CHAPTER X

Has Capitalist Reform Developed China's Technology and Productive Forces?

with Hsin-Hsing Cheng

One of the most important justifications the reformers made for China's capitalist Reform in 1979 was that the Reform (*gai-ge*, capitalist reform) and Opening up (*kai-fang*, linking up with the international economy) would speed up the development of productive forces. One of the most important aspects of faster development of productive forces, according to the reformers, was to acquire advanced technology from the West once China's economy could be opened and linked with the rest of global economy. The reformers charged that China did not make much progress in technology during the socialist era, because it had isolated itself from the advanced Western countries, which possessed superior technology.

The Reform's most important strategy for acquiring high-level technology has been to offer foreign multinationals China's vast market as incentive for their direct investment in the country. The reformers thought that foreign corporations who relocate their production to China would bring advanced technology to use in their operations. China would thus be able to acquire the technology transferred. The other strategy has been to import sophisticated technology from Western countries. The Reformers believed that once China upgrades its technology then it will be able to compete with the foreign multinationals in both domestic market and international market.

It has been almost 30 years since the Reform began and at least two decades after the Reform transformed China's basic relations of production from socialist to capitalist. China began to accept foreign direct investment in the 1980s and allowed more foreign investment to pour in during the 1990s. By the time China became a member of the World Trade Organization (WTO) in 2001, it had swept away all barriers that would prevent it from full integration into the world capitalist system. China became the most favorable

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place for foreign multinationals to invest, to produce goods, to sell these goods in the domestic market, and to export them. China's exports were growing at astonishing rates, above 20 percent annually until recently, or a 500 percent increase in real term between 1992 and 2005. This high export growth rate was the main reason for equally impressive GDP growth rates during this period. According to one estimate 5.7 percent (or 3/5) of the 9.7 percent GDP growth in 2004 was due to the increase in exports.[1] How should we interpret the impressive growth in China's exports and GDP in terms of development of productive forces and improvement in technology?

This paper answers the questions regarding changes in technology during the 20-plus years of China's capitalist Reform in the following four sections:

Section A presents some superficial observations that seem to support the view that China's capitalist Reform has achieved the goal of acquiring more advanced technology and also the goal of developing productive forces.

Section B will point out the technological bottlenecks experienced in China's industries in general and in its automobile industry in particular. China's lack of progress in advancing its technology will also be examined from the content of its large volumes of exporting goods. We would then argue that despite all its efforts, the Reform has failed to upgrade China's technology in any significant way.

Section C will briefly summarize reasons given by Chinese academics and government officials for the failure of adopting advance technology from abroad. Then the authors will add their own explanations for the failure.

In the last section, we will examine how the capitalist Reform has affected China's development of productive forces, and end with a brief conclusion.

A. Superficial observations about 'great progress'

A quick survey of China's economy can easily lead to the conclusion that the country has made great progress in developing its productive forces and has made significant progress in upgrading its technology. China is not merely the world's largest steel and cell phone producer; it has also built modern automobile factories that are turning out better quality passenger cars than in the past. In addition, its exports have moved from low-tech products like garments, toys, and shoes, to high-tech products such as machinery and electronic products, including computers (parts and components), high quality steel, and automobile parts. News from the Ministry of Commerce says that in 2006, the volume of China's total trade (imports and exports) of machinery and electronic products amounted to $977 billion—with the volume of its exports of machinery and electronic products reaching $549 billion, which is 12.5 times that in 1995. As a result, China achieved third place worldwide in exporting these products, after the United States and Germany.[2]

A quick survey also shows that spending on research and development has increased significantly in China. A report by the Organization for Economic Cooperation and Development (OECD) indicated that the country's expenditure on research and development increased to $60 billion in 2001, ranked third after the United States and Japan whose investments amounted to $282 and $104 billion respectively. China's spending on R&D in 2001 accounted for 1.1 percent of its gross domestic product that year, almost double the 0.6 percent in 1996.[3] The report also said that about 40 percent of China's expenditure in R&D in 2001 was from the government and the other 60 percent came from domestic and foreign enterprises.[4]

One of the ways the Chinese government spends its R&D is to give grants to well-known universities for research and development. Its institutes of higher learning conduct research and train highly qualified scientists and engineers ready to enter into fast expanding high-tech businesses. The foreign multinationals have not only expanded R&D spending in their business operations; in increasing numbers, high-tech multinationals have set up research and development centers in China. IBM and Microsoft established research institutes in China in the late 1990s, while German industrial conglomerate Siemens AG launched a new research facility in 2006, one of its two largest research bases outside of Germany. In 2005 Siemens filed more than 1,000 patents, one of the largest numbers of patent filings in China.[5]

Apart from U.S. and European multinationals, other countries are joining the rush to establish such centers. For example, the South Korean LC Electronics set up a research and development center in Beijing in 2002, the largest outside South Korea. This center hired a few hundred Chinese engineers and other technical personnel, and was expected to expand to 1,600 people by 2005 (Industrial Economics Study Center 2003, 232). A *New York Times* article in its 13 Sept 2004 issue indicated that with the coming of these multinational-created R&D centers, estimated by Chinese officials to be growing at 200 per year, China has become a new "hotbed of research."

B. Evidence of failure in advancing technology

The questions that need to be addressed are: To what extent foreign investment has brought their advanced technology to China? How much has China learned from such technology transfers? How much has R&D spending by the Chinese government and by foreign and domestic businesses, including these R&D centers, helped China develop its technology?

Currently, some academics and government officials in China, including those closely related to the Reform, have admitted that the Reform's strategy of using the domestic market to attract foreign technology has not been successful, and that all efforts to attract foreign investment have failed to upgrade the country's technology. They have presented evidence contradicting the claim that China has significantly advanced its technology in the Reform era. Moreover, the World Bank's recent study on China's exports has also revealed that its fast growing exports of machinery and electronic products has been

mainly due to the increase in its processing trade, which is simply assembling imported intermediate inputs then exporting the outputs. In other word, the high technology and skill contents of machinery and electronic products being exported come mainly from imported components. The evidence of failure is presented below.

1. A general survey

There are several major technological bottlenecks in China's manufacturing industries, which are signs of weakness in its technology. One bottleneck is in the machine-building industry. Despite its being third-ranked worldwide in exporting machinery, China's machine-building technology has not made much progress in the past three decades. As it produces more sophisticated goods, it also becomes more and more dependent on imported machinery. According to the *China's Industrial Development Report, 2003,* the utilization rate of China's domestic machinery industry was only 50 percent of its capacity; the country has to import many different kinds of specialized equipment, precision machines, and other skill-intensive machinery. For example, China has to import over 80 percent of the machinery and equipment needed for synthetic fabric production and 70 percent of the machinery and equipment including digital lathes for its petrochemical and passenger car industries. (Industrial Economics Study Center 2003, 28)

The other major weakness in China's technology is that it must import not just machinery and equipment but also parts and components for its industrial production. The same 2003 report said that even though China is the world's largest steel producer, it must import certain crucial components of steel. For example, its self-sufficiency rate for a certain kind of sheet steel is only 65 percent; its self-sufficiency rate is even lower for stainless steel—only 15 percent—which means that China has to import 85 percent of materials needed to produce stainless steel. The report also said that even though China is capable of producing many high-end consumer durables, it has to import many intermediary products and specific materials for the production of these consumer durables. It has large capacities to produce electronic products, such as refrigerators, freezers, washing machines, microwave stoves, and air-conditioners, so that large multinationals (Whirlpool, GE, Sony, Siemens, and South Korean firm LG) have contracted Chinese firms to produce these products with imported parts and components. In 2002, China imported 6.1 million compressors for air-conditioners, 5.2 million compressors for refrigerators, and 25 million magnetrons for microwave stoves. Since Chinese manufacturing firms have not been able to produce these components, multinationals such as Toshiba, Matsushita, Sanyo, and Hitachi have seized the opportunity by setting up their own businesses to produce these critical components to replace the imports. (Industrial Economics Study Center 2003, 27, 230).

This weakness means that China has not been able to build a technological base needed for domestic innovation. Despite its large spending on technology imports, totalling $75 billion between 1999 and 2003, Chinese manufacturing companies are not able to engage in independent product development and product design in order to establish their own brand names for their products. These firms have to continue their production under foreign brand names.

2. The automobile industry

The reformers' ambitious plan for the automobile industry was to expand passenger car production. China's passenger car technology at the time of the Reform was very much behind, because during the socialist era the emphasis of the automobile industry was to produce trucks for transporting goods and large buses for public transportation, and very little investment was made to produce passenger cars. The First Auto Works (FAW) established in 1953 with the help from the Soviet Union produced medium weight and heavy weight trucks. The foundation of truck production was laid in the 1960s and 1970s, so in 2002 FAW was able to produce 200,000 of these two types of trucks to become the number one producer of trucks in the world. There had been very few passenger cars produced before the Reform. Hongqi, the most well-known luxury passenger car, also produced by FAW, served as limousines for government guests and high-level officials.

The rapid expansion of China's passenger car production came in the 1990s, later than other export-oriented industries, but its rate of growth has been as impressive. In 1990 China's passenger-car production took off, then doubled between 1991 and 1992, and for the rest of the 1990s grew at an annual rate of 27 percent (Gallagher 2003, 9). The total car production reached 2.3 million units in 2004, then went up to nearly eight million in 2007. (*Annual Report on Automotive Industry in China* 2008).

The Chinese government regarded the automobile industry as the engine of growth for the rest of the economy, and by 2006 the industry's total production accounted for 15 percent of the total value of manufacturing (*Annual Report on Automotive Industry in China* 2008). Reformers recognized that the key to developing passenger car production was advanced technology. The passenger car industry is a good example of the strategy of using the domestic market in exchange for foreign technology: the government would offer foreign firms the opportunity to invest, produce and sell cars in China; in return, the investors would bring their advanced manufacturing technology into the country.

There were three major Chinese automobile enterprises at the onset of the Reform—the First Auto Works (FAW) in Changchun, the Beijing Automobile Industry Corporation (BAIC), and the Shanghai Automotive Industry Corporation (SAIC). In 1984, BAIC formed a joint venture with American Motor Corporation—The Beijing Jeep—to produce a utility vehicle. (American Motor Corporation later became Chrysler and then DaimlerChrysler.) In the same year, SAIC joined up with VW to form the Shanghai Volkswagen, also to produce passenger cars. Around the same time, other Chinese automobile companies also licensed technology from foreign automobile companies.

The first two automobile joint ventures between Chinese and foreign automobile companies were formed in the mid-1980s. During the 1990s, more foreign investment poured into China's passenger car industry and all major international automobile corporations formed joint ventures with China's car companies. By the early 2000s, the total investment from both foreign and domestic sources totaled almost $60 billion. (CATARC 2002)

In the late 1970s, BAIC was producing the BJ212 (now named BJ2020) utility vehicle with the old technology given to China by the Soviet Union in the 1950s. The plan was for the Beijing Jeep to continue producing the old model for a while and then AMC would upgrade it with its Jeep Cherokee XJ model. However, instead of transferring Jeep Cherokee technology, AMC and then Chrysler just sold the kits of full Cherokee engines to the Beijing Jeep, which in turn assembled these kits into the old BJ212 to become the new BJ2020. Beijing Jeep continued to sell BJ2020 with no modification made on it except installing the Cherokee engine kits, which was never updated since it had been first introduced. Since for many years the sale of BJ2020 exceeded the Cherokee sale in the U.S., AMC and then Chrysler made large profits from selling the Cherokee kits to China (Mann 1997). As far as the Shanghai VW was concerned, Volkswagen imported its technology to produce the passenger car, Santana, but little technology or knowhow was transferred to SAIC.

Gallagher says that despite this "flurry of activity" in the 1980s, China had not acquired much knowledge from foreign car companies; she believes that the foreign companies selected what technology would be transferred and how to transfer them without teaching their Chinese partners anything significant (Gallagher 2003, 8).

The Chinese government belatedly realized that the two early automobile joint ventures were operating in a protected environment (through China's import quota and high tariff) and they made two different lines of automobile so there was no real competition between them. Also, there was no specific requirement for technology transfer in the joint venture contracts. This realization prompted the Chinese government to establish some guidelines regarding technology transfer for foreign car companies in the 1994 Industrial Policy for the Automobile Industry.

One of the guidelines was for automobile joint ventures to buy more of the parts and components they use from local suppliers. If these supplies were not available in China, the joint ventures should ask their suppliers to relocate to the country or train local suppliers to produce them. The joint ventures would then be able to localize their production by reaching the levels of local content as mandated. At the start the local content should be 40 percent, increased to 60 percent by the second year, and then 80 percent by the third year.

The 1994 policy also required each joint venture to set up a research and development office for upgrading its products and for the company to have the capacity to attain the international technological levels of the 1990s. The policy made it clear that since the foreign carmakers have the privileges to operate in the protected market, they should follow the explicit guidelines for technology transfers. The policy also aimed to consolidate the automobile companies into the so-called Big Three and Mini Three, because the dozens of automobile companies were operating at too small a scale to realize the benefit of mass production.

However, there was no time for the Reformers to carry through the guidelines stipulated in the 1994 industrial policy, as explained further below: when China joined the WTO in 2001, it was no longer allowed to enforce any of the guidelines. Currently,

the country's automobile joint ventures are making better cars with improved technology transferred from the foreign car companies, but the Chinese partners are not learning much from these transfers. China's automobile industry encountered the same bottlenecks as other industries. All the joint ventures use imported machinery and equipment from the respective automobile companies in the developed countries, and also continue to import certain parts, components and material. For example, the Honda plant in Guangzhou had to import from Japan 90 percent of the steel for the Accord sedans and Odyssey minivans it produced. To cite another example, the Asimco Brake assembly factory makes the brakes for various cars built and sold in China by GM, Ford, Peugeot and others; to do so, the factory simply assembles imported parts for brakes.[6]

The 1994 policy's attempt to consolidate small automobile companies into larger ones also failed. By 2003, dozens of car companies remained. Only Shanghai-VW and FAW–VW reached an annual production volume of 250,000 cars, while as many as 17 car companies produced below 50,000 cars each.

One exception to the rule is a small, fully Chinese-owned car company named Chery. The small firm has been able to acquire technologies and improve on them without following the same route as the larger joint ventures. Chery's success has caused quite a bit of excitement within China's passenger car industry, with some seeing it as an example for others to follow to achieve independence. However, in the meantime, the joint ventures controlled by foreign car companies have held tightly to the lion's share of the market—mainly China's domestic market, which has been growing at fast speed.

When the Vice Chair of the Ministry of Science and Technology, Liu Yanhua, spoke at China's Science and Humanity Forum in Hong Kong, he admitted the fallacy behind the belief that technology would be forthcoming if China opened its market, adding that this notion was naïve and self-deceiving. Now the strategy has totally failed. After China opened up the automobile market, 90 percent of this market is now occupied by foreign multinationals. China's automobile industry has not only been unable to acquire new technology; it has discarded the technology it used to possess, and has become totally dependent on foreign multinationals.[7]

3. Examining technological change from China's trade data

China's import and export information can help us understand the gap between the appearance of the country making great progress in technology and the reality that efforts made in technology transfers during the Reform era have failed rather miserably.

As mentioned earlier, China in 2006 was the number three exporter of machinery and electronic products in the world. In that same year, China imported $428 billion in machinery and electronic products, making it the number two importer in the world for such products. The reason behind such impressive figures is that China's processing trade has been the mainstay for imports and exports of machinery and electronic products. The processing trade, which exports products made by assembling imported intermediate inputs, grew faster than China's total trade, and its share in the total trade increased from 47 percent in 1992 to 54 percent in 2005.[8]

"The Anatomy of China's Export Growth," a recently published World Bank paper by Amiti and Freund (2008), shed some light on the question of China's technology by examining information on its trade. The study noted that China's exports in real terms increased 500 percent between 1992 and 2005; the structure of the exports also changed dramatically. During this period, the shares in more sophisticated products, such as machinery and electronic products, increased, and the shares in agriculture and apparel decreased. Looking at this part of their findings alone, it appears that China has indeed made significant improvement in its technology because it was able to shift its exports to products that required a higher level of technology.

However, upon closer examination of China's exports, Amiti and Freund found that the reason for the faster growth in machinery exports (one of the most significant factors in the shift from less to more sophisticated products) was mainly due to the faster growth of the processing trade as it is defined above. For the processing trade, the skill content of imported inputs, machinery and/or intermediate products from the United States, Japan and other developed countries is higher. Therefore, when these imported products are re-exported after processing work is done in China, they also have higher skill content. When the authors separated China's exports into the processing trade and the non-processing trade, they discovered the skill content of China's processing trade, 54 percent of the total, improved but the skill content of the non-processing manufacturing trade remained unchanged. In other words, for 46 percent of the manufacturing trade, there was no change in skill content.

The authors of the World Bank paper then referred to a study by Dean, Fung and Wang, in which the authors concluded that imported inputs accounted for 52 percent-76 percent of the value of China's processing exports. Therefore, there was still 24 percent-48 percent value-added in China, which could mean that the skill content also became more intensive in this value-added part. We think it is reasonable to argue that this is indeed the case. It is entirely possible, even very likely, that workers and engineers who work in different processing industries have acquired more technical knowledge and are also better trained to do the assembling work. Therefore, higher-skilled workers and even engineers could actually replace low-wage and low-skilled workers resulting in better quality products for these processing industries.

In other words, processing work in China and the imported intermediate goods together have upgraded the skill content of the processing trade. However, this does not change the basic nature of this type of production: process manufacturing is still process manufacturing. As time goes on, China would import improved machinery, better parts and components, and would also improve processing work. However, from this work China will not learn product design, how to produce its own machinery, or build its own brand names. There is little chance for China to move away from its current role as processing center for the multinationals. In fact, the trend only shows that China's exports have become more concentrated in the processing trade, from under 50 percent in 1992 to over 50 percent in 2005.

Most, if not all, of government expenditures on research and development and the foreign exchange spent on technology imports, plus the R&D centers set up by

multinationals, have not enhanced China's technological development. Rather, they have been largely spent only to make China do better processing work. The increasing share of the processing trade in fact points out the same technological bottlenecks shown earlier. Despite large increases in manufacturing output and exports, China is dependent on imported machinery, key components, parts, and certain specific material.

Therefore, we can conclude that although China has shifted its exports from low-skill industries to higher-skill industries and has become a major player in exporting machinery and electronic products, such changes are due to the growing share of processing trade. Clearly, the Reform's plan of acquiring better technology by welcoming foreign investment has failed.

Such failure means that China pays a price. Amiti and Freund found that the average prices of goods exported from China to the U.S. fell by an average of 1.5 percent per year between 1997 and 2005, while the average prices of similar goods from the rest of the world to the U.S. actually increased 0.4 percent per year. [9]

Moreover, the foreign-owned multinationals have been receiving larger shares of China's export revenues because they control a larger share of the processing exports. According to George J. Gilboy in a *Foreign Affairs* article published in 2004, China's exports of industrial machinery grew twentyfold in real terms over the past decade, reaching $83 billion in 2003. The share of those exports produced by foreign-owned enterprises grew from 35 percent to 79 percent. Gilboy also wrote that between 1993 and 2003, China's exports of computer equipment increased from $716 million to $41 billion, with the share of foreign-owned enterprises increasing from 74 percent to 92 percent. While China's electronics and telecom exports grew sevenfold since 1993 to $89 billion in 2003, the share of foreign-owned enterprises increased from 45 percent to 74 percent over the same period. He added that this pattern repeats itself in almost every advanced industrial sector in China (Gilboy 2004). This means that the advanced technology contained in these products belongs to the multinationals, not to the domestic economy.

Foreign technology transfers not only have failed to eliminate bottlenecks in China's economy, but they actually foster over-dependence on imported technology, and have, therefore, been one cause for these bottlenecks.

C. Reasons for failure in technological advancement

The Industrial Development Report, 2003 said that one of the reasons for China's failure to acquire advanced technology through foreign investment was that the foreign multinationals intend to maintain a gap between the most advanced technology that they possess and apply in production in their home countries and the technology they use in the less developed countries where they set up subsidiaries. They place tight controls over their most advanced technology to stay competitive in the international market, thus keeping an upper hand in negotiating investment contracts with the less developed

countries. For the advanced technology these multinationals bring to their operations in China, the report said they keep this technology from spreading to their Chinese partners or to other Chinese firms in the same industry.

It is, however, even more important to understand how the multinationals use the so-called "trade-related aspects of intellectual property rights" (TRIPS) to permanently maintain their technological superiority. Provisions in the WTO's TRIPS Agreement were actually drafted by large U.S. and European multinationals in the fields of pharmaceutical products, computers (both hardware and software), and music and other entertainment, then handed over to their respective governments for negotiation. One significance of putting TRIPS in the WTO was that it forced all less developed countries to adopt the rules on legal protection of patents, including the length of protection adopted in developed countries. The other significance of TRIPS is that it expanded the scope of patentable "inventions" to include more and more knowledge, techniques, and production processes, which were regarded as public goods before, but are now privatized as intellectual properties. The TRIPS regime imposes these new rules on WTO members on how knowledge could be legally disseminated.

Under the TRIPS regime, even if Chinese workers, technicians, engineers and scientists learned the knowhow from engaging in production or in research and development (in a foreign or joint-venture firm, or in a multinational-run R&D center), they are not allowed to take these knowhow away and use these in setting up their own production processes. The R&D centers set up by Microsoft and other multinationals are protected by TRIPS to ensure that the results of their innovation can benefit only these multinationals.

After Microsoft set up its R&D center, it successfully employed a large pool of highly qualified university graduates with Masters or Ph.D. degrees to work on product development and design. Speaking at the 1st anniversary celebration of Microsoft Research (MSR) China in November 1999, the managing director of the center, Kai-fu Lee, said that the key ingredient for success was "a staff of brilliant minds." Microsoft was able to staff MSR China by selecting 100 of the best-qualified researchers from 2,000 applicants. One of those selected was researcher Jin Li, who claimed to be "the best engineering student ever to have graduated from the prestigious Tsinghua University."[10] These R&D centers set up by Microsoft, IBM and Siemens, now joined by many more centers set up by other firms, have drained China's scientists and engineers away from working on developing China's core technologies. The TRIPS regime assures that Chinese brain power harnessed by these foreign-controlled R&D centers will not benefit China's domestic firms, because all knowledge and skills developed in these centers are their private properties.

Apart from attracting foreign investment in the hope of acquiring new technology, the Reform also purchases foreign technology from abroad. However, according to Bai Jingfu, spending on imported technology also failed to produce results because the funds available for disseminating the technology thus acquired were grossly inadequate. For example, Bai said, China spent $75 billion between 1999 and 2003 to import foreign technology but spent very little in disseminating the technology to domestic industries. He said that for each dollar worth of technology imports, South Korea spends five to eight

dollars towards absorbing and disseminating such technology into its domestic economy; in comparison, China spent as little as seven cents on dissemination for each dollar on imported technology. (Bai, point 8)

The lack of Chinese government spending to disseminate imported technology, as pointed out by Bai, is actually the result of the lack of a nationally coordinated policy on utilizing imported foreign technology. Japan in the 1960s and South Korea in the 1980s had national policies on technology advancement, which prioritized what technology to import at a particular stage of development and how to disseminate and integrate such technology into their domestic industries. China's capitalist Reform has abandoned a broad range of planning at the level of the central government, including a plan for technological improvement.

Without a centralized plan, provincial governments or even city governments have been free to negotiate contracts with foreign multinationals on their own. Provincial and city officials have been either ignorant about the kinds of technology they need to import, or they see little incentive in selecting different technologies that would benefit the country as a whole. Governors are praised and promoted when they attract foreign investment that brings in technology, regardless of the kind of technology. There is better understanding at the national level on the specific types of technology needed by China, such as the many technological bottlenecks pointed out by the Industrial Economy Research Institute of the Social Science Academy that publishes the *China's Industrial Development Report* annually. However, without a national industrial plan on advancing technology, adopting foreign technology has proceeded in an ad hoc manner, resulting in ineffective utilization of whatever technology has been imported.

Moreover, without an overall national technology plan, Chinese firms have been focusing mainly on their short-term returns. According to Gilboy, Chinese firms tend to import foreign manufacturing equipment, sometimes in complete sets of assembly lines, instead of licensing technologies and knowhow. He reported that in the 1980s and 1990s, China spent 80 percent of technology imports on hardware and only the remaining 20 percent on licensing, knowhow services, and consulting.[11] Gilboy also pointed out the problems of China's research and development centers. A 2003 World Bank report found that these centers tend to focus on their own financing gain, so instead of diffusing the result of their research, they choose to mass-produce and sell the products of their research (Gilboy 2004, 13–16).

All the explanations given for the Reform's failure in technological advancement are premised on the possibility for a less developed country to improve its technology by relying on foreign monopoly capital in the world of intensified imperialist globalization, if only the government could carry out better policies. We believe this assumption is false. As a latecomer, South Korea has done better in advancing its technology. However, if South Korea had not exerted serious efforts in technology improvement in the 1980s, it would have been too late to accomplish anything a decade later. In other words, in the 1980s South Korea still had a tiny space to develop several of its major industries. By the time the Asian economic crisis arrived in the late 1990s, stronger American multinationals

were ready to buy up as many Korean firms as possible. By then South Korean monopolies were a little better equipped to defend themselves.

In the late 1990s, when China was still negotiating to join WTO, Western and Japanese multinationals were ready to launch their offensive moves. When China first negotiated with the General Agreement on Tariff and Trade (GATT, the world trade body before the WTO), it was unwilling to give up many of critical measures protecting its economy, and that was the reason the negotiations lasted 15 years. We believe the Chinese government's decision to finally accept the stiff conditions for its WTO accession was a sign that it had conceded failure in the attempt to develop an independent automobile industry as well as other industries. By 2001, the Chinese government either decided that the benefits from joining the WTO, from the Reformers' point of view, outweighed the cost, or it realized that the conditions for China's WTO entry were not going to get any better. The Chinese government welcomed foreign investment by granting duty-free status to the multinationals' imports of machinery, equipment, components and parts. China thus acquired new technology that remained almost totally under the multinationals' control.

China joined the WTO only seven years after the 1994 Industrial Policy for the Automobile Industry, but it brought drastic changes to the automobile industry as well as other industries. It's uncertain whether the 1994 Industrial Policy could have actually transferred any new technology to domestic businesses, but the WTO stipulations for China's automobile industry eliminate any possibility for foreign technology transfer.

These conditions imposed on China's automobile industry in the WTO were:

- China must abolish its automobile import quota by 2005.
- China was to reduce import duties on automobiles from 80 percent–100 percent at the time of joining to 25 percent by one July 2006.
- China was to reduce import duties on automobile components from 35 percent at the time of joining to 10 percent by July 1, 2006.
- China was to remove any restrictions on trading rights (import and export) and on distribution (wholesale, retail, maintenance and repair, transportation) over a period of three years.
- China was to phase out restrictions on production policies (type, category, model) on automobiles produced in joint ventures within two years of accession.
- China was to abolish compulsory formation of joint ventures in engine production and instead permit wholly foreign ownership.
- China was to increase the value for joint ventures that are subject to approval from $30 million to $150 million within two years of accession.

These conditions imposed on China's automobile industry and similar impositions on other Chinese industries have ensured that any attempt to develop the national economy independent of foreign monopoly capital will fail.

As we have shown, China has not made any significant technological progress in the past 30 years of capitalist Reform. It is very important to realize that capitalist Reform destroyed the system of technology development and dissemination successfully implemented during the socialist era. The Reform has turned China into a large manufacturing processing center for foreign multinationals. As such, it must import technology needed to compete with other countries in the international market.

D. Has capitalist reform developed China's productive forces?

It is true that fast growth in exports and GDP during the past three decades meant many new factories in China's coastal areas and in some large cities. However, that is only the well-publicized aspect of the Reform, while the fact that it actually destroyed productive forces on a large scale has been kept hidden.

As mentioned earlier, China is now importing over 80 percent of the machinery and equipment needed to produce synthetic fabric. It completely restructured its textile industry, from producing clothing for its population to mainly focusing on the export market. In the process, the Reform phased out the older capital equipment of nearly the entire textile industry and closed down many previously well-known textile enterprises in central China. Many textile factories were closed down and tens of thousands of workers lost their jobs, while the textile industry became dependent on export markets and imported technology, both of which are tightly controlled by international monopoly capital.

The textile industry is only one of many examples where older machinery and equipment were destroyed in the industrial sector. Every time a domestic business changes ownership to foreign-owned or joint-venture, the older machinery and equipment are routinely discarded. In wholly foreign-owned or joint-venture firms, the foreign investors usually need only to contribute machinery and equipment to be counted as their (or their shares of) investment. These imported machinery and equipment are often being phased out in their home countries.

During the restructuring phase of the Reform in the early 1990s, several hundred or even over a thousand factories in each of the many large and medium-sized cities all over China were closed down, laying off tens of thousands or even hundreds of thousands of industrial workers. The situation in these cities is in stark contrast to the often-reported massive building of export-processing factories in the coastal provinces. On the one hand, the industrial workers idled by factory closures had to find odd jobs in the informal sector, barely earning enough to survive. On the other hand, new factories or renovated old factories are using imported new capital-intensive technology. This demonstrates the irrational consequences of importing technology that is not appropriate for development in a less developed country. Moreover, while technology is replacing

labor in the restructured factories, another trend has taken place—the de-mechanization in many areas of production in urban areas.

For example, many of the modern mechanized slaughtering plants built during the socialist era are no longer in operation. Animal slaughtering and meat processing have gone back to the traditional inefficient way. There are also cases of unemployed workers and their families doing assembly work by hand in their homes. TV news praised this as a good way for these families to earn some income, but it is yet another example of de-mechanization, because these unemployed workers used to work in machine-operated modern plants. Small peddlers are now using human- or animal-pulled carts for transporting goods, while in the socialist period trucks had done most of the hauling of goods in urban areas. It is ironic that the rich replaced their bicycles with passenger cars, while the poor have to resort to the most primitive way of transport. On the surface, China's cities congested by cars seem to symbolize modernization, but a deeper look tells you quite another story.

The destruction of productive forces is also seen in the de-mechanization of China's agricultural production under capitalist Reform, with devastating effects on agriculture. Before the Reform dissolved the communes, China's agricultural production had achieved a significant level of mechanization. According to Thomas G. Rawski, from 1957–58 to 1977–78 farm machinery raised to a significant degree the mechanization of China's agricultural production. Rawski said that three types of farm equipment alone—irrigation and drainage machinery, tractors, and power tillers—provided Chinese peasants with mechanical power a little larger than the 0.69 horsepower per hectare of cultivated land available to Japanese farmers from all types of power machinery in 1955. However, if all types of machinery were included, China at the end of 1970s was not far from reaching the level of mechanization achieved by Japan in the early 1960s.[12] (Rawski 1979, 83) According to Rawski, the stock of agricultural machinery and equipment increased at fast rates during the 20 years between the late 1950s to the late 1970s. The stock of irrigation and drainage equipment, tractors (in horsepower), and power tillers increased at annual rates of 25 percent, 20 percent, and 50 percent, respectively. In terms of total horsepower, the three types of machinery increased at the average of 24 percent each year from 1957 to 1978.

After the commune system was dissolved in 1984, small farm households have been unable to buy new tractors or any other modern farm tools. Some farms are now too small to use tractors and power tillers. The electric-operated irrigation systems also fell apart from lack of maintenance. The de-mechanization of agricultural production and cessation of infrastructure building in the countryside have been the main reasons for the rise in rural unemployment and under-employment over the last 20-plus years. The lack of job opportunities has forced peasants to migrate to cities, swelling the number of migrant workers in cities from a few million to 100 million, and then to the current 150–200 million. As agricultural production was being de-mechanized, younger and stronger family members were leaving to find work in cities. Meanwhile, children, the elderly, and the weak were left behind, many of them are subsisting mainly on the money sent home by family members who left for work in the cities.

A recent report indicated that one of the three biggest barriers to agricultural production is the shortage of labor. The other two are the high price of inputs and the backward agricultural infrastructure. The report said that without enough labor, even if peasants could afford to buy fertilizer, many of them have no way to transport it or to apply it to their land.[13] This example shows the impact on China's agricultural production of the destruction of productive forces.

After the Reform had dismantled the communes, the small-scale rural factories were privatized. They flourished for a short period of time, and produced the first group of "ten-thousand yuan households" in the rural areas in the mid-1980s. However, within a brief period of about five years, the majority of these small-scale enterprises went bankrupt, because with small amounts of capital and a lower level of technology they could not compete with large enterprises that were equipped with bigger capital and newer technology. As the capitalist Reform began to take hold, inferior technology, though still useful, was driven out of the market and discarded, wasting scarce capital resources and causing workers to lose their gainful employment. That was another reason for the peasant migration.

Moreover, with this de-mechanization in both urban and rural areas, workers and peasants have lost the technical skills they acquired and used during the socialist era. Scientific knowledge and technical skills possessed by workers and peasants were critical to the development of productive forces during the socialist era. Now these knowledge and skills are possessed by the intellectual elites, a great number of them working either directly for the multinational corporations or in their research centers. They are indeed working at the frontiers of science and technology, but the results of their research will be patented by foreign corporations.

The tremendous number of exporting factories built during the Reform era should be considered as developing productive forces. However, even before the current global economic crisis arrived, many of these factories were losing their contracts with the multinationals, which were already in the process of relocating their operations to India, Vietnam and other low-cost areas. The current wave of global crisis has already hit China hard; large numbers of factories producing toys, furniture, clothing, machinery, and electronic products have already closed and laid off large numbers of workers. It seems certain that a large number of these businesses would not survive the crisis. As a result, the machinery, equipment, and factory buildings acquired only a decade or two ago would have to be abandoned. What is happening in China is exactly like what happened in Southeast Asian countries during the crisis of the late 1990s. All less developed countries saw their valuable productive forces and scarce resources disappear once their strategies to serve as manufacturing process centers of the multinationals failed.

At the start of this paper, we asked the question whether China's capitalist Reform was able to develop its technology and productive forces. Our answer is a resounding no. The negative answer has been supported by evidences presented and arguments made in the sections above.

To conclude, we choose to quote at length the following words of George J. Gilboy:

> China's own choices along the road to global economic integration have reinforced trends that favor the continued industrial and technological preeminence of the United States and other advanced industrialized democracies. ... But reforms have also favored foreign investment, which has allowed foreign firms to claim the lion's share of China's industrial exports and secure strong positions in its domestic markets. ... Chinese firms continue to rely heavily on imported foreign technology and components—severely limiting the country's ability to wield technological or trading power for unilateral gains. (Gilboy 2004, 3)

In other words, Gilboy told the United States and other industrialized countries that having China as part of the global economy only reinforced its dependence on foreign technology and investment, and therefore restricted the ability of this country, the largest in the world, to become an industrial and technological threat to the advanced countries.

Notes

1. See point 2 of Bai Jingfu's report.
2. News report, 12 March 2007, http://www.chinaeconomic.net, no longer accessible online.
3. It was predicted in 2005 that by 2006 China was going to overtake Japan in R&D spending.
4. Data from "China rises to third in research, development spending," economic news brief from the Embassy of the People's Republic of China in the United States, 2 November 2003. http://www.china-embassy.org/eng/jjmy/b/t39936.htm
5. Data from *China Daily*, 31 October 31 2006
6. *The New York Times*, 2 November 2003
7. Xinhua online news for 30 November 2005. Accessible at http://news.xinhuanet.com/fortune/2005-11/30/content_3855583.htm.
8. News report, 12 March 2007, http://www.chinaeconomic.net, no longer accessible online.
9. The average prices were based on a weighted price index.
10. Microsoft Press Pass, Information for Journalists, November 4, 1999.
11. Chang'An licensed technology from Suzuki in 1983 and Tianjin Automotive Industry Corporation licensed technology from Daihatsu in 1986. (Gallagher 2003, 8)
12. Thomas Rawski was sent by the World Bank to China to study whether the claim made by the Reform that China's economy suffered tens years of disasters during the Cultural Revolution. Rawski's book was published in 1979 just as China's new regime was ready to embark on the Reform. According to Rawski, not only the economy did not suffer any setbacks during the Cultural Revolution, the economy was marching forward and made great achievements.
13. *Jing-ji can kao bao* (Economic News), March 26, 2008.