

China and India:

A Comparative Study of the Manufacturing and Services Industries

Submitted April 24th, 2006

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EXECUTIVE SUMMARY

The accelerated economic growth of both China and India in recent years has been the focus of significant policy discussion and analysis. China's economic growth has been led by manufacturing, while India's growth has been through information technology (IT). As both of these countries look to sustain their growth, China is striving to increase its presence in IT, while India strives to be a stronger player in manufacturing. Achieving these respective goals will require both countries to take a series of policy actions, which is the focus of this paper. For China to increase its IT sector, necessary policy steps include: focus current IT industry on global exports; spur entrepreneurship and reduce dependence on central government; create a strong trade association to improve regulatory environment; and improve quality and approach of educational system. Conversely, for India to improve its manufacturing sector, it must increase its FDI inflows for manufacturing and improve basic infrastructure.

INTRODUCTION

The rate at which China and India have been growing since the early 1990's has been a major topic of discussion around the world. Both countries are home to nearly a billion people and they experience tremendous GDP growth each year (See Table 1). They can attribute success of their growth to certain factors like large numbers of highly-skilled engineers and technicians, but certain differences in government policy and social and cultural behaviors have led to each country's success to come from different industries. One of the main factors that make India and China an interesting comparison is the fact that although they are similar in many ways, their differences have led each of the take different paths towards economic development.

Table 1: India and China Comparison of Key Indicators

Source: Economist Intelligence Unit.

Indicators	India	China
Size of Population	1.1 Billion	1.3 Billion
Type of Government	Democracy	Communist State
GDP Growth (2005)	7.9%	9.3%
Manufacturing as a % of GDP	16%	53.3% ¹
Services as a % of GDP	51.5%	32.2%
FDI Inflows (2005 – 2006)	7.5 Billion (predicted)	52 Billion
Remittances (2003)	17.4 Billion	4.6 Billion

Economic development is traditionally spurred by high rates of productivity which is often a result of a strong manufacturing sector. Much of China's approximately 9% GDP growth can be attributed to the strength of China's manufacturing sector which builds a variety of goods ranging from automobiles to textiles. India has also increased its productivity and economic development in the past decade, experiencing a GDP growth of 7.6% (CIA World Factbook). However, India's growth has been spurred by the service sector as opposed to its manufacturing sector. India's service sector comprises approximately 52% of its GDP while China's is significantly lower, at 41%. While these percentages are significantly lower than the average 70% found in developed countries, both countries are moving to increase this share (Economist, January 2006).

Different geographic regions tend to specialize in particular products because of comparative advantage. This is the case of manufacturing which tends to arise within geographic clusters. In China, areas such as Guangdong, Shanghai, and Shenzhen are characterized by their strong manufacturing base. For years manufacturing has contributed significantly to GDP output. However, the service industry is taking over as the primary contributor to GDP output and

¹ Includes construction

economic development. Like manufacturing, the service industry, and in particular the knowledge based service industry such as software development and IT enabled services, has also concentrated in very specific zones. Indian cities such as Bangalore, Chennai and, Mumbai are known for their vast numbers of IT related companies. Increased technology has affected both sectors but in opposite ways. Technological advances in manufacturing regions have resulted in reduced labor demands. Meanwhile, technological advances have helped achieve massive growth in the IT and software industries. Since services often demand more education-promoting strategies while manufacturing tends to encourage more infrastructure-centered policies, the policy implications of these two development strategies vary.

Increased technology and economic liberalization have significantly increased the flow of service delivery. Knowledge based service industry such as software and IT enabled services such as back office operations for businesses, software development, and call centers are becoming popular means for developing countries to increase their revenue flows. India is the poster child for the growth and dominance of the IT and IT enabled service (ITES) sectors. Given this success, China has realized that it too wants a piece of this lucrative pie and is currently making efforts to enhance its IT and ITES sectors to compete with India. India is also trying to emulate China's success in the manufacturing sector, given the increased competition in the IT and ITES service sectors. Can both countries simply copy each others development strategies?

OVERVIEW OF MANUFACTURING IN CHINA

China has experienced spectacular economic growth, quadrupling its GDP to become the second largest economy in the world based on its purchasing power parity (CIA Factbook, 2005). Much of this growth is driven by manufacturing. Today, China has become the manufacturing

center of the world. Exports of manufactured goods have risen at a rate of 15 percent per year to about \$730 billion in 2004 (EIU Country Report, 2006). China now makes 50 percent of the world's telephones, 17 percent of refrigerators, 41 percent of video monitors, 23 percent of washing machines, 30 percent of air conditioners, and 30 percent of color TVs (Rowen, 2003).

China's Key Manufacturing Sectors: Electronics and Automotive Components

China no longer is merely a place to churn out low-tech, high-labor components. In recent years, China has been especially prominent in developing its electronics and automotive component industries. The Chinese electronics industry has become the leading export industry in China, and has a significant presence globally across a wide spectrum of electronics products, from household electrical appliances to semiconductors. Today China makes \$60 billion worth of consumer electronics goods a year (Farrell, 2004).

China is also fast becoming an important source of automotive electronics for the global market. According to figures by Chinese supplier Asimco Technologies, in 2005, China exported \$1.49 billion worth of automotive electronics and electrical instruments. Moreover, last year, General Motors moved its global electronics purchasing office to Shanghai. Visteon Corporation has also announced that its global electronics group will be headquartered in Shanghai as well.

The combination of preferential government policies, foreign direct investment, great infrastructure, and human capital has contributed to the success in Chinese electronics and automotive component manufacturing.

Factors Leading to China's Success in Manufacturing

Preferential Government Policy

Among developing countries, the openness of China's trade and industrial policy are often cited as its comparative advantage. While interventionist government policies are often noted as adversely affecting economic efficiency, these policies have worked for China's manufacturing sector. The manufacturing sector requires large provision of investment capital, coordination of the localization process and the monitoring of technology transfer. More specifically, in the automotive and electronic sectors, the emphasis is on promotion of learning rather than innovation (Segal and Thun 2001). To further develop these industries, the government needs to be more interventionist. Local governments such as Shanghai have been very successful in coordinating investments across firms in the automotive industry to ensure a smooth supplier network (Segal and Thun, 2001). To date, the Shanghai area is considered one of the most robust manufacturing centers for electronics and automotive parts.

The Chinese government has led investment in the manufacturing sector by giving preferential loans to targeted industries. In recent years, the government has promoted growth in the value added manufacturing industries such as electronics and automotive components. Tools used to promote the electronics industry include public research, trade protection, sector-specific financial incentives, selective government procurement, and control of foreign participation, relaxed antitrust regulation, and the provision of training and education for sector-specific skills (Linden, 2003).

Additionally, the ease of doing business in China is very important. Compared to other countries in the Asia-Pacific, the cost and time to start up and close a business are lower in China (IFC Doing Business). Moreover, the costs and procedures involved in importing and exporting

a standardized shipment of goods in China are less than countries in the region (IFC Doing Business).

Foreign Investments

By welcoming foreign investment, China's open-door policy has added power to the economic transformation. In 2005, China received \$153 billion in foreign direct investment (US China Business Council). This foreign money has built factories, created jobs, linked China to international markets, and led to important transfers of technology. Through this strategy, multinationals have brought large sums of capital and senior talent to China, helping China develop its manufacturing arm without relying on local institutions.

Joint venture firms have also been a huge boon for the Chinese manufacturing sector. By employing local managers and workers, foreign-invested companies teach management, production, and marketing skills to local employees (Chuang and Hsu, 2004). The process is especially well delineated in the automotive electronics sector. The majority of the automotive electronics exports are coming from foreign-invested firms rather than fully domestic companies because most domestic companies lack the necessary advanced technology. Moreover, foreign companies are putting time and money into developing a local supplier network.

Through opening up its retail and distribution sectors, China has been successful in promoting the automotive component market. Automaker Ford Motor and foreign auto parts makers like Tenneco Automotive and Lear have set up production facilities in western China (US China Business Council 2004). High-tech companies are also establishing operations in western China: Intel Corp. announced a \$375 million chip testing and packaging facility in Chengdu, Sichuan (US China Business Council, 2004)

Infrastructure Investment

One of the most important success factors is China's superior infrastructure. It is especially essential in manufacturing. Good roads are needed to transport raw materials and finished products. Resources such as power supply and sound facilities are needed to prevent the interruption of production.

China invests heavily in maintaining its transport system. It makes enormous efforts to lower congestion levels on main railways. Additionally, China has built 25,000 km of four- to six-lane, access-controlled expressways in the past 10 years.

Having a stable power supply is very vital to manufacturing efficiency. Power outages can lead to loss of sales by forcing downtime or idle capacity on managers. Power disruptions waste material, damage equipment, add maintenance and repair costs, thus increasing the overall cost of doing business in a country. In China, power outages happen on average every other week, which is considered low compared to other developing countries (World Bank). To prevent power shortages, China is continuing to invest in power generating structures. The Chinese government continues to pay close attention to investing in infrastructure such as roads and transportation systems, manufacturing machinery, and communications systems (Hu and Khan, 1997).

Human Capital

Cheap labor is one of the main draws for firms relocating in China. Firms come in search of human resources. During our visit to Xian's High Tech Zone, we heard the same sentiment from the local business elites. Many hi-tech firms choose to locate in Xian because the surrounding universities provide an abundant supply of educated laborers. Similarly, one of the

reasons global electronics and car manufacturers are relocating its headquarters to Beijing and Shanghai is to access the readily available supply of cheap, skilled human capital.

In addition to its vast supply of cheap but skilled human capital, China has large numbers of foreign educated people coming back from Silicon Valley and other centers of innovation. China currently has 1,731 universities and continues to build more universities and trade schools. In 2005, there were an estimated 3.4 million college graduates (EIU China Country Report, 2006). In terms technical resources, China adds 600,000 new engineers every year (Christian Science Monitor).

Lessons Learned from China's Electronic and Automotive Component Sector

- In capital intensive industries, government interventions such as preferential industrial and fiscal policies are needed to channel growth.
- Foreign direct investment is important in facilitating technology transfer and capital investments.
- Manufacturing sector requires good infrastructure such as transport system and power supply.
- Investment in tertiary education is vital in the promotion of hi-tech industries because human capital is the key in a firm's expansion strategy.

OVERVIEW OF MANUFACTURING IN INDIA

While India's Information Technology services sector has been credited with much of India's economic growth (in 2004 51.1% of GDP), experts predict that manufacturing (in 2004 16% of GDP) will fuel India's next era of growth (EIU India Country Report, 2006). India's manufacturing sector has lagged behind those of China, Thailand, Malaysia, and Mexico. The main reasons multinational companies have not invested in India results from the lack of infrastructure including electricity, roads, and sea and air ports as well as government regulation and corruption. Despite these obstacles to growth, electrical and electronic components manufacturers ABB, Honeywell, and Siemens and automotive manufacturers DaimlerChrysler and Toyota Motor have started operations in India. Their incentives for starting production in India are low labor costs and the availability of high levels of technical expertise. Industry trends show an increase in skill-intensive manufacturing sectors. Approximately 50% of U.S. offshore is manufacturing in skill-intensive sectors, and this number is expected to increase to 70% by 2004 (Luthra, Mangaleswaran and Padhi 2005). Industry growth alone will not continue to attract multinational companies to India. If lessons learned from China's success are applied to India, it becomes evident that India mimics China's success in developing human capital and providing some preferential treatment. However, India needs to continue to take steps to improve its infrastructure and government regulation in order to increase FDI flows. A further examination of the electronic components and automotive manufacturing sectors will provide insight on what factors are spurring growth in these sectors and what government regulations need to be leveraged to increase growth.

India's Key Manufacturing Sectors: Electronics and Automotive Components

The ten key manufacturing sectors in India includes engineering, electronics, automotive, textiles, chemicals, leather, metals, machine tools, food processing and gems and jewelry. Of these ten sectors electronic and automotive components have had some of highest rates of growth.

Table 2: Information on India's Automobile and Electronics Sectors

Source: India Brand Equity Foundation. 2006. Manufacturing in India. February 13, 13-14.

Indicator	Automotive Sector	Electronics Sector
Key Sub-Sectors	<ul style="list-style-type: none"> • Commercial vehicles • Passenger vehicles • Two wheelers • Three wheelers 	<ul style="list-style-type: none"> • Consumer electronics • Industrial electronics • Computers • Strategic electronics • Communication & broadcasting equipment • Electronic components
Market Size (2004 -05)	Total vehicle production – 8.4 million	Total size – US\$11 billion
Domestic Growth Rate	CAGR – 14.2% last 4 years	
Export Growth Rate	CAGR – 39% last 4 years	16% between 2003 and 2004
Key Companies	Ford, General Motors, Hyundai, Hero Honda, Toyota, Daimler Chrysler, Tata Motors, Mahindra & Mahindra, Ashok Leyland, Hindustan Motors, Bajaj Auto, Maruti Suzuki etc.	Samsung, LG, Philips, Mirc Electronics, Flextronics, Solectron, Jabil Circuits, HCL Infosystems Ltd, Videocon International Ltd.

Factors Leading to India's Growth in Manufacturing

While there are certain similarities in India and China that encourage growth of the manufacturing sectors, there are key differences that can account for why China has been more successful in manufacturing than India. As mentioned in the section above, China has been successful in manufacturing because of preferential government policy, foreign investment, infrastructure investment, and human capital. Preferential government policy and human capital have also played a role in India's new growth in manufacturing, but other factors such as reliable suppliers, low cost of materials and labor, and a large domestic market have also encouraged the recent growth of manufacturing in India.

Preferential Government Policy

In order to encourage growth of the manufacturing sector the government has implemented reductions in import and customs duties. In the electronics sector the government has removed customs duty on raw materials and inputs for the manufacture of electronic components. In the automotive sector the government has reduced customs duties on raw materials and inputs for manufacture of automotive components from 20 – 15 percent (IBEF 2006). India has also developed Special Economic Zones (SEZ) that allowed for government, private, or joint sector initiatives to develop business. The SEZs provide high quality infrastructure facilities and support services, besides allowing for the duty free import of capital goods and raw materials (IBEF 2006).

Human Capital

India has an abundance of skilled engineers and technical experts. The U.S. and Singapore are the only countries that outrank India in the availability of skilled-workforce. In addition, India's employable skilled workforce is predicted to grow for the next 20 years, but China's skilled workforce will begin to decline in 2010. In 2003, India also had the lowest hourly labor costs among its major competitors at US\$0.74. India's competitors followed at the following rates: China US\$0.90, Thailand US\$1.20 and Mexico US\$1.68 (IBEF 2006).

India has a well-developed technical and tertiary education infrastructure that produces over 500 PhDs, 200,000 engineers, 300,000 non-engineering postgraduates and 2,100,000 other graduates each year (IBEF 2006). Eight percent of the Indian population between the ages of 25 and 34 receives tertiary education compared to only 5% of the Chinese population in that same age cohort. High levels of education not only lead to engineering and technical capability, but also strong managerial capability.

Large Domestic Markets

India's rising incomes and growing consumerism are the main factors aside from lower costs that make India appealing to foreign investment. As income rises, there is also an increase in domestic consumption. Between 2005 and 2006 domestic consumption was forecasted to increase by 8.7% (EIU 2006). While a large domestic market creates a good incentive for initial investment in India, companies need to realize that this is a limited source of growth and they need to be poised to export from India in order to truly expand.

Quality and Trade Standards

India's adherence to quality and trade standards makes exporting from India a viable option. India manufacturing companies have quality management programs in place including ISO 14001, TS 16949 and TQM that make them export ready. Approximately 80 percent of automotive component manufacturers in India meet ISO 9000 quality standards. In addition they are WTO compliant for Trade Related Intellectual Property (TRIPS) (IBEF 2006). Companies who set-up operations from India need to take advantage of these opportunities to expand India's manufacturing sector to serve international markets.

Factors Slowing India's Growth in Manufacturing

Lower Levels of Foreign Investment than China

Since the beginning of the 1990's, India has improved its manufacturing environment. In the first half of the 1990's, manufacturing exports grew 30% higher than the world export market, but during this time China's exports grew at a rate of 57% higher than the world market. One main factor that contributed to China's higher rates of growth was that during that time China averaged US\$40 billion in foreign investment annually while India averaged foreign investment

was only US\$3 during the same period of time. The main obstacles preventing investment were the regulatory quality and corruption, and provision of infrastructure (World Bank, 2004).

According to the World Bank 2004 Doing Business in India report, it is harder to do business in India than China. One supporting example of this fact is that in 2004 it took 89 days to start a business in India, but it only took 41 days to start a business in China. In addition, India also has stricter labor laws, which makes it much harder to hire and especially fire workers. This is also cited as an impediment to growth by businesses. Senior management at Indian firms also spends more time addressing regulatory issues than management of Chinese firms (11.9% in India vs. 7.8% in China) (World Bank 2004). The government officials in India responsible for overseeing various regulations including labor and tax provisions have more discretion over what rules and regulations they enforce. This leads to higher levels of corruption than other developing countries.

In addition to the ease of doing business, another factor that prevents FDI inflows is the tight regulations India places on FDI inflow. India's Leftist Government front government parties resist FDI inflows because they fear that an influx of multinationals will drive out local business.

Lack of Infrastructure

Infrastructure is often cited as the biggest impediment to growth of the manufacturing sector in India. Gains made through low labor costs are often lost through bottlenecks in power supply, telecommunication, and transportation. The following chart highlights differences between China and India for three major indicators.

Table 3: Objective Indicators of Bottlenecks in India and China

Source: World Bank. 2004. India: Investment Climate and Manufacturing Industry.

November, 34.

Telecommunication		Power Supply		Transportation	
Number of Days to get a new phone connection		Number of Days to get connected to a public grid		Average Inventory Days of Average Inputs	
India	China	India	China	India	China
29.8	9.3	47.8	25	32.5	24.2

Each of these factors increases cost of business in India and deter investment. Problems with lack of access to power supply are also exacerbated by frequent power outages. In terms of transportation, India has the second largest railways system in the world, but the high duties on transporting goods makes it an expensive way to move goods around the country. In addition, India lacks an interstate linking its key economic zones. These inefficiencies in transport lead to higher levels of inventory, which in turn leads to higher operating costs for companies.

Recommendations for India’s Manufacturing Sector Given China’s Success

Based on Key Lessons from China’s Success in Manufacturing and India’s Obstacles to Growth in Manufacturing, it is quite evident that India needs to increase its FDI flows and improve its infrastructure to increase growth in manufacturing.

Recommendation 1: Increase FDI Inflows

FDI inflows is one of the main factors that will enable India to improve its manufacturing sector. Higher FDI will allow India to further develop its infrastructure, which will lead to business development. To increase FDI, India needs to further liberalize FDI regulation. The one cultural factor that makes that more difficult for India than China is Indian nationalism.

Certain government parties are resistant to multinational investment in India. Unless there is an acceptance in the role foreign investment can play in making India stronger, this will continue to be a hurdle. Another main factor in increasing FDI flows in making it easier to enter and exit the Indian market. Until these factors are addressed foreign companies will continue to choose other destinations for their investment like China, Brazil, or Malaysia.

Recommendation 2: Improve Infrastructure

Making a serious investment infrastructure will help business grow and attract more investment to India as well. While the Indian government is taking some steps towards developing infrastructure through the Special Economic Zones, in order to truly be competitive they need to allow for better access to power supply and transportation. Following China's example of developing preferential treatment for access to power supply and transportation would lead to more investment in manufacturing.

OVERVIEW OF SERVICES IN INDIA

The Indian information technology (IT) industry has been the source of much discussion on the successful growth of a knowledge industry in a largely poor, developing country. Politicians, business leaders, and numerous academics have cited the growth of IT in India as a case study from which lessons on government intervention, effective business strategy, and economic development can be drawn. IT in India is spread across four key sectors- IT services, IT enabled services (ITES), software, and e-business. These sectors combine for a 2008 annual revenue forecast of \$87B, (NASSCOM) with numerous analysts suggesting higher revenue. Highlighting the rapid growth of IT in India, software was a small \$150MM industry in 1991, but grew to \$5.7B in 2000, an annual growth rate of 50%. (NASSCOM) The public and private sector factors that have contributed to this hyper growth of IT provide lessons for possible replication in China and other developing countries. These factors include the passive role of government, the prevalence of English speaking labor, the role of education, and the impact of entrepreneurship.

Factors Leading to India's Success in Services

Passive Role of Government

India's IT industry has flourished with minimal intervention or support from the central government. While the Indian government made itself famous (or infamous) to many business executives during the 1980s with its "license raj" bureaucracy, the government exhibited "benign neglect and active encouragement" with software, a story similar across India's entire IT sector (Arora, pg. 4). In particular, the Indian IT industry did not face a rigorous process for starting new companies, a certification that had often encumbered the formation of new businesses in

other industries. IT also faced limited labor restrictions on hours and overtime, while having the opportunity early in its development to receive foreign direct investment (Farrell, 2004).

Whether the Indian government consciously did not regulate IT, or just underestimated its possible growth, is unclear, but the resultant growth of the industry has been helped by the government being hands-off, especially when compared to regulated slow growth industries (financial institutions, retail). Rather than being lauded for facilitating IT growth, the central Indian government has often been criticized for its lack of widespread broadband infrastructure and slow technology adaptation. Similarly, the Indian government's special economic zones "have had difficulty attracting foreign and domestic investors" to spur IT (or other industry) growth (Asia Pacific Bulletin, 2006). Hence, it can even be argued that the Indian IT industry has growth *despite* the government.

English

At least 70MM individuals (Torreblanca) speak English at a professional level in India, a fact that is regularly cited as a critical advantage in India's IT growth (Dossani, 2005). This factor was especially critical during IT's nascent stage as multinationals still becoming familiar with the language of IT did not want the further challenge of managing language differences when creating offshore development centers or partnerships. India's English endowment became further magnified with the growth of email, as international linkages became increasingly cheap. Indian software engineers could easily market their new company or product using email or the Internet, while global companies could conversely reach out to hundreds of new possible partners, all accessible via the web. As India's IT industry has matured from software to business process offshoring (BPO), English has again been a comparative advantage as the sheer number of employable English speakers has made India a key FDI destination (#3 rank in A.T. Kearney

FDI index) for customer-facing services like call centers and billing, tasks for which communication is the key skill required.

Education

A common belief, especially in the popular press, is that India's IT growth is driven primarily by the success of its technical education. This is true to some degree, especially if citing absolute numbers, as India graduates between 130,000 and 150,000 engineers each year and has more than twice the number of annual college graduates of the United States (Farrell, 2005). Yet, of the college educated populace, India has only 4% engineers, while Germany and China have 20% and 33% respectively (Farrell, 2005). Further suggesting that India's government did not play a positive role in the growth of IT, India's aggregate "education policy has been widely criticized as being ineffective," as technical facilities are inadequate, limited interaction exists between industry and academia, and enormous student inequity exists (the IIT system is a world leader, but most Indian students attend significantly lower quality institutions) (Dossani, 2003, pg. 21). But particularly helpful to the growth of Indian IT is the historical style of education, which has focused on "rote learning" and prowess in mechanical computation (Friedman 2006, pg. A19). That style of training has been highly beneficial in developing the software industry and IT infrastructure, as labor-intensive computer coding and programming were disproportionately valued.² Similarly, the profound technological changes associated with IT required large numbers of technical graduates, especially relatively inexpensive, English speaking ones, which has been a major advantage for India, despite overall shortcomings in the education system.

² Note that this initial advantage in mechanical learning, at the expense of creativity, has been cited by Thomas Friedman and others as a future challenge for India as it tries to develop innovation industries like R&D

Entrepreneurship

While the heavily regulated post-Independence economy in India was not conducive to entrepreneurship, IT beginning the 1980s was an exception. To start, Indian IT entrepreneurs (especially in software) benefited greatly from the minimal start up capital necessary to start a firm (Arora). Given underdeveloped capital markets in India and the large number of technical workers, starting a software company was comparatively easy to manufacturing or other capital intensive industries. As multinationals began using India for IT services, early Indian IT entrepreneurs matched local talent with international projects, exposing local Indians to the tremendous growth opportunities internationally in IT. Amplified by the thousands of Indian engineers working abroad and “with only a limited demand for their services from the rest of their (Indian) economy,” numerous start-ups began to grow in geographic areas with high numbers of computer and electrical engineering graduates (Arora, pg.4). As a result, clusters of high tech areas formed in cities like Bangalore and Hyderabad, essentially creating natural high tech zones that pulled in greater amounts of investment. While the role of the Indian Diaspora was limited as entrepreneurs in the new technology clusters of India, it has been beneficial in linking local entrepreneurs with capital and technology abroad, especially in the United States (Arora). The consequence of this is that the Indian IT industry has been focused on the international market since its inception (Tschang), exposing it to tremendous growth opportunity and international standards for intellectual property (Arora). The Diaspora also supplemented shortcomings in India’s education system (which does not provide skills for global businesses success) by providing context to western investors about Indian business culture and also advising Indian entrepreneurs on the skills necessary to engage in international businesses.

Lessons from India's IT Industry

A number of policy lessons can be drawn from the Indian IT experience:

- Strong English ability, perhaps more so than technical skills, is necessary to be competitive in world labor market
- Government role of minimal intervention and/or reducing the complexity of new business formation is especially important in knowledge industries like IT
- High-tech areas, driven by the market, can pull in global capital, even if domestic capital raising opportunities are limited
- Foreign-born or out-of-country immigrants provide linkages to capital, technology, and culture to emerging entrepreneurs in native country

OVERVIEW OF SERVICES IN CHINA

One of China's fastest growing service industries is the software industry. The Chinese software industry is inherently different than India's and will likely take different paths. The majority of Chinese software services producers are domestic companies with domestic consumers. According to Gartner, Chinese firms comprise about a third of the domestic software market, with the government pushing for a 60% domination by 2010. (Tschang and Xue, 2003. pg. 4). Because software development creates more efficient manufacturing processes, China's software industry is in high demand. In addition, more and more Chinese are acquiring personal computers and mobile phones that require software advances.

Table 4. Output of software, computer industry and total GDP

Source: Tsang, Ted and Xue, Lan. 2003 *The Chinese Software Industry: A Strategy of Creating Products for the Domestic Market. Asian Development Bank Institute*. January, 2

(100 million yuan)

	Output of software industry	Output of computer industry	Software as proportion of computer industry	Total GDP	Software as proportion of GDP
1999	441.5	1720	25.6%	82000	0.54%
2000	593	2150	27.6%	89000	0.67%
Growth rate	34%	25%	-	8.5%	-

In addition to the software industry, China is also experiencing growth in other knowledge based service sectors. In particular, China is racing India in the IT enabled services/ Back Office Operations industry. As more and more companies move manufacturing operations to China, they have realized the potential for service operations in the form of data centers and call centers.

Differences between India and China's service sector

Similar to its support of the manufacturing sector, the Chinese government has provided extensive support to the software industry through tax breaks and high tech development zones. There are currently approximately 53 State-level new and high-tech development zones in China, the majority of which are heavily subsidized by the government (Chinagate). In addition, the government has established 15 national software industrial parks to encourage more R&D that will contribute to the growth of this sector. These development zones provide infrastructure and facilities for new companies and hence reduce the overhead costs of these start ups. The majority of the companies that develop in these zones are in the service industry. More than half of the approximately 1000 foreign start ups in Shanghai in 2002 were in the service sector (A.T. Kearney). Perhaps the government's most important role comes through its support of national R&D centers in the several dozen research institutes of the Chinese Academy of Sciences (CAS).

Many of the leading software industries have arisen as spin offs from CAS. This is vastly different to India, where the service sector has succeeded despite the limited interaction of the government.

Another major difference between the Chinese and Indian software sector is the fact that the latter is more export oriented whereas the former serves primarily domestic demand. A mere 5.6% of China's software industry was exported in 2000 versus approximately about 70% in India in 1998 (Tschang and Xue). Therefore, many of the software companies currently emerging and contributing to China's fast growth are not looking outside their borders to continue growing. Despite China's vast size, the software industry will be forced to look beyond the borders to continue its growth. Since software is a global industry, the future and success of the Chinese software industry will likely depend on its ability to sell its products in other countries.

Factors Leading to China's Growth in Services

English

The recent emergence of English education in China is likely attributed to the growth of the service sector. Because the government understands the importance of English-language knowledge to success in the Knowledge based service sector, the Ministry of Education, in 2001, required that all students begin their English language education. While on average level of proficiency is low due to a shortage of well-trained teachers, the government is making a clear effort (Farrel and Grant).

Education

To take advantage of the large technically educated labor pool, many American educated and trained Chinese entrepreneurs are moving back to China to develop ITES/BPO companies. According to Gartner, salaries amongst IT professionals in China are less than a sixth of those in the United States (Global Envision). Not only is there a cost advantage, but there is also an education advantage. Emphasis on Higher Education by Chinese officials, especially in software and technical training, are evident by simply visiting some of the university infrastructure. Beijing has 76 universities, Shanghai has 52, while Xian has 43 (Farrel and Grant). In 2000 China, spent 2.3% of GDP on education, compared to 5.1 % by the United States in the same year.

IBM for instance, opened three new data centers in Hong Kong and Shenzhen in the summer of 2003 to take advantage of the highly educated labor pool.

Obstacles to Growth in Services in China

IPR violations

Despite the efforts in education and infrastructure that China has started, one of the largest drawbacks is the constant threat of intellectual property rights violations in China. Rampant software piracy contributes to the smaller and weaker size of China's software firms. According to Dr. Xue, an industry expert we met with at Tsinghua University, China "clearly needs better protection of IPR since there are local software companies that suffer from violations." Some of the ways the government has attempted to curb IPR violations is by creating incentives for original IT innovation and R&D. Some examples of these include providing funds to research institutions such as the Chinese Academy of Sciences and Research University.

Recommendations for China's software industry/ITES given India's successes

As mentioned above, the Chinese and Indian service sectors are not identical. Despite the differences, most of India's lessons can be applied to ensure the success of the Chinese service sector.

Recommendation 1: Become more export oriented

The first recommendation that China should adopt to improve its software sector is to develop a more export oriented growth strategy. Being domestically focused could leave the industry susceptible to internal shocks. While China has an extensive supply of consumers, these will eventually be exhausted. China's software sector should therefore look abroad for future clients. The high tech development zones should provide technical assistance on exporting guidelines and globalization to help companies export abroad.

As soon as the Chinese software industry becomes more export oriented, it should become more entrepreneurial and less government support dependant. As soon as the software industry becomes more export oriented, it should be driven more by the market than by the government.

Recommendation 2: Create a better IPR regulatory environment

To ensure the continued success of the industry, China needs to focus on improving its protection of IPR and target pirating. A first step towards this goal is through the creation of an IT/Offshoring Trade Association similar to India's NASSCOM. The creation of this type of organization would allow companies to share best practices to increase efficiency and, apply more pressure to increase compliance with international IPR standards. In addition, the

government should create an IPR regulatory body. However, before this is possible, China must create incentives for its entrepreneurs to innovate, rather than simply copy.

Recommendation 3: Improve English language education

While some measures have been taken to ensure adequate English language skills for most Chinese students, the fluency level is a deterrent for many international companies looking to offshore their call and data centers to China. Therefore, universities should ensure that English classes are taught not only at the grammatical and theoretical level, but more emphasis is placed on enhancing communication skills. While China may never be able to compete with India in terms of English language fluency, it is imperative that the country at least takes measures to decrease the gap in language skills.

CONCLUSION

China and India have embarked on two very different development paths. Each has leveraged its strengths to develop its own industries. While China has been hugely successful in developing its manufacturing sector, it has fallen short on its service sector. While India has been tremendously successful in its service sector, it has fallen short on its manufacturing sector. As a result, China is looking towards India for lessons learned and vice versa.

To develop its manufacturing sector, India would need to improve its infrastructure, continue its development of human capital and provide some preferential treatment to increase FDI and the foster specific industry development. Besides allowing for the duty free import of capital goods and raw materials, similar to China, India has developed SEZs that provide high quality infrastructure facilities and support services to manufacturing firms. Learnings from China's experience would suggest that higher level of FDI is necessary for further growth in the

manufacturing sector. However, Indian nationalism would make it difficult for India to liberalize its FDI regulation. Certain government parties are resistant to multinational investment in India.

To develop its service industry, China would need to focus on an export oriented growth. Currently, the majority of Chinese software services producers are domestic companies with domestic consumers. Since software is inherently a global enterprise, China will need to look beyond its borders for expansion. With the internationalization of the industry, China would need to make extra efforts to stamp out intellectual property rights violations.

So far, China has channeled resources to grow its hi-tech service industries through science parks. Future growth would require less government intervention and more entrepreneurial activities because protected industries would not be able to compete in the global economy. Additionally, while a trade association would be important in ensuring better regulatory environment, this recommendation may be more challenging to implement because the Chinese government does not allow organizations outside the government. As a result, a NASCOM will not be possible in China.

Overall, China and India's experiences provide a productive comparison on success factors in developing specific industries. While the recommendations in this paper apply more directly to China and India, they can be applied more generally to other developing economies that encompass similar characteristics.

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