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Synchronizing Export Orientation with Import Substitution: Creating Competitive Indigenous High-Tech Companies in China

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Summary. — This paper examines how the synergy between China's domestic and the international market has affected its most competitive indigenous companies. Through case study in China's ICT sectors in the 1990s, the paper shows that when export upgrades and domestic market growth intersect in timing and sectors, that is, when they synchronize, Chinese companies found conditions most favorable to compete with foreign companies within the domestic market. The synchronization has significant impact on sectors for both mature products and technologically advanced products. It is thus necessary to reexamine the role of import-substitution practices under the new context of globalization and in conjunction with exports.

Key words — ICT industry, China, exports, import substitution, multinational corporations, synchronization, regional division of labor

On December 8, 2004, IBM announced that it was selling its personal computer (PC) business to focus on the more lucrative corporate server and technology service sectors. While IBM's sale had long been anticipated, the buyer startled many industry observers. "Lenovo who?" questioned the *New York Times* in a headline in its business section (Barboza, Bradsher, & Markoff, 2004). Virtually unknown in the United States until then, Lenovo had been China's largest PC company since 1997.

For more than a decade, China has been the world's most important manufacturing hub for the technology industry. In 2004, it became the largest exporter of electronic products, exceeding the United States. Many of these products were produced by foreign, including Taiwanese, multinational corporations (MNCs) or their affiliates in China (OECD, 2006). Meanwhile there has been a notable rising of Chinese indigenous technological companies that have built their brands and achieved technological competence almost exclusively within the domestic market. Lenovo is the best known of them, but it is hardly alone. Many other leading Chinese indigenous companies have undergone similar trajectories, such as telecommunication giants Huawei and ZTE, electronic manufacturers TCL and Haier, and countless more-specialized companies thriving in fields ranging from mobile phones and the Internet, to multimedia integrated circuit design. Remarkably, none of these companies or the business structure supporting them existed prior to the mid-1980s.

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While the scale and continuous upgrading of China's export industries have been widely noted, it is unclear what impact those industries have had on China's indigenous companies serving the domestic market. A small number of studies claim that China has developed a dualist structure in which the dynamic export industry is dominated by foreign-affiliated companies, which are largely separated from domestic-oriented counterparts. Yet the growth of Chinese indigenous technological companies and their considerable success competing with MNCs within China cast doubt on this assertion, raising important questions about the synergy between China's domestic market and the international market, and about its effect on the learning and competitiveness of Chinese companies serving the domestic market.

This paper concerns the processes of growth of Chinese indigenous companies in the information communication technology (ICT) industry—one of the most dynamic and globalized industries of the world. While studies of East Asia's newly industrialized economies (NIEs) have credited exports as the main driving force behind technological learning in these countries, this paper argues that in the case of China, it is the conjunction of domestic and export markets, rather than export alone, that have provided the main impetus to technological learning and the development of industry competitiveness of indigenous companies. More precisely, I argue that the synchronization of China's export upgrading and domestic market growth in the same sectors at the same time is the very foundation of the development and success for China's most able companies in the domestic market. Through several case studies, each exemplifying channels through which export industries intersect with the domestic market, the paper shows how Chinese companies learn to be competitive with MNCs in mature product manufacturing, and how newer Chinese companies move into more advanced sectors of technology. The paper also challenges the conventional wisdom in the developmental studies after the 1980s that argue for exporting to advanced markets as a superior path of technological progress while discrediting the earlier strategy of import substitution. I view export upgrading and import substitution not as alternative strategies but as two distinctive processes that produce dynamic conjunctions, which in turn generate favorable conditions for indigenous companies. Though China's market size and dynamic economy since the 1990s are clearly unique, the lessons drawn about the intersections of export industries and domestic markets may have broader implications for China and other developing countries. [1]

Unlike Japan, South Korea, and India, where large, privately funded business powerhouses have long existed, China in the 1980s faced the monumental task of creating, from scratch, internationally competitive companies with intensifying globalization. The state-owned enterprises—stable under China's centrally planned economy—were proved unresponsive and difficult, if not impossible, to reform. Since the mid-1980s, a new breed of the so-called minying (民营) companies has emerged. They are commercial for-profit companies, some of which have state institutions as their major shareholders while others are mostly privately owned. They have become the mainstays of China's ICT industry. According to a 2006 ranking by sales volumes, conducted by China's Ministry of Information Industry, 15 of the top 20 Chinese ICT companies were minying companies, with the remaining five being restructured state-owned enterprises (CCID, 2006). Though still small in size compared to global MNCs, these companies have competed successfully with MNCs in the Chinese market, and have also engaged with overseas markets since the earlier 2000s. Understanding the foundations of their competitiveness and their trajectories of technological learning is key to assessing the capacity and future promises of China's technological industry.

Among all Chinese indigenous companies, those oriented to the domestic market warrant special attention not least because they are among the best known ones in China. More importantly, their roles as technological agents are indispensable for a developing market. MNCs are no doubt enthusiastic about China, but it is important to realize that MNCs have biases and limitations when it comes to intensely competitive emerging markets. Not all of the problems MNCs have encountered in the developing world can be blamed on the preferences and interference of local governments (a ready scapegoat in far too many cases). Indigenous companies may not possess the most advanced technology, but they play crucial roles in searching out and assembling external knowledge and technology to serve the needs of their home markets. Their introduction, utilization, or substitution of imported technology represents one of the most important but often

underappreciated ways in which technological learning and market development occur in developing countries.

That is not to say, however, that MNCs are unimportant, or that the competition between MNCs and indigenous companies is a zero-sum game. In fact, MNCs are also collaborating with Chinese companies in production and marketing (Zhou & Tong, 2003). Indeed, MNCs' increased involvement in China during recent decades has been accompanied by—and in many cases has been dependent on—the growing capacities of China's indigenous companies. These Chinese companies represent an expanding part of China's involvement in the global commodity chains, which has resulted in the transformation of China's technological prospects and acceleration of, China's integration with the world market. If the ultimate goal of development is to improve technological capacity within the less developed countries rather than forever catering to the needs of the most affluent global consumers though exports, the strategy and growth of these indigenous companies serving the home markets deserve closer attention.

1. EXPORT, IMPORT SUBSTITUTION, AND TECHNOLOGICAL LEARNING

From Schumpeter onward, most theorists have agreed that technological changes constitute the most fundamental driving force in the advancement of societies (Castells, 1996; Malecki, 1991; Nelson, 1996). Yet the overarching question of how technological changes and innovations occur in societies other than mature capitalism has yet to be clearly formulated.

Since the 1980s, an enormous stream of literature has been produced based on close examination of the developmental experiences of Latin America and East Asia. These studies have expanded on Gerschenkron's argument in 1962 that late industrialized countries follow paths of development divergent from those of Western Europe (Gerschenkron, 1962; Hobday, 2003). In particular, the spectacular performance of export-oriented East Asian NIEs became the standard par excellence in economic development and technological catch-up.

Scholars on NIEs have argued that the export industry in these countries generates superior technological acquisition. Stephan Haggard, among many others, concludes that "the crucial difference between the East Asian and Latin American NIEs is the difference between industrialization through export and import substitution" (Haggard, 1990, p. 27). Export is conducive to technological learning because technological progress in late industrialization is based on learning or borrowing, unlike earlier industrialization in the West that was based on the generation of new products and processes (Amsden, 1989; Wade, 1992). Such learning and borrowing are more effectively achieved in export industries under the guidance and assistance of MNCs involved in production for the advanced markets. Kim (1980) summarized three stages of technological catch-up in South Korea: implementation of imported foreign technology, assimilation of the technology based on homegrown capabilities, and the improvement of the technology to enhance competitiveness in international markets.

In Hobday's (1995) detailed comparative study of Taiwan, Hong Kong, Singapore, and South Korea, he presents a general model of latecomers' technological learning from foreign firms. In contrast to firms in advanced countries, Hobday observes, East Asian firms traveled backward along the product life cycle, starting from a mature, standardized manufacturing process, and incrementally building their technical, management, and marketing competency (p. 194). After a painstaking and cumulative process, moving from simple assembly for foreign brands, namely OEM (original equipment manufacture), to heavier-design-responsibility ODM (own design and manufacture), to marketing-competent OBM (own-brand manufacturing), some firms are now approaching the technological status equaling that of western and Japanese firms. A particularly valuable institutional arrangement for technological learning in South Korea and Taiwan are the subcontracting linkages between MNCs and local companies. As local companies received technological training from their MNCs' suppliers or clients, and were put under constant pressure for quality, technology and business performance, they gradually climbed the technological ladder. Hobday emphasizes the importance of export and the OEM system as a learning platform, calling it "an enduring technological training school for later comers" (p. 192). While he acknowledges the existence of import substitution in newly industrialized economies, he concludes that the export-led growth catalyzed their technological dynamism: "Export acted as a focusing device for

technology investments and encouraged the growth of a variety of institutions to enable exports to flourish'' (p. 198).

Compared to the successes of East Asian export-oriented economies, the failures of import-substitution policies adopted by large developing countries such as Brazil, India, and China during the 1950s–70s stood out sharply. Import substitution typically depends on prolonged protection of domestic industries, with high tariffs for imported goods. Protectionism leads to persistent weak performance of domestic firms as compared to those in the international market. Import substitution is also blamed for a failure to reduce import dependency, achieve sufficient economic diversification, and alleviate social inequality in these countries (Evans, 1979; Haggard, 1990; Porter & Sheppard, 1998; Wade, 1990a).

Based on these findings, the World Bank adopted a standardized position promoting export industries as a proven policy for economic development (World Bank, 1993). Yet closer studies of the experiences of the East Asia NIEs argue that oversimplifying the efficacy of export has obscured the effects of other state interventions on these economies. Webber and Rigby (1996), in summarizing the findings of numerous studies on Brazil, Taiwan, and South Korea, suggest that export promotion in certain industrial sectors in Southeast Asia was always accompanied by import substitution in other sectors, implying that excellent performance in economy or technology could not be attributed to exports alone.

Many studies have also questioned whether the rise of export would necessarily lead to technological upgrading. They point out that in many countries export industry often amounts to labor-intensive assembly with little technological value (Dickens, 1998). Studies on the widespread practice of building export-processing zones in developing countries have found extremely limited technological benefits to the local economies, as the main purpose of these zones has been to exploit cheap labor or land (Malecki, 1991, p. 231). Some research on China's trade and export sectors identifies a profound dualism wherein highly competitive industry in China is dominated by imported technology and foreign affiliates. These foreign affiliates are segregated from other domestic sectors and thus have a limited impact on local production and the diffusion of technology in China (Huchet, 1997; Lemoine & Unal-Kesenci, 2004).

In fact, researchers on NIEs have always cautioned against applying the export-oriented model universally. They point out that the East Asia model requires specific social, economic, and political institutions and traditions, which emerged under a special geopolitical circumstance during the Cold War. It is unlikely that such conditions can be met in a different time and place (Cumings, 1987; Evans, 1995; Haggard, 1990; Wade, 1992).

In the case of China, despite noticeable social and cultural commonalities with other East Asian NIEs, its size and geopolitical position set it sharply apart. On the one hand, China faces more political barriers to accessing advanced technology from the West and more pressure to open its markets to MNCs. Even though the Asian NIES encountered some restrictions on technological transfer from the United States in sensitive areas such as nuclear technology, and had to circumscribe the intellectual property rights of western companies during their boom periods, such restrictions pale in comparison with the political scrutiny and limitations that the United States has imposed on technological transfer to China. The United States has longstanding regulations banning American firms from exporting a broad range of military-civilian dual-use high technology to China, including high-speed computers and certain semiconductor manufacturing equipment, which American allies have ready access to. Such geopolitical considerations not only affect businesses but also limit the roles of Chinese state research institutions in facilitating foreign technology transfer. For instance, studies on the semiconductor industry in Taiwan have widely credited the state-run Industrial Technology Research Institute (ITRI) for purchasing and transferring American semiconductor technology to Taiwan's private sector (Hsu, 1997; Johnson, 1987; Wade, 1990a, 1990b; Webber & Rigby, 1996, p. 482). ITRI was instrumental in enabling the less sophisticated Taiwan manufacturing industry in the 1980s to move from electronic product assembly into the integrated circuit business by incubating companies to provide foundry service to large United States semiconductor firms and independent chip designers. It would have been impossible to even contemplate that such an intermediate function is being played by any mainland Chinese state-owned institute with regard to American technology. Furthermore, China's size makes it far more susceptible to politically motivated criticism of its trade or

other policies from the West than is the case for the United States' traditional allies. Although China is now the "factory of the world," it is feeling rising heat from other countries that blame China for their job losses and wage depression. In sum, China cannot get away with exporting to its full potential without opening its market to other countries, which Japan and South Korea were allowed to avoid during the 1970s and 80s.

On the other hand, unlike smaller countries, large developing countries such as China have large and growing markets in their own right. Studies of export-oriented economies in NIEs have largely ignored the roles of domestic markets, which in their cases are insignificant in size by comparison to potential export markets. Yet the mainland China has one of the largest and most dynamic markets in the world—the world's sixth largest ICT market by 2005, for example (OECD, 2006). In total size of the ICT market, China in 2005 was about one-tenth of that of the United States, half of that of Japan, and two and half times of that of India. China is also the world's largest market for mobile phones and the second largest for PCs (OECD, 2006, p. 19). More importantly, China's domestic ICT demand has been growing between 14% and 20% annually since 1997 and it is expected to continue the double-digit growth at least till 2010 (China Daily, 2005). The impact of such a vast and dynamic market on both MNCs and indigenous companies is certainly enormous. We know that the earlier stage of industrialization in large western countries such as the United States was heavily fueled by import substitution (Chang, 2002; Gordon, 2004). Studies of Latin American countries have also noted that import-substitution policies have played significant roles in promoting technological learning despite the overall disappointing economic performance there from the 1960s to the 1980s (Katz, 2000). There is no question that import substitution as practiced by China, India, and Brazil in the 1950s–60s suffered from major failures. But such failures can be explained by the particular ways the policies were implemented *via* state protectionism under the specific geopolitical conditions. Chang (2002) has argued forcefully that developed countries such as Britain and the United States historically employed tariff protection and subsidies during their early stage of industrialization with more successful results. Though I do not advocate going back to history, I simply argue that under the new context of globalization, it is necessary to reexamine how domestic markets may affect technological learning and market competitiveness for indigenous companies.

Another important characteristic of Chinese high-tech industries has to do with the spatial scale of analysis. Studies of Southeast Asian NIEs have a tendency to generalize at the national level. While tolerable in smaller countries, such generalization marginalizes or misses entirely the distinct regional models of technological development in larger countries. Indeed, from a national perspective, China may appear to be the poster child of export-led development. Yet, a focus on the region scale reveals that high-tech areas in Beijing are the antithesis of the foreign-capital-driven export growth characterizing China's Pearl River Delta and Yangtze River Delta. Beijing is dominated by domestic companies concerned mainly about China's market (Zhou, 2005, 2008). But it is also a region deeply engaged with coastal China, as the largest companies in Beijing almost always have establishments and collaborative networks in the Pearl River and Yangtze River Deltas, and vice versa. While almost no one would deny the fact that regions matter in China, few studies have focused on how the differentiation and interaction among these domestic and export-oriented regions may have created productive divisions of labor and novel possibilities of synergy between them.

In short, the process of building the competitive strength of indigenous companies in China is likely to be different from the experiences of leading companies in other Southeast Asian NIEs. Some Chinese companies may indeed follow the models of other NIEs by supplying multinationals and gradually climbing up the technological ladder in ways similar to Hobday's study. Other companies, including some of China's leading ICT giants, however, have found their success by competing with MNCs within the domestic market.

When it comes to the business success of Chinese companies, questions are frequently raised about whether it is a result of state protectionism or favoritism. The Chinese state had indeed implemented high tariffs and other protectionist policies until the early 1990s. But with China's progressive opening of its market to foreign companies and its accession into the WTO in 2001, extensive protection has become more difficult, and in some cases nearly impossible. Within the WTO framework, blunt state pro-

tection can be and has been challenged. China's dependence on exports means that it cannot afford to engage in prolonged trade wars or risk retaliation from major trade partners. The Chinese state does try to implement more subtle forms of protection that benefit domestic companies. Overall, however, these measures are not fundamentally different from those in many western countries. In fact, some analysts argue that China's market is among the most open of any large country's, and certainly more open than Japan or South Korea in the 1980s (Naughton & Segal, 2003) and even more than the relatively closed United States market during the interwar period (Chang, 2002; Nelson, 1996, p. 250). The ICT manufacturing sector, in particular, is the most open for international companies. Leading global companies play active if not dominant roles in virtually all segments of the industry, even though ICT services continue to be monopolized by state-owned companies.

It may be tempting for foreign executives or the media to blame their business disappointments in China on China's preferential policies for local companies. While such policies exist, their effects are unclear. Chinese domestic companies have frequently voiced legitimate complaints about preferences for MNCs in tax rates and state purchases (Zhou, 2006). While protectionist policies may play a role here and there, it can hardly offer a full explanation of uneven performance of MNCs in the ICT market.

It is important to realize that, beyond the interference of the Chinese state, MNCs are not naturally more competitive than their domestic rivals in China. Despite their advanced technology, capital, and expertise, and their formidable global networks of resources, MNCs' lack of local roots, knowledge, and commitment can hurt them when competing intensely in an emerging market. In the initial stage of MNCs' presence in a developing market, their primary goal was to sell their existing products—products designed for advanced countries. Their marketing strategies are dominated by a global profit strategy, which frequently bear strong home bias. For example, MNCs tend to be slow to devote sufficient resources and attention to low-profit developing markets and are often caught off guard when such a market takes a sudden turn. The managers responsible for these markets often sit lower in the bureaucratic hierarchies of their corporations with less bargaining and decision-making power at their headquarters. This is especially true at the beginning stage of market formation in the developing countries.

Porter succinctly summarizes the problems that MNCs encounter doing business away from their home countries:

> Understanding needs requires access to buyers, open communication between them and a firm's top technical and managerial personnel, and an intuitive grasp of buyers' circumstances. This is hard enough with home buyers. It is extremely difficult to achieve, in practice, with foreign buyers because of distance from headquarters and because the firm is not truly an insider with full acceptance and access. Even if a subsidiary is able to gain sufficient access to fully understand foreign buyer needs and how they are changing, it is a daunting task to communicate them credibly to headquarters (Porter, 1990, pp. 86–87).

On top of these universal concerns, adding the often far more complicated and different political, cultural, and social realities of developing countries, one can see that MNCs are not always well equipped to respond to the often varied and changing demand patterns of an emerging market, especially a low-income market such as China. This is changing, however. After 2003, a small minority of MNCs have started to develop products for the Chinese market, but it is still extremely rare for senior CEOs responsible for the Chinese market to break into the top rank of corporation decision making at their global headquarters.

In contrast to MNCs, Chinese indigenous companies have a commitment and access to the home markets as well as local knowledge. For the vast majority of them, this market is all they have. In other words, there is no exit or trade-off strategy to offset the loss of one part of the world with another, as MNCs are able to do. Since the indigenous players are highly motivated and focused on the domestic market, they are much quicker to grasp and react to market shifts. Their competitiveness *versus* MNCs thus should not be surprising. Indeed, it is common for Chinese companies to gain market shares at the expense of MNCs in sectors ranging from consumer appliances to Internet providers to certain segments of the automobile industry.

Furthermore, the relationships between MNCs and indigenous companies are hardly always antagonistic. MNCs often depend on indigenous companies to deliver products and services to Chinese consumers. The attraction and difficulties of the Chinese market mean that

MNCs have inherent interests in raising the technological level of local partners to expand their own market reach. In a study of computer software and the hardware industry in Beijing, Zhou and Tong (2003) found that Chinese companies serve as intermediates between the most advanced technology providers—MNCs—and the local market. In other words, the rise of some local companies may threaten the business of certain MNCs, but the same local companies are surely supported and applauded by other MNCs because they help expand these MNCs' market. The following section carefully examines the interactions of China's export and domestic industries.

2. INTERACTIONS OF EXPORT INDUSTRY AND DOMESTIC MARKET IN CHINA

Studies of developing countries have found that the presence of an export industry does not necessarily lead to development of the domestic market; nor does the technology in export industries necessarily help indigenous companies. Most export industries are designed to meet the demanding specifications of advanced countries, which can be very different from the developing countries' domestic demands, with their much lower purchasing power and distinct cultural preferences. Governments that promote export-oriented industries to generate foreign exchange also typically regulate them so as to minimize domestic sales, as is the case in China. As a result, domestic or foreign firms involved in export industries do not necessarily have the channels or resources for developing the domestic market, or inherent interests in doing so. We can find plenty of examples: high-end Nike shoes made in China had few sales within China (excluding counterfeit), and formidable Indian software companies have done little to strengthen India's own technology application (Parthasarathy, 2004; Schware, 1992).

Previous studies have also characterized China's industrial structure as dualist. They claim that China's export-oriented sectors are segregated from the domestic-oriented ones (Huchet, 1997; Lemoine & Unal-Kesenci, 2004). Wang (2006), for example, argued that China's institutional structure has prevented domestic companies from developing organic linkages between them or with foreign companies to facilitate technological learning and innovation.

The dualist thesis in these studies was largely based on fieldwork in export-oriented areas in China's coastal region. Wang's work primarily concerns state-owned enterprises and joint ventures with foreign companies. They may be correct as far as the practices of majority of companies are concerned. However, it is highly problematic or simply wrong when we focus on China's indigenous industrial leaders such as Lenovo, Huawai, and TCL, to name just a few. Not only have these companies actively cultivated relationships with the export-oriented industries from the very beginning, but such relations have also grown stronger over time as the companies have improved their manufacturing competence. I argue that the export industry and the domestic market in China are not separate spheres; rather, they interact in complicated and evolving ways. When upgrading of the export industry happens to take place at the same time that the Chinese market grows in similar or closely related sectors, Chinese companies find particular fertile ground for technological learning and for improving their competitiveness (Figure 1).

Unlike the export-oriented countries in Southeast Asia, the Chinese home market allows the domestic companies the opportunity to move directly into own-brand manufacturing rather than moving progressively from manufacturing others' brands to creating their own (OEM to OBM). Indeed, quite a few Chinese companies developed their own brands only a few years after start-up, often without moving through the OEM phase. Yet, without domestic protection from foreign competition, the only way for these companies to replace foreign brands in China is to somehow become competitive. This is no small challenge for under-capitalized and inexperienced indigenous companies facing MNC giants. Whether they can meet this challenge depends on their technical and managerial capacities. But an additional crucial factor is the presence of world-class export-processing facilities in China. With easy access to competitive, reliable, and high-quality component suppliers—the same suppliers for MNCs in the global industry—Chinese companies can target the Chinese market with special designs and pricing, and build extensive distribution networks. These will allow them to take better advantage of the domestic market growth than their foreign counterparts, thus best the competition. In contrast, if the component suppliers are mainly outside China, the Chinese companies

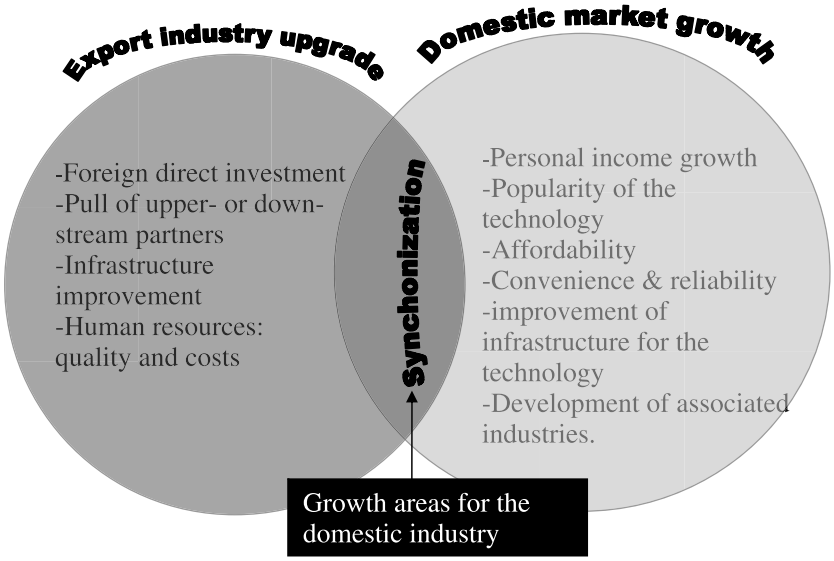

Figure 1. *Respective factors in export industry upgrade and domestic market growth.*

can certainly use them, but it is infinitely easier during the earlier stages of development of these companies to conduct most business deals within the country, since at that point they had very limited international experience and even more limited bargaining power with upper-stream suppliers. The presence of export facilities essentially reduced the learning curve for the latecomers. It helped these companies improve their technical competency, without requiring them to accumulate detailed engineering and processing skills. Competing with MNCs in their home market also teaches the Chinese firms valuable and sorely needed lessons on management and marketing—after decades of centrally planning.

In short, the synergy between the domestic and exports market allows for the entry and fast growth of newcomers in areas of mature product manufacturing, as the newcomers can tap into the existing global supply chain to ensure quality and competitive prices. Together, the economies of scale enjoyed by the global parts suppliers and mass demand in China's market have enabled the competitiveness in final products by these Chinese companies. This synchronization has created some of the fastest learners in the industry, including Lenovo.

The effect of the synergy between export industry and the domestic market is not limited to an ability to produce mature technical products, however. As the design and marketing abilities of Chinese companies improve, they can increasingly replace foreign-brand products—from the lower to higher ends—in the Chinese market, provided the export industry continues to upgrade by attracting more advanced manufacturing processors. Newer companies that specialize in more technically advanced products may also spur innovative ideas based on their intimate knowledge of consumer preferences. High-quality export supplier networks can then incorporate these innovations into a viable commodity chain. In other words, as China expands its functions in the global division of labor by providing more services to global industry, it simultaneously provides expanded opportunities for indigenous companies to take advantage of the formation of commodity chains within its borders to create products distinct from those in the international market. For example, Chinese companies have designed and produced different models of mobile phones for the Chinese market with the help of many suppliers from the coastal regions.

But what if the export capacity in China is out of sync with domestic market growth? At one end, if the Chinese market is not ready for a particular product, no company can be successful at selling it, no matter how mature its export value chains are in China. Their only option is to produce for export, which some Chinese firms specialize in. There are plenty

of examples of Chinese companies producing for export with virtually no domestic sales: reproductions of western-style antique furniture and solar energy panels, to name just two. At the other end, if Chinese companies specialize in products in demand in China for which most of their suppliers are located outside China, it is much harder to achieve competitiveness *vis á vis* MNCs, since the latter have more established channels and better bargaining power with the upper stream suppliers than Chinese up-starters. These would likely be areas that continue to be dominated by MNCs, such as semiconductor equipment supply, where localization is yet to occur.

As shown in Figure 1, China's export industry and domestic market growth are two distinct processes at work, driven by different sets of impetuses, globally and nationally. Those Chinese companies that are able to locate the intersections of these two processes are in a stronger competitive position.

But how can firms depending on the domestic markets maintain competitiveness given that import substitution had a poor record at generating competitive firms? This is doable because the Chinese market has become one of the most competitive in the world for mature products. (Kraemer & Dedrick, 2002), with MNCs aggressively participating in it and plenty of domestic rivalries. Pressure is constantly mounting for the leading companies to deepen their expertise and improve their market performance to avoid being replaced by newcomers or other old hands. The situation is very different from the traditional scenario of import substitution in which the state protects domestic companies from the international competition.

The heavy reliance on the domestic market, even a competitive one, may set limits on international competitiveness, however, especially on producing innovative products. The Chinese market at the moment generally has a higher preference for low price over quality or technical sophistication, providing fewer incentives for technological advancement. This makes it difficult for Chinese companies to become technological innovators globally at this point. Porter (1990) has argued that it is not just the size but the sophistication of the market that matters in creating national competitiveness. Transcending such limits of the Chinese market is no easy task, that is, being competitive in China does not mean to be competitive abroad. To achieve it requires tremendous additional learning. Some Chinese companies try to develop their overseas competence through exporting, as South Korean and Japanese companies did. Haier, for example, has built plants in North America for manufacturing home appliances. Other companies, such as Lenovo, TCL, and Huawei, have tried overseas acquisitions or mergers with existing foreign brands. Both approaches have been met with difficulties, however, and success is far from assured. Yet all these companies depend on the Chinese market as their initial profit reservoir, which shows in another way how essential the domestic market is. The focus of this paper is on how these companies build industrial competence within China, a cornerstone for any future development. Their internationalization is a different topic, to be explored in the future or by others.

3. FIELDWORK METHODOLOGY

This paper relies on case studies. I interviewed people at many companies, mostly in Zhongguancun Science and Technology Park (ZGC), China's first and the largest science park in the northwestern part of Beijing. The ZGC region was China's crown jewel of scientific research under the socialist system prior to 1978, hosting many of China's most prestigious universities and research institutes. Beginning in the mid-1980s, it has transformed from a quiet Beijing suburb designated for scientific research and higher education into a bustling hub of high-tech business (Francis, 1997; Zhou, 2008). By 2005, the region boasted over 17,000 certified new technology enterprises; [2] about 60% were in ICT or related sectors. Unlike in other Chinese high-tech regions such as Shanghai and Shenzhen, companies in ZGC tend to be driven by domestic capital, with 85–90% of the region's revenue being domestic in origin (ZGC Administrative Committee, 2005a, p. 10). Some of China's most notable ICT companies can be found there. Besides Lenovo, they include Baidu (百度), China's leading Internet search engine company; UFIDA (用友), China's largest privately owned software company; Founder (方正), China's largest digital media company; Datang (大唐), one of China's largest telecommunication solution companies; Aigo (爱国者), China's leading portable storage and digital entertainment product maker; and Sina.com (新浪) and Sohu.com (搜狐), two of China's most popular Internet portals.

The cases here comprise only a small subset of the companies I have studied during my fieldwork from 2000 to 2006. I interviewed the senior managers of many Chinese, American, and Taiwanese companies, including large and smaller ones in ZGC, inquiring into their developmental histories, business strategies, collaborative partners, and views on their core competencies. Data were also gathered from publications on these companies, the Internet, and Chinese ICT trade magazines. This information was triangulated with the results of discussions I had with people at other related companies, industrial observers, and government officials. The cases discussed here are meant to be representative rather than exhaustive. Similar cases can also be found in other parts of China, especially in Shenzhen and Shanghai, two other major hubs of China's ICT industry. Huawei, for example, is in Shenzhen. Since I did not conduct interviews there, my discussion of Huawei is briefer, and mostly based on existing publications.

4. COMPETING IN PC SECTORS: LENOVO

Lenovo was founded in 1984 as a spin-off of the Institute of Computation of the Chinese Academy of Sciences (CAS). It was a part of the first wave of start-ups by research institutes and universities in ZGC in the mid-1980s that sought to commercialize their research products and generate income for the financially deprived mother institutions (Zhou, 2005, 2008). Prior to this time, China's PC sector has been characterized by import substitution with high tariffs, as state-owned companies monopolized the market with their own products, which were distinct from those in the global mainstream. Companies such as Lenovo were called minying or nongovernmental companies to distinguish them from the state-owned companies, as these start-ups were not funded through the state's regular budget allocation and therefore were granted autonomy in business and personal decision making (Segal, 2003).

Lenovo first made its name by selling a Chinese language card, a piece of computer hardware that gave PCs efficient Chinese language input. The card was developed by engineers who were former employees of the Institute of Computation. It was named LianXiang (联想 related thinking), still the Chinese brand name for Lenovo. Most of Lenovo's revenue in the 1980s, however, was generated by trading imported computer parts between Hong Kong and mainland China, like most of the minying companies at the time in ZGC. China's tariff on imported computer parts created huge price differences between the China's and the international markets, making it easy for trading companies to earn handsome profits since they almost always had an import permit which exempted them from paying a punishing tariff. The trading companies, in turn, brought the global mainstream PCs into China, and eroded most of the market share of the state-owned companies.

After 1993, however, China's PC market experienced a major shift. Trade liberalization reduced the tariff on computer parts, gradually eliminated the price differences between China's market and the international market. Major foreign brands such as AST, Compaq, and HP also entered China. Foreign companies were not allowed to sell their own products directly, so they teamed up with local partners and overwhelmingly selected minying companies as their sales representatives. Local companies found that selling proven technology developed abroad was a lot more lucrative and less risky than autonomous innovation (Zhou, 2005). Lenovo, just like other ZGC enterprises, became a sales agent for MNCs—in this case, for the American firm AST, HP and Sun.

While Lenovo was doing well selling foreign-made computers and accessories, Liu Chuanzhi (柳传志), its founder and CEO at the time, set the company's sights on producing its own brand PCs. Lenovo established a joint venture in Hong Kong in 1988. Using the name of a Hong Kong company, it turned to the mainland to build a motherboard production line in the Pearl River Delta. This "curveball" strategy was common for Chinese firms who wished to take advantage of the government's preferential policy for foreign investment while evading the strict governmental controls on resource allocation for nonstate firms.

The motherboard production helped Lenovo learn the complex industrial process of mass production and client and supplier management in a highly volatile market. It prepared Lenovo to mass produce PCs within a few years (Lu, 2000). Lenovo started to make its own-brand PCs in 1990, but sales were very small compared to those of the major MNC brands that had dominated the market during the mid-1990s (Kraemer & Dedrick, 2001, p. 10). Due to weak purchasing power in China,

MNCs concluded that Chinese users could not afford the most up-to-date products, so they logically used China as a ground for clearing out inventory left over from the mainstream global market. So prior to 1996, China's mainstream PC market was one generation behind the global market.

Yang Yangqing (杨元庆), current Chairman of the board of Lenovo, who was then a young manager of its PC department, better understood than MNCs the desire of Chinese users to access the most up-to-date products. He saw an opportunity for Lenovo, which by then already had sufficient experience and capacity to mass-produce PCs, to utilize the suppliers' network taking shape on China's southeast coast. In 1996, Lenovo reduced its PC price four times during one year, to substantially below the price of major foreign competitors, while introducing the latest CPU into its models. Dramatic market gains made Lenovo the best seller in the Chinese market in 1996 and again in 1997, as it firmly defeated all foreign brands to establish itself as the top PC brand in China. Since then, Lenovo has gradually extended its lead in the Chinese market by furthering its marketing networks into smaller cities of China. It increased its China market share from 12.5% in 1997 to 19.4% in 1999, and had about a 30% domestic market share throughout the 2000s (Kraemer & Dedrick, 2001, p. 10; Barboza *et al.*, 2004). Lenovo's price reduction benefited Chinese consumers and contributed to the popularity of PC technology. In turn, the rapid growth of China's PC market since the 1990s (Figure 2) eventually enabled Lenovo to carry out the bold purchase of IBM's PC business mentioned at the beginning of this paper.

Lenovo's speedy rise is illustrative of several key features of MNCs and domestic companies in China's market. It can be argued that it was the complacency of the MNCs during the earlier period of China's PC market that led to the success of Lenovo in 1996–97. Had the MNCs been more attentive to the desires of Chinese consumers for faster and cheaper PCs, Lenovo might not have been able to stage the upset. Yet, MNCs planned their strategies globally, and China's market was marginal in the early to mid 1990s. In 1995, the United States had an annual sale of 21.3 million PC units with growth in the double digits. Japan's market size was 5.5 million, and China only had 1.2 million units, barely 2% of the global market (Computer industry Almanac Inc, 2002). It was no wonder that MNCs did not pay much attention to China. Most MNCs' sales branches in China were small and low in the administrative hierarchy, so even if the local staff were to advocate a more locally oriented approach, the likelihood of them winning support from headquarters was miniscule. So what may look like arrogance or complacency on the part of MNCs was in fact their normal behavior toward emerging markets. MNCs in the mid-1990s had neither the motivation, the local knowledge, nor the competitive pressure to focus on the Chinese market, since their lucrative markets lay elsewhere. Reducing prices and introducing the fastest CPU were clearly the things MNCs could have done, but chose not to do. More tellingly, MNCs did little to regain their market shares immediately after Lenovo's price reduction. Other Chinese companies, however, followed Lenovo's steps and expanded their markets at the expense of MNCs. By 1998, only a few years after leading the Chinese market, foreign MNCs' market share had shrunk to barely 20% (Kraemer & Dedrick, 2001).

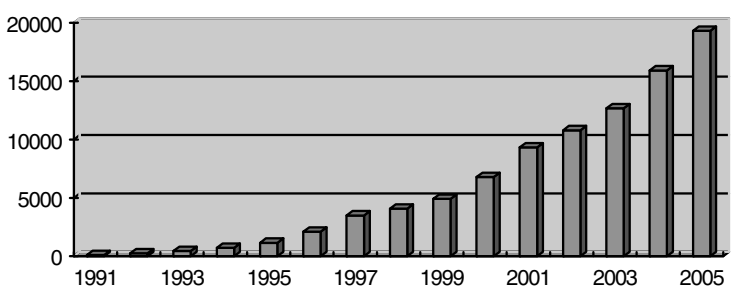

Figure 2. *China's PC market growth, 1991–2005. Source: Data from 1991 to 2000 were obtained from CCID (2001). Data during 2001–03 were obtained from Statistical Yearbook of China Electronic Information Industry, 2003, 2004 (Ministry of Information industry, 2003, 2004). The figures from 2004 and 2005 were obtained from press release by Gartner 2006 (AFX News, 2006).*

Since CAS is Lenovo's largest shareholder, questions can be raised about whether Lenovo's success was a result of state favoritism. This shareholding structure, however, has more to do with the legacy of China's centrally planned economy and the awkward positions of minying companies in it than with favoritism. The Institution of Computation within CAS had founded Lenovo in 1984 with 200,000 renminbi (roughly US$70,000 at the official exchange rate then). By all accounts, CAS has rarely been involved in the management of Lenovo (Ling, 2005). The fact that CAS remains the largest shareholder was a result of a clever political maneuver in 1992 by Lenovo CEO Liu Chuanzhi. In exchange for giving 65% of Lenovo's ownership to CAS, Liu gained crucial backing from CAS to convert Lenovo to a shareholding company, an extremely controversial step at that time (Ling, 2005, p. 167). Nor was there any reason in the mid-1990s for the state to favor Lenovo since there were many other PC companies just like it in ZGC, and all had relationships with the state institutions. Some were larger in sales or had more prestigious connections than Lenovo. What made Lenovo unique was its aggressive preparation for mass production and its bold steps in the market.

Lenovo had had help, however, though not exclusive to the company. There were two important factors in its ascendance. In many developing countries, market liberalization is often accompanied by the dominance of MNCs in the domestic markets. Dedrick *et al.* (2001) report that, after trade liberalization, the domestic market shares of Brazil's and Mexico's indigenous PC brands declined to 25.6% and 12.2%, respectively, excluding "white-box" (nonbranded) clones. In contrast, Chinese-brand-name PCs to this day control more than two-thirds of China's market while being relatively open to international competition. To understand China's difference, one has to recognize the unique conditions of its market and its growing export capacity in the coastal region.

China's domestic market is different from those of other large developing countries. Unlike Mexico and Brazil, China had a far more dynamic economy in the 1990s, with the explosive growth of its technology sector. The high growth rate and rapidly changing market behavior required close attention and adaptation by companies, and MNCs were not equipped to do this then. Moreover, due to China's exchange rate, domestic purchasing power for imported goods is very low. In Brazil and Mexico, a middle class has long existed that can not only afford imported consumer goods but is also accustomed to them (Felix, 1989). In the 1990s, China had just emerged from the Mao era with a miniscule middle class population. Chinese computer users, though eager for newer technology, had a strong preference for low prices. Under such conditions, the price reduction initiated by Chinese firms was likely to generate a far more favorable response than would have been the case in Brazil and Mexico. Chinese domestic firms understood this very well, unlike less attentive MNCs.

Also, Lenovo was able to expand its production capacity rapidly, thanks to the developing cluster of suppliers on China's coast. It is difficult for any company to increase output dramatically without suffering capacity and quality problems. It would be especially hard for an inexperienced PC company such as Lenovo to do so at short notice. However, since the 1990s, Taiwanese companies have dominated the global supply chain of low cost PC products; they are the key OEM suppliers for multinational companies such as Dell, Compaq, HP, and others (Engardio & Gross, 1993). Starting in 1993, these companies transferred a large portion of their production capacity to mainland China (Chung, 1997). Mainland PC makers also set up factories in the same areas to work with the Taiwanese firms. By the late 1990s, the cluster in the Pearl River Delta in Guangdong Province had developed to such an extent that if one were to assemble a PC from scratch, it could get all the supplies from the surrounding international vendors and assemble the PC within two hours (interview of Qingxi town official in Dongguan county of Guangdong province, 1999). So trustworthy and time-tested venders for PC parts were within Lenovo's easy reach. While this supply network is oriented globally, with its primary goal being export, the Taiwanese firms did not hesitate to sell to mainland companies. Linguistic commonalities and geographical proximity helped facilitate communication and negotiations between them. My interviews with people at Taiwanese companies revealed that the majority of Lenovo's parts suppliers were from these companies, including those for the motherboard despite the fact that Lenovo had its own factory (interviews; Kraemer & Dedrick, 2001). The power of synchronization between import substitution

and the export industry was evident. The concurrence of the maturation of the PC industrial facility for export and the rapid growth of the PC market in mainland China was the key factor in Lenovo's emergent competitiveness. Had there not been a fast-growing PC market in China, or had Chinese PC makers been forced to deal with distant and unfamiliar foreign vendors, the import-substitution effort by Lenovo would have been far more challenging, if not altogether impossible.

If Lenovo's experience was particularly notable, it was not unique. Similar events took place with other companies. For example, Ziguang (紫光), another ZGC company that was a spin-off from Tsinghua University, had been the chief sales representative of a Taiwanese scanner manufacturer for eight years beginning in 1987 (interview). In 1995, when the Taiwanese company decided to directly market its scanners in China, Ziguang chose to develop its own brand of scanner using an array of internationally competitive vendors located on China's coast. Within one year, Ziguang became one of the top three sellers in China; it took over the number-one spot just three years later (Liu & Zhang, 1998, p. 182).

Both Lenovo's and Ziguang's experiences suggest that the size of China's domestic market could generate an economy of scale that allowed Chinese firms to turn quickly to OBM rather than moving progressively there *via* OEM. OBM also provided a valuable opportunity for Chinese firms to learn the relevant technology and gain market-management expertise, as it gave them a higher degree of autonomy and more control over their products. This allows them to concentrate on designs that can best meet the needs of domestic consumers, while counting on technical help from global vendors located in China.

In recent years, China's market in small portable entertainment devices has been booming. A leading company, Aigo (爱国者), self proclaimed as China's "iPod" maker, is resorting to similar strategies to create many fashionable and rapidly changing models that will appeal to China's young consumers. Aigo has been among the top-selling brands of MP3 and MP4 music players in China for most of the 2000s. It relies on OEM vendors in China to manufacture parts while working closely with these vendors on design and other technical issues (interview).

Reliance on the rapid expansion of the Chinese market and active collaboration with MNC vendors characterize the strategy of many China's other leading companies. In the early 1990s, Huawei in Shenzhen, started to make telephone digital switches to sell, in smaller cities as replacements for the far more expensive products of MNCs. It has since become one of the top venders of telecommunication equipment in the world today, due in large part to the spectacular growth of the Chinese market since the 1990s (Simons, 2006). Huawei is now aggressively pursuing an international strategy. By 2006, it had established a presence in over 40 countries, deriving more than half of its revenue from overseas. Huawei heavily focuses on R&D and marketing. Though it has its own manufacturing facility, it also relies on various international vendors in China for parts of its products. For example, in March 2007, Huawei announced a strategic alliance with Taiwan's Foxconn to manufacture part of its products (ccw.com.an, March 9 2007).

It is not my intention to detail the stories of all these companies here but to highlight that a key to their success is a shared strategy of synergy between China's export capacity and domestic market growth. Yet it is important to note that in the cases of Lenovo, Ziguang, and to a lesser extent Huawei, their success has been built on producing relatively mature technological products. They also emerged at a time when MNCs were not nearly as focused on China as it is at present. It is legitimate to question whether the similar strategy can be replicated in more technologically sophisticated sectors and in a more globalized China, or whether such synergy can be realized for smaller companies.

To try to answer these questions, let us now look at China's multimedia chip-design industry, particularly the experience of Vimicro Corporation (中星微), a fabless semiconductor chip-design company that started in 1999 in ZGC.

5. MULTIMEDIA CHIP DESIGN: SYNCHRONIZATION EXTENDED TO ADVANCED TECHNOLOGICAL SECTORS

By 2004, China had become the world's largest mobile phone market, and wireless subscriptions continue to climb rapidly. Chinese consumers show a distinct pattern of mobile phone use, emphasizing text messaging and entertainment functions. Hence there was considerable interest in developing multimedia

chips that appealed to the Chinese market. MNCs are now far more attentive to China than they were during the era of PC competition, and the leading MNC brands such as Nokia and Motorola each have established multiple R&D centers in China to study consumer behavior more closely and design their products accordingly (interviews). The growth of the mobile phone market also attracted numerous domestic companies, not only as mobile phone makers but also as phone designers and chip designers, such as Vimicro.

Unlike ZGC start-ups from the 1980s such as Lenovo, companies that began in ZGC during the late 1990s typically boast extensive international connections and much better technical expertise. Vimicro was founded by an overseas returnee, John Deng, who graduated from the University of California, Berkeley, with a Ph.D. in engineering. The senior engineers and managers of Vimicro all had extensive working experiences in American companies. Vimicro is one of the more successful multimedia chip designers in ZGC because, unlike other start-ups in this field, it already had an established multimedia product—the chip used in desktop computer cameras—for which it had 60% of the world market share in 2006 (Vimicro Company website). Its chief financial officer, who had previously worked for several large western investment banks in New York and Hong Kong, explained to me that Vimicro reached its current world market share because most of the world's mainstream PC accessory makers are already located in China. As long as Vimicro can convince such manufacturers as Samsung, HP, Lenovo, and Logitec to use its chips in their PC cameras, those chips can quickly become a mainstream product worldwide. In other words, Vimicro established itself as an IC designer by insert into the export supplier chain in China, a classic strategy employed by many IC companies in Taiwan in the 1990s.

Yet Vimicro sees its future developmental opportunities not in continuing to supply components for export-oriented manufacturers, but in designing multimedia chips for China's future third-generation (3G) mobile phone market. It has put much of its energy into designing chips with integrated multimedia functions for mobile phones, in the hope that once China starts its 3G system it will be in a good position to benefit from rapid growth in this market. The same executive explained Vimicro's competitive edge in the global market:

"You need three conditions to compete in the international market:

1. *Market demand*: not only does China have the world's largest mobile-phone market, it is also among the most demanding in designing features for communication and entertainment functions.
2. *Supply*: the IC chip production chain is already established in China. All major world companies have come into China. All stages of IC production ranging from design, foundry, packaging, testing, and others are available here. There is no problem to produce a quality chip here.
3. *Human resources*: we have U.S.-trained experienced entrepreneurs, professionals, and engineers, including senior engineers from Intel, HP, Lucent, and Kodak. In addition, we have many smart Chinese students from Tsinghua University and elsewhere.

As we are able to meet these three conditions, we can succeed."

It is worth noting, from conditions 1 and 2, that Vimicro explicitly sees its core competency as exploiting the synchronization of China's domestic demand and export industrial infrastructure. The size and characteristics of the domestic demand suggest the future market potential and offer incentives for technical advancement. Existing production facilities for export guarantee product quality and allow for economies of scale. Though IC chip design is very different from PC manufacturing, there is strikingly similar reasoning behind Vimicro's and Lenovo's competitive strategies.

Not surprisingly, many other entrepreneurs in this sector share the same reasoning, so a critical mass of Chinese companies collaborating on mobile phone-related technology has already come into existence. Most of these companies were founded by overseas returnees with extensive working experience in the major companies of the United States or elsewhere. Although still a small minority among companies in ZGC, returnee-founded companies have been growing rapidly since 2000. For example, ZGC region reports a steady increase of roughly 500 such firms every year since 2000. By the end of 2005, there were over 3,000 of returnee-founded firms, with a total of 7,300 returnees working in them (ZGC Administrative Committee, 2005b). Because these companies are small, they often specialize in the most knowledge-intensive segments of the industry and rely on manufacturing facilities

in China's coastal export zones to make their technology into hardware.

Since the late 1990s, the Yangtze River Delta has become one of the most rapidly growing regions in semiconductor chip production, attracting key companies from the United States, Europe, Japan, and Taiwan. The production capacity of semiconductor lines in this area is expected to become among the largest in the world (Jelinek, 2004). When I interviewed employees of chip-design companies in Beijing in 2005, most commented that the capacity for manufacturing IC chips or related devices on the coast had become quite mature: "They can do anything you ask them to do and to do it well," one entrepreneur remarked. Consequently, companies in Beijing can concentrate on designing or devising software solutions, leaving all hardware manufacturing tasks to the Yangtze River and Pearl River Deltas. Vimicro and many newly founded companies represent a new generation of Chinese high-tech companies pursuing advanced technology and innovation by taking advantage of the domestic market and China's increasingly sophisticated semiconductor manufacturing chain.

Of course, not all returnee companies can find success. Many returnees were originally lured by China's seemingly rapidly expanding information technology market. But if their products did not locate in synchronization areas of China's market and export industry, plenty of them discovered rather painfully that either the famed Chinese market may not materialize for their technology, or that a poorly developed commodity chain cannot support their products.

One returnee from Silicon Valley, Hu Hui (胡晖), spent US$150,000 to set up his company in ZGC, a sum too small for such a venture in California. Hu developed a software solution for remote medical diagnoses, but could find no buyers in China, nor could he convince Chinese venture capitalists to invest in his firm since they too concluded that there was no market for his product in China. Hu tried to donate the device with his software to Chinese hospitals during the SARS outbreak in 2003, but the units were never used. Relief finally came from the United States: an American firm bought his company for the princely sum of US$18 million in 2004. It appears that a valuable piece of technology in the United States may not find its value in China (ZGC Administrative Committee, 2004).

On other occasions, it is the commodity chain that caused the fatal problem rather than the market. Small returnee companies often specialize in rather narrow niches. Without the support from an available commodity chain, they are doomed. In 2002, I interviewed one entrepreneur who returned from Seattle, United States, who said that he spent eight months rethinking his business strategies after returning to China

> The commodity chain in China is far from developed, as compared to in America. If you just specialize in your technological niche, it will be impossible to survive here. You have to extend your work up or down the chain. It might be enough for me to just do software in the U.S., but here I have to make it into a piece of hardware, so it is a so-called product. Otherwise, the clients do not recognize the value of your technology.

When he was interviewed again in 2006, he said that the commodity chain was in much better shape in China and his business partners could now comprehend what he was trying to do. Thus, he was finally developing a marketable product.

These last two examples show what can happen if a company's specialization is out of sync with China's export industry or its domestic market. In sum, the growth and increasing sophistication of the export industry provide new opportunities for more advanced technological enterprises, attracting an increasing number of overseas returnees. A regional division of labor is particularly important for these start-ups. The most fertile business areas for them continue to be those that can profit from the synchronization of export capacity and domestic market growth.

6. CONCLUSION AND IMPLICATIONS FOR OTHER DEVELOPING COUNTRIES

This paper has examined the reasons behind the rapid rise and competitiveness of China's leading indigenous companies in the ICT industry, virtually all of which were created from scratch since the mid-1980s. Rather than treating export development and import substitution as mutually exclusive alternatives, the paper shows that the synchronization between the two has been key to cultivating technological and market competence for the most capable Chinese companies.

This paper does not intend to diminish the importance of export industry, or the role of foreign companies; rather, it aims to make more explicit the contributions of indigenous companies and the domestic market to technological development in China. Import substitution in China is not the product of an old-fashioned, state-protectionist model. It takes place amid intense competition with MNCs and is closely connected to the export sectors. Lenovo became successful in the PC sector because of the attention to and an understanding of the domestic market, and its collaboration with export vendors in the coastal regions of China. The case of Vimicro similarly suggests that the synergy between export and the domestic market can provide opportunities for making technologically advanced products.

Though China is unquestionably unique with its dynamic and large economy, lessons drawn about the conjunctions between local markets and export activities may be useful for other developing countries. In particular, it points to the importance and the appropriate means of fostering domestic markets for indigenous companies. Ironically, the success of China's indigenous minying companies were not a results of the state policy, but in spite of it. During its earlier years of reform, the Chinese state pursued a strategy of ''technology in exchange for the market,'' that is, encouraging technology transfer by promising market access to foreign firms (Wang, 2006). This strategy is counterproductive from a synchronisation perspective since it granted favorable terms for MNCs while undermining the market access of indigenous companies, especially if they were minying companies. In addition, the expected technology transfer hardly took place, as MNCs are always protective of their core intellectual property rights. Without access to the domestic market, indigenous companies would have a hard time growing. Both Lenovo and Huawai encountered resistance and suspicion from the governments toward their products in their earlier stages of development while the same governmental agencies welcomed foreign products. Even now, Chinese minying companies in other sectors are always complaining of various official barriers for their access to the market despite the growing openness to foreign MNCs.

The paper also argues that developing countries should not be under any illusion that MNCs can be the main technological providers for low-income markets since MNCs' global perspective tends to limit the attention they pay to developing markets, even if it is China. Indigenous companies are indispensable agents for initiating market growth in these countries. This is not to say that the state should exclude MNCs. The active participation of foreign MNCs in the domestic markets of developing countries is essential for producing the competitive pressures on domestic companies that spur technical advancement. The paper shows that even with foreign competition, the domestic market can still serve as the most favorable training ground for business competence of indigenous companies.

For developing countries, policies aimed at promoting the ability of local businesses to meet local demands, and promoting linkages between domestic and export-oriented establishments deserve close attention from policy makers. The synchronization between export industry and the domestic market benefits both small and large companies, and at different locations in the commodity chain. Although some of China's experiences may not be replicable elsewhere, it is reasonable to expect that developing countries will benefit by paying more attention to such synchronization. I look forward to similar studies, conducted in China or other large developing countries, to judge the applicability of this argument elsewhere.

NOTES

1. For a more detailed analysis, please refer to The inside story of China's high-tech industry: making Silicon Valley in Beijing. 2008. Lanham, MA: Rowman and Littlefield Publisher.

2. Zhongguancun Administrative Committee provides certification for firms that are deemed high-tech with various measures on R&D inputs, and share of export, *etc*. Those who are certified were exempted from corporate income tax for three years and have reduced tax for another three years. The process is supposed to be reviewed annually and usually hundreds of firms lose their status every year (http://www.zgc.gov.cn/cms/template/item_english.html?did=73&cid=73\3985).

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ccw.com.cn. Huawei yu Taiwan Honghai jiemeng, foxcon wei qi shengchan zhongduan shebei 华为与台湾鸿海结盟 富士康为其生产终端设备 (Huawei and Taiwan Honghai form strategic alliance, Foxcon will produce terminal equipment for Huawei). <http://www.ccw.com.cn/news2/corp/htm2007/20070309_244445.shtml>.

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