science and Technology, No. 8, July 2009, Chinese Ministry of Sciences and Technology.

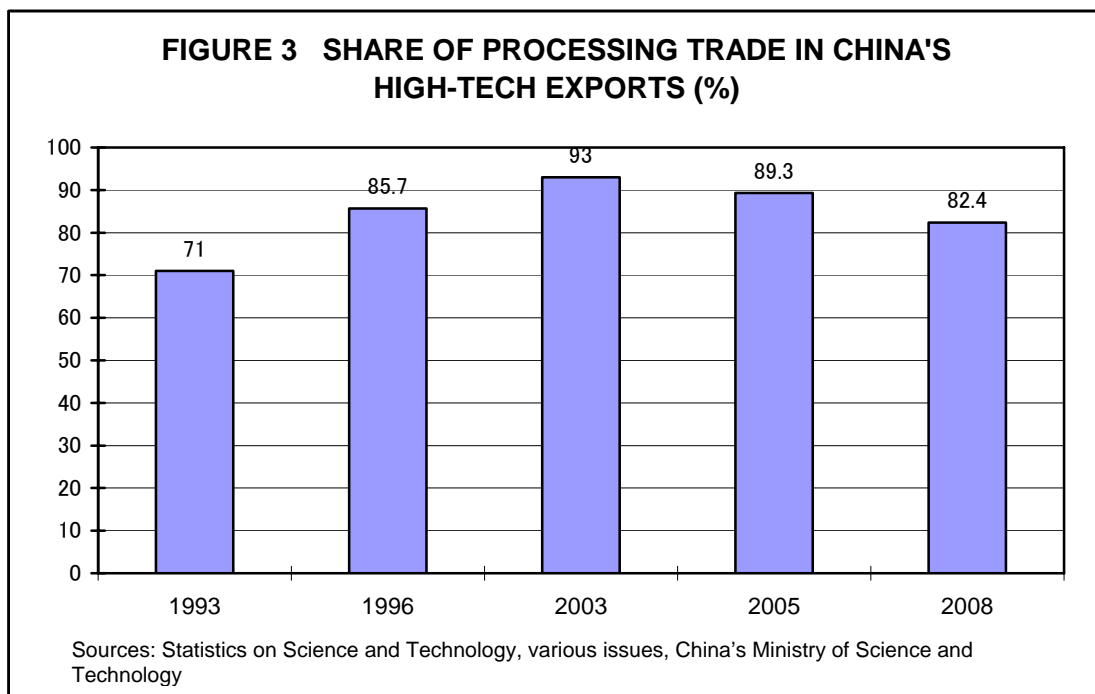
- 3.7 High-tech exports of Sino-foreign joint-ventures may represent the technology advancement of Chinese partners of these ventures to a certain extent. However, the technology and production know-how used for producing exports of wholly foreign owned firms belong to the foreign investors and cannot be used as an indicator of technology of the Chinese indigenous firms. The spillover effects to Chinese firms did improve their technology levels, however. The small share of indigenous local firms in high-tech exports implies that the firms are far from being a real competitor to multinational firms in industrialized countries.

China Exporting Labor, but little Technology

- 4.1 The trading forms of high-tech exports can also help in the understanding of the nature of China's high-tech export myth. Processing trade is a unique form of China's foreign trade and accounts for about 50% of China's exports. Processing exports are produced with imported materials, parts, components, and even packaging materials. These intermediate inputs are either purchased by companies located in China, or supplied by foreign firms without financial payment. Thereafter, these companies located in China process/assemble the imported intermediate inputs into semi-finished, or finished products, and export them abroad.
- 4.2 Like trade in all commodities, processing exports, which are produced with imported materials, parts, components, and even packaging materials, represent a major form of high-tech exports. In 2008, processing exports accounted for 82% total high-tech exports.
- 4.3 Due to the lack of technology advantages, processing trade has been the major form of Chinese high-tech exports since the early 1990s (Figure 3). In 1993, China exported US\$4 billion high-tech products, less than 5% of its total exports. Processing exports accounted for 71%. As more and more foreign firms took advantage of China's cheap labor by relocating labor intensive segments of their production chains to China and utilizing China as their

export platform, the share of processing exports grew dramatically. By 2003, the share of processing exports in high-tech goods surged to 93%.⁶

4.4 In other words, high-tech exports in general trade, which actually reflect the real technology advancement, shrank substantially to merely 7%. Processing and assembling are labor intensive. The declination of general trade in high-tech goods implies that China's high-tech exports became more labor intensive rather than capital intensive after ten years of rapid expansion from 1993 to 2003. The share of processing exports declined slightly to 82% in 2008, but remained dominant.



4.5 The production procedures of processing exports suggest that the contribution of companies located in China to high-tech exports classified under processing exports is not advanced technology, but labor. Since all key components are imported, the technological sophistication of these products does not represent the technology advancement of China.

⁶ "Analysis on China's Exports and Imports in high-tech," No. 6, 2007, China's Ministry of Science and Technology.

- 4.6 One typical example is the trendy and advanced music player iPod, designed and marketed by American company Apple. iPods are assembled in companies located in China, which are owned by the Taiwanese. When assembled iPods are shipped to foreign market, the shipment is classified as high-tech. Nevertheless, China only contributes labor for processing, the lowest value added segment along the “smile curve”, which defines the value added of production chains.
- 4.7 Given the significantly high share of processing export in China’s high-tech exports, it is misleading to claim that China has become the leader in high-tech exports. The so called high-tech exports by China are no different to the exports of shoes and clothes as in both cases China contributed mainly labor to these commodities.

Taiwanese Invested Firms and China’s High-tech Exports

- 5.1 Among all foreign investors, Taiwanese companies made a major contribution to the rapid expansion of China’s high-tech exports in major information and telecommunication products. As indicated in Table 1, computers and telecommunication products represent the largest group in high-tech exports. Close to 90% of China’s high-tech exports belong to this product group. It is the relocation of production facilities from Taiwan to mainland China that helped China emerge as a leading IT exporter in the world. The relocation simply transplanted the success of Taiwan’s semiconductors to mainland China.
- 5.2 Since 1980, Taiwan has developed technology and production capacity in semiconductor and information technology products. Taiwanese companies have become the largest original equipment manufacturers (OEM) and original design manufacturers (ODM) for leading international IT firms such as IBM, DELL, Intel, SONY, etc. OEM and ODM are the major forms of production fragmentation in information and telecommunication industries. As production technologies in IT industries are gradually maturing and production processes are being standardized, IT products become commodities

rather than high-tech goods. It is easy to divide production into segments and locate in different countries.

TABLE 3 STYLIZED FACTS OF TAIWANESE-OWNED IT COMPANIES, 2007

	Laptop PC	Desktop PC	Motherboard	LCD monitor for PC	Servers	Digital Camera
Rank in Market share	1	2	1	1	2	2
Annual Output (1,000 unit)	90,165	46,055	149,097	117,539	2,950	49,896
Global Market Share (%)	92.8	32.6	97.2	70.2	35.2	42.2
*Exports as (%) of output	91.5	82.8	73.7	80.5	89.4	95

*: Exports consist of all sales outside of mainland China and Taiwan.

Sources: Taiwan Information Technology Yearbook 2008.

5.3 In terms of global market shares, in 2007, Taiwanese companies ranked number one in laptop computer with more than 90 million units, LCD monitor for PC with 117.5 million units, and motherboards with 149 million units; they are also ranked number two in desktop PC, and servers, and digital camera productions. (Table 3)

5.4 Most of these IT products are sold in markets outside of Taiwan and mainland China. For instance, 95% of digital cameras, 92% of laptops and 89% of servers are exported to overseas market. The export-oriented operations of Taiwanese firms in mainland China have pushed China into the number one of global IT producers.

TABLE 4 SHARES OF MAJOR IT PRODUCTS BY TAIWAN AND MADE IN MAINLAND CHINA

	Laptop PC	Desk Top PC	Motherboard	Server	LCD monitor for PC	digital camera
2003	54.3	51.7	73.9	21.3	79.1	89.2
2004	77.8	54.1	86.2	25	84.6	98
2005	92.8	57.5	91.6	42.2	88.7	98.5
2006	96.9	63.9	94	53.4	90.6	99
2007	97.8	71.7	96.4	57.5	91.5	98

Sources: Taiwan Information technology Yearbook, various issues.

5.5 To strengthen their competitiveness and to lower production costs, Taiwanese companies have gradually relocated most of their production capacities to mainland China. Relocating the production of these products into mainland China immediately increased the China's output in IT products and created an IT growth myth.

5.6 By 2007, 98% of digital cameras made by Taiwan were produced in its mainland China factories; the same could be said of 97.8% of laptop computers, 57% of servers and close to 92% of LCD monitors for PC. (Table 4)

Myth and Reality

6.1 In sum, the myth of China's high-tech exports is created by FDI inflows. China's real contribution to more than 82% of high-tech exports is labor and not technology.

6.2 MNEs, in particular Taiwanese firms in China, have played an important role in the rapid expansion of China's high-tech production. The trend of production fragmentation and outsourcing activities of MNEs in information and communication technology has benefited Chinese firms significantly. However, these firms remain at the low value added segments. The small

share of indigenous firms in high-tech exports implies that China has yet to become a real competitor of the US, EU and Japan.

- 6.3 Technology transfers are expected from inflows of FDI, in particular foreign investment in high-tech companies. The small share of Chinese indigenous companies and the dominance of processing trade in high-tech exports indicate that the technology transfer impact is very limited and insignificant, if any.
- 6.4 The experiences of Japan, Korea, Taiwan and Singapore suggest that developing indigenous technologies and building capacities to produce core parts and components is the key to becoming a real high-tech exporting country and improving the value added of manufacturing goods.