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Growth and Development in China and India: The Role of Industrial and Innovation Policy in Rapid Catch-Up

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Industrial Policy

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**GROWTH AND DEVELOPMENT IN CHINA AND INDIA: THE ROLE OF
INDUSTRIAL AND INNOVATION POLICY IN RAPID CATCH-UP**

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Introduction

The objective of this chapter is to review the role of industrial and innovation policy in the development of China and India for insights into rapid catch up strategies. It will then reflect on the challenges to development policy advice from their experience, as well as from the new more demanding global context.

China and India have used industrial policy extensively. Nevertheless, contrary to the expectations of those who have a negative view of industrial policy, China and India have been growing for the last 25 years at average annual rates of 9.8 % and 6% respectively relative to average world growth rate of 3% (Table 12.1). However, although they had nearly the same per capita income 25 years ago, their growth performance has differed.

China has been growing at 9-10% per year for the last 30 years, while India's increase in growth has been more recent, and has reached 8% since 2003. Currently the Chinese economy is almost three times that of India, and its per capita income is more than twice (see Table 12.2). They also illustrate contrasting development strategies – China a more traditional labor intensive export strategy, India a new knowledge intensive service export strategy.

This paper will explore the role of industrial policy in their different development strategies and performance. In 1980 India was ahead of China in most economic and social indicators. However now China is ahead of India in virtually all indicators (except democracy and some elements of the rule of law), in spite of India's recent acceleration of growth rates. In addition, although they are only two countries they are very large. China is 20% of world population and 6% of world GDP. India is 17% of world population and 2% of world GDP. In PPP terms China is already 10% of world GDP, India is 4%.¹ Given current size and growth prospects, they affect the growth prospects for many developing countries, including rather

advanced ones such as Brazil, Mexico, and South Africa.² Therefore, there are some interesting lessons to learn about the different development experiences of each, as well as to reflect on their implications for development advice.

The development literature has focused a lot on industrial policy.³ This paper will argue that industrial policy and infant industry protection have been important in the development of both China and India, and that they would not be the strong global players they are if they had not had some industrial policy. It will argue that some of the key policy elements that differentiate the performance of the two countries are how they have tapped into global knowledge as well as their education strategies. The paper will also argue that industrial policy is easier when countries are in the catch up phase and will focus on three issues that are critical – how were they able to avoid having their industries become permanent infants, what was the role of lax intellectual property protection, and to what extent will they be able to go beyond imitation to technology development.

Table 12.1. Average Annual Growth of GDP 1980-2005

	1980-1990	1990-2000	2000-2005
<i>East Asia and Pacific</i>	8.0	8.5	8.4
<i>China</i>	10.1	10.6	9.6
<i>Europe and Central Asia</i>	2.4	-0.7	5.4
<i>Latin America and the Caribbean</i>	1.8	3.3	2.3
<i>Argentina</i>	-0.7	4.3	2.2
<i>Brazil</i>	2.7	2.9	2.2
<i>Mexico</i>	1.1	3.1	1.9
<i>Middle East and North Africa</i>	2.0	3.8	4.1
<i>South Asia</i>	5.7	5.6	6.5
<i>India</i>	5.8	6.0	7.0
<i>Sub Saharan Africa</i>	1.6	2.5	4.3
All Low and Middle Income	3.3	3.9	5.3

High Income	3.1	2.7	2.2
<i>US</i>	3.0	3.5	2.6
World	3.2	2.9	2.8

Source: 1980-1990--WDI 2000; 1990-2000, and 200-2005--WDI 2007. The region country groupings are those used by the World Bank and top six categories consist of developing countries.

The paper will end by summarizing some of the challenges for development policy that arise from the different experience of these two giant countries. Not only are some key elements of the strategies of China and India quite contrary to typical neoclassical development advice. Their strategies are also quite different from each other. In addition, the world has changed. Some of what China and India did is not replicable, in part because of their size, but also because the international system has become more restrictive towards traditional industrial policy. In addition, the global system is now much more demanding and fast paced. Trade is done primarily through global production and distribution networks controlled by multinational companies. It is much more difficult for new entrants to break into these systems because of the higher capabilities and scale required. Thus it is much harder for other developing countries to break in.

Table 12.2. Current Comparison of China and India

BASIC INDICATORS	China	India
GNI		
GNI (2005 nominal billion)	2,270	804
GNI as share of Global GDP	5.4	1.9
GNI/capita (2005 nominal)	1,740	730
GNI (2005 PPP)	5,333	2,341
GNI as share of global GDP 2005 (PPP)	9.7	4.3
GNI/capita (2005 PPP)	6600	3486
EXPORTS (2005)		
Merchandise Exports (billion)	762	95

Merchandise Exports % Share of World Total	7.3	0.9
Service Exports (billion)	74	56
Service Exports Share of World Total	3.8	2.9

PEOPLE

Population (2005)	1,305	1,095
Population as Share of Global Population	20.2	17.0
Life expectancy at birth	72	64

POVERTY

People living below \$1/day (2004-2005)	9.9	34.9
People living below \$2/day (2004-2005)	46.7	80.0

Note: In December the International Comparison Program of World Bank released a preliminary report of new PPP price series which adjusted downward by 40% the previous PPP GDP estimate for both China and India. See <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0,,menuPK:1973757~pagePK:6200243~piPK:62002387~theSitePK:270065.00.html>

Source: WDI 2007 except for new PPP data

Industrial Policy

Industrial policy is generally defined as any selective government intervention to promote the development of specific sectors. In both countries the government has been actively involved in industrial policy through virtually all the usual mechanisms: direct state ownership, selective credit allocation, favorable tax treatment to specific industries, tariff and non-tariff barriers to imports, and restrictions on foreign direct investment, local content requirements, special intellectual property rights policies, government procurement, and promotion of large domestic firms.⁴ Table 12.3 compares both countries on some of the key elements of industrial policy.

Table 12.3: Industrial Policy in China and India

	China	India
State ownership	Yes , was extremely high as result of Communist take-over, but	Yes , strong state control of commanding heights, starting with India's first

	thousands of state enterprises have been privatized or shut down as economy has undergone massive restructuring towards market	President. Relatively little privatization has occurred, although state ownership was not as pervasive as in China
Subsidized credit	Yes , still significant subsidized credit through state owned banks directed at state enterprises	Yes , still significant directed credit through policy banks and special programs
Tax incentives	Yes , and many have been strongly biased toward foreign investment and high technology	Yes for targeted sectors and areas
Tariff and non-tariff protection	Yes , but levels have been reduced significantly with WTO entry and are now relatively low	Yes , were extremely high and even though reduced over time, still remain very high by international standards although India is member of WTO
Foreign Direct Investment Targeting	Yes . Initially there was very strong control on FDI. Then strategy changed to opening up to FDI and of getting cutting edge FDI in key areas. One of main means of rapidly modernizing China. Much has come to use China as export platform. Government has been effective at creating strong competition among foreign firms and induced them to bring best technology.	Much less There has been much more control of FDI overall and less targeting. India has only recently liberalized FDI regime and begun to target, but much still relatively little FDI has been attracted because of high transactions costs and poor infrastructure. Exception has been in software and ITC related services which have not been constrained by regulatory regime or physical investment infrastructure
<i>Average Gross FDI/GDP 1995-2004</i>	3.89	0.68
Local content requirements	Yes , important mechanism to develop backward linkages which succeed because of capabilities of domestic firms	Yes , explicit local content requirements in many industrial projects, but not many foreign to participate
Intellectual Property Rights	Very weak until required to update as part of WTO accession in 2001 . Enforcement is very weak and is likely to become a very controversial issue in future relations with advanced countries	Weak until completed compliance with WTO requirements in 2005 Enforcement is weak, though not considered as much of a problem as in China
Government procurement	Yes , important mechanism to develop national firms in many areas. Also effective use of national standards to support competitiveness of indigenous firms	Yes , significant use of government procurement to support domestic industry, including very small firms
Promoting large domestic firms	Yes , multiple instruments used to create world class indigenous (public and private) companies to compete with MNCs domestically and eventually abroad.	No . For long time Indian state was against big business and severely restricted growth of large firms. Policy more open now, but still not strongly supportive.

Thus it is clear that both countries have made extensive use of industrial policy. What is interesting is that the countries have had different performance and have pursued different

strategies in part as a result of their industrial policies.

One of the main differences in the development strategies of these two giants is the extent, timing, and means through which they have acquired global knowledge. This is also part of the explanation for their different performance and growth paths. As a broad characterization, China has embraced globalization and has been benefiting very much from this. India has been much more autarkic and circumspect. It opened up much later and much more slowly, and is still not as globally integrated as China.

A second major difference has been their education strategy. China invested earlier and more massively in basic education than India. During the Cultural Revolution China actually froze the higher education sector between 1966 and 1976. However, in the 1990s China began to invest massively in higher education and rapidly surpassed India. India on the other hand neglected basic education in its early years, and instead invested in a small number of elite engineering schools and then management schools. While this was controversial at the time, this core of highly educated engineers and managers are part of India's current success story.

A third difference, which is in part the result of the particular type of industrial policies that they followed, is their different industrial structures and differing strengths. China has become a manufacturing hub for the world. India has become a major offshore service center. Hence it is interesting to examine the role of industrial policy in the development of India's competitive information technology services.

Acquiring Foreign Knowledge

The main means of tapping into global knowledge are trade, foreign direct investment, technology licensing, copying and reverse engineering, foreign education and training, and accessing foreign technical information in print, and now through the internet. On all these counts, China has been more aggressive and systematic than has India

Trade

China began opening up to the world much earlier than did India and has become much more integrated into the global economy. The share of imports and exports in China was 71% of GDP in 2005 compared with only 37% in India (see Table 12.4). China's high degree of trade integration was second only to Germany's among the world's large economies in 2005, and it will surpass Germany soon.⁵ Purchases of foreign products and services are a key way to gain access to knowledge embodied in those goods and services.

By initially protecting its industries from imports, China developed basic technological capability. Then by opening up to foreign investment in special economic zones with near free trade status it was able to get access to world class technology and inputs. This worked very well and not only began to modernize China, but also provided needed foreign exchange and employment. The number of these special economic zones was expanded from the initial four to 19 and then to many more.⁶ This program was very so successful in generating employment and foreign exchange that by the late 1990s China decided to significantly generalize this free trade status by joining the WTO. This involved committing to a major program of reduction of tariff and non-tariff barriers and opening up to foreign investment not only in the manufacturing, but also in financial and other service areas.

Unlike China, which has significantly removed tariff and non-tariff barriers to trade a part of its joining the WTO, India is still one of the most closed economies in the world. In the 1950s India followed a very autarchic policy of self reliance, relying initially mostly on massive capital goods imports from the Soviet Union, as was also done by China. Unlike China, India maintained it strongly inward oriented nationalist policy through the 1980s. It was only after the trade liberalization of the early 1990s that India began to open up more to foreign technology imports. There were also very strong restrictions on direct foreign investment and on the licensing of foreign technology. During this period technology policy focused very much on self reliance

Foreign Direct Investment

The inflows of foreign direct investment into China have been several multiples those into India (Table 12.3). This is the result of several factors. First, China opened up its regulatory regime towards foreign direct investment more than ten years earlier and more broadly than did India. Second, China's larger and richer market has been an important pull factor. Third, China has many cost advantages over India, even though its labor costs are now generally higher than India's. Transportation is more efficient, service infrastructure is more developed, and the red tape for trade in physical products is less burdensome. As a result, China has been very attractive not just as a production platform for global markets, but also of production for the Chinese market which soon became the world's fastest growing market. This strong pull of producing in China has also permitted the government to encourage strong competition among foreign multinational firms to bring their very best technology when they locate in China, even though they are very aware of poor intellectual property protection and the risk that their

technology will be pirated.

Table 12.4. Trade

	China	India
Trade as Share of GDP		
1990	35.4	16.5
2005	70.7	36.7
Merchandise exports (% of GDP)		
1990	17.5	5.7
2005	34.1	11.8
Manufactured Exports (% of merchandise exports)		
1990	72	70
2005	92	70
High tech exports (% of manufactured exports in 2005)	31	5
Commercial Service Exports (% of GDP)		
1990	1.6	1.5
2005	3.2	7.0
IT services (as % of service exports)		
1990	18.7	42.7
2005	38.6	66.4
Average Tariffs (av. simple/av. weighted)		
1990	42.3/40.6*	81.8/83.0
2005	9.2/4.9	17.0/14.5
Royalty and license fee payments (\$ mil 2005)	5321	421
Royalty and license fee payments/million population (2004)	4.08	0.38

Notes: * 1992 rather than 1990

Sources: WDI 2007, and World Bank KAM 2007

The most important contribution of FDI to China has not been capital since China has had a high savings and investment rate. More important has been access to advanced technology

and management through FDI. Equally important is entry into global markets as the foreign investors integrate their Chinese operations into their global supply chains.⁷ Moreover the latter does not even require owning production plants in China, but just sourcing from China. An excellent example of this is Wal-Mart which sources over \$25 billion dollars from China directly into its retail stores without even using middlemen.

India only began to open to FDI in the 1990s and only slowly and selectively. As a result it got very small inflows. In the last five years India has liberalized FDI inflows and trade inflows but, as noted, both are still very small compared to China. Thus Indian industrial policy has protected domestic industry for too long and also did not take advantage of the technology it could get from abroad, or the economies of scale and scope of pushing its firms to operate globally.

Technology licensing

China has also been much more aggressive in licensing foreign knowledge through formal technology-licensing agreements. Chinese royalty and fee payments are almost 13 times those of India in absolute terms and more than 10 times even in per capita terms.

Diasporas

It should also be noted that both China and India have benefited enormously by drawing on their respective Diasporas. However China had done this more systematically and for longer than India. More than one half of the FDI in China has come from Taiwan, Hong Kong and

Singapore. These are market economies which have had great experience operating in global market. They were already well plugged into global supply chains. They initially moved their more labor intensive operations into China. As China moved up the technology ladder they have been moving more technology intensive operations. This is particularly true for Taiwanese companies which are now putting some of their most advanced production facilities in China.

In addition, China has set up special high technology parks specifically targeted at attracting back experienced Overseas Chinese to set up high tech companies in China. Several of the more than 100 high tech parks in China cater specifically to this Diaspora. India has done this much less. Furthermore, China has also made a more sustained effort to attract back Chinese professors and former foreign students to staff the rapid ramp up of its tertiary education sector. India has had much less success in doing this because it is more constrained by regulations that do not allow its universities to pay professors competitive salaries.

Copying and reverse engineering

While there are no hard data on this, it is quite certain that China has been much abler on doing this than India. Greater access to foreign knowledge through all the formal channels listed above, higher levels of human and technological capital, and a policy (now changing) of ignoring intellectual property rights laws have given China an advantage in copying and reverse-engineering foreign technology.

In China besides the large state owned firms, thousands of township and village enterprises were developed behind strong trade protection. Some of these, such as Haier, have gone on to become globally competitive companies. In China, the government also negotiated

with the large multinationals that wanted access to the Chinese market. Initially they forced companies to go into joint ventures with domestic firms. They also negotiated local content and training requirements.⁸ This greatly helped them develop technological and management capability. The Government was able to negotiate this because of the attractiveness of the domestic Chinese market to the foreign manufacturers. Once the cost advantage of producing in China became apparent to both the Government and to multinational companies, the government relaxed the joint venture requirement in order to encourage the foreign firm to bring its best technology.

Education

Basic education

As a very poor developing country even just 25 years ago, China had very low levels of education. However it has made massive investments in basic education and its literacy rate is 91% compared to 61% in India. In India there is also a very strong gender bias in literacy. The illiteracy rate is 52% among women and 27% among men. India's basic education system is still very poor with tens of millions of primary school children out of school.

Secondary education

China invested not only in basic education but also expanded secondary education much more

than India, even during the tumultuous period of the Cultural Revolution (1966-1976). By 1980 China had 50% higher secondary enrollment rates than India. China increased secondary enrollment rates from 46% in 1980 to 73% in 2005. India's secondary enrollment rates were only 30% in 1980 and it only expanded them to 54% by 2005.

Tertiary education

China has undertaken a massive expansion of its tertiary education system starting in the late 1990s to make up for the havoc reeked on the educational system after the Cultural Revolution. By 2005 its enrollment rate reached 19%. Because of China's large population it had more students at the tertiary level than the US and 40% were in engineering and sciences. By 2007 China's tertiary enrollment rate reached 21%.⁹

In India, Nehru went for a strategy of elite higher education by setting up seven elite Indian Institutes of Technology to develop the technical human manpower necessary to run the commanding heights of the economy and government and neglected basic education. This decision was controversial until the 1990s as it did not seem to have had a high economic return. However, with the information and communications technology (ICT) and the challenge of Y2K millennium software bug problem at the end of the 1990s, these early investments paid off. Its English speaking engineering talent was able to help the global response and in one of the factors in India's strength in knowledge intensive exports (see below).

Although India has expanded tertiary enrollment rates, it has not done so as fast as China and now is considerably behind. Also, the quality of higher education is poor with the exception of those mentioned above (which produce less than 7,000 graduates a year), the Indian Institutes

of Science and some of the regional engineering colleges. The low quality of tertiary education and the regulatory constraints on expanding high quality institutions will be a major bottleneck to India's continued rapid growth in knowledge intensive services.

Foreign education

China has been sending more tertiary level students abroad for education and training than India in absolute and relative terms. In 2005, more than 16% of the 2.7 million tertiary students studying outside their home country were from China (not counting Hong Kong), and 6% were from India (Table 12.5).¹⁰ Foreign education and training are very important means to tap into global knowledge. These students not only learn academic subjects, but a large number of them are researchers at higher education institutions around the world. Many also go on to work in the high technology firms in the United States and Europe. Until a few years ago, many of them stayed on in their host countries. However, in the past five years more of them are returning to China and India, in part because of increasing opportunities and attractive incentive programs designed by their home countries to stem this brain drain. This trend has been stimulated by the more restrictive visa procedures for students following the 9/11/2001 bombing of the World Trade Towers in New York City.

Table 12.5. Education

	China	India
Literacy rate, population 15 & above		
1995	80.8	53.3
2004	90.9	61.0

Av. Ed. Attainment of Adult Pop. (2000)	6.35	5.06
Basic education	<i>Universal</i> but spotty quality	<i>Incomplete and poor quality</i>
Secondary Education Enrollment Ratio (%)		
1980	46	30
2005	73	54
Higher education	<i>Very rapid ramp up</i>	<i>Initially high</i> through Indian Institutes of Technology, relatively little expansion and high variance and much low quality
Enrollment ratio (%)		
1980	2	5
2005	19	12
Students studying abroad (2005)	404,664	139,223
% of World Students Studying Abroad	17	6
Skilled labor	<i>Well developed</i> training market inside and outside firms	<i>Very under developed</i> Very poorly developed training market

Source: KAM 2007 and WDI 2007, except for student studying abroad, which is from OECD, *Education at a Glance 2007*.

Training

Besides the much lower level of education in India, there is not much training and upgrading of workers skills for those already employed. The exceptions are the high technology firms in information services such as Infosys and Wipro (where up to one third of their workers may be engaged in training at any given time) and a few others. On the other hand, training and retraining is much more prevalent in Chinese manufacturing firms.¹¹ In addition, in China there

are massive training schemes for the million of rural workers coming into the cities and for the millions of workers being laid off from state- owned enterprises.¹² Thus China is not only providing more formal education to its population, but it is also upgrading the skills of its work force and keeping them more current with the changing skills needs of the economy.

Development of the ICT Service Sector in India

One of the hallmarks of the Indian economy is its strong information technology services sector. It also distinguishes it very much from China which is known as an exporter of manufactures rather than an exporter of services. Therefore it is instructive to explore o what extent the development of this sector was the result of far seeing explicit industrial policies. Paradoxically the dramatic success of this sector was not the result of coherent and explicit industrial policy, but more a case of being well positioned and the dynamisms of the Indian entrepreneurs. Its good positioning came for having developed a core of well trained engineering talent through the Indian Institutes of Technology and latter many Indian engineering colleges. When the world was hit by the Y2K millennium bug scare in 1999, Indian engineers were in high demand to fix the computer and software glitches, although India has already begun to develop software and export software and ICT services. The visible success of Indian engineers in helping to solve the Y2K problems greatly enhanced the reputation of India in the ICT sectors. This led to a strong increase in demand for Indian software services. This was facilitated by the fact that many high level executives in IT companies in the US and Europe were actually engineers and managers of India origin who knew of the capabilities of their compatriots back home and steered business in their direction. Some of them also invested in these Indian firms.¹³ Thus the Indian Diaspora

played an important role here.

Also as the success of Indian software export became known it also led many firms to realize the cost effectiveness of hiring skilled English speaking professionals to do ICT related services to high quality standards at a fraction of skilled labor costs in the US or Europe. This led to an expansion of the demand for IT enabled high skilled labor services.

In addition, as the ICT sector was new, it was not subject to the stifling regulations typical in most other sectors of the economy. To the credit of the government, once this sector started to take off it did not try to over regulate it (as happened in Brazil through the Informatics Market Reserve Policy). Rather policy makers supported its rapid development and expansion. They permitted the establishment of efficient broad band and satellite connections for data transfer. They reduced tariffs on the imports of hardware and software tools. They facilitated the creation of software parks with less onerous labor regulations, and their own electric power suppliers to overcome the problem of the daily power interruptions common in India because of very poor infrastructure services.

Another reason why the ICT service sector took off is that it did not require much infrastructure services other than satellite communications or fiber optic cables. Most sectors that require imports of inputs and components for exports of physical products are not very economically viable because of all the problems with trade and customs clearance, port and transportation costs and other physical bottleneck. The magic of ICT services was that they were largely immune from the constraints of the onerous Indian regulatory regime and poor infrastructure and transport services.

Thus, the most successful sector in India was not the result of explicit industrial policy. It was much more the result of the earlier investments in engineering education, the fact that it was

in English as a result of the English colonial period, and the luck of having these skills at the turn or the millennium when they suddenly were in very high demand. This is not to minimize the very impressive development of the industry since then including the virtuous cycles driven by Indian entrepreneurial capability, and the stimulus of the Indian Diasporas in the ICT industry in the US and Europe. Thus although the government did not lead this sector, at least it has supported it since its emergence.

It should also be noted that although, not as visible because it is not exporting as many ICT enabled services as India because less of its highly skilled labor force is English speaking, China is also becoming a location for knowledge intensive services. China actually has a larger ICT service industry than India and it is now being actively supported by the Government.¹⁴ In addition China is strongly pushing English language training not within formal education, but also as part of preparation of its general population for the 2008 Olympic Games.

Lessons from China and India Experience

The entry of China and India onto the world stage is one of the major events of the turn of the century. Both of these countries are benefiting from the rapid generation and dissemination of new knowledge as well as from the greater integration of the global economy. Both countries have become major economies in ppp terms and are having a growing impact on world trade.

China and India have followed different development strategies. China has grown more rapidly and for longer. It has also concentrated its growth more on industry and manufacturing. India's strategy has not pushed industrialization as much. As a result the sector that has been expanding the fastest has been services. Since the Y2K bug business at the turn of the

millennium its ICT enabled services have become a significant growth engine even though employment in the ICT services still accounts for just 1% of its labor force.

The rise of China and India reflect part of a new division of labor. China is positioning itself as the low cost manufacturing center for the world thanks to the reduction of transportation costs. China has benefited from is the unbundling of manufacturing based on logistics of physical trade, aided by ICT and insertion into global production and distribution chains.¹⁵ (However China is moving to the task unbundling too as it strengths its high level human capital and English language skills).

India is positioning itself as the ICT enabled service for the world thanks to the reduction of communications costs and the possibility of trading labor services at a distance. India has benefited from the unbundling of tasks – based largely on possibilities opened up by new ICT infrastructure which has allowed it to overcome constraints of physical infrastructure.

Table 12.6. Differences in Economic Structure: China and India

	China	India
Development Strategy since major regime change in 1947-1949	Starts Communist, moves toward market economy and integrates to world faster	Starts as market economy, goes socialist for 40 years and slowly moves toward market liberalization
Role of Government	<i>Major change</i> from total state control of centrally planned economy towards a market economy. Share of private sector estimated at over 60% of GDP. Still significant presence of state owned enterprises across economy including banking.	<i>Some change</i> from 1950s and 60s when state acquired control of commanding heights of economy and was anti large private business, toward more business friendly policies since the 1980s, and further liberalization in 1990s and present decade.
Composition of GDP* (% distribution by	Currently Industry sector led	Currently Service sector led

years) Agriculture 1965/1985/2005 Industry 1965/1985/2005 (Manufacturing) 1965/1985/2005 Services 1965/1985/2005	39/31/13 38/46/48 30/34/34 23/23/40	47/32/18 22/29/27 15/19/16 31/39/54
Consumption vs. investment orientation*	Heavily investment oriented. Investment 36% GDP in 1990, increased to 44% of GDP in 2005, household consumption decreased from 46% in 1990 to 37% in 2005, and government consumption share unchanged. Total consumption only 51% with government consumption 14%.	Previously heavily consumption oriented. Household consumption 66% of GDP in 1990, down to 59% in 2005. Government consumption marginally down from 12% to 11%, but investment increased from 24% in 1990 to 33% in 2005 (with surge to 30s only in last 4 years)
Average Gross Investment to GDP 1995-2005¹	39.2	25.9

¹WBI KAM 2006

Source: KAM 2007 and WDI 2007

The higher growth performance of China over India has been due to in part to higher investment rates. The rate of investment between 1995 and 2005 has averaged 39% in China versus 26% in India. The higher rate of investment combined with a much greater import of capital goods embodying more advanced technology helps to explain the higher rate of growth in China. As indicated above, China has also made much more extensive use of foreign knowledge through much greater inflows of FDI, greater integration through trade (most of the manufactured imports being capital goods and components), greater formal technology purchases in absolute and relative terms, greater number of students going abroad, greater use of its larger Diaspora, and more copying and reverse engineering.

However, if both countries had liberalized from the beginning, it is unlikely that they would be the strong world economic powers that they have become. To a large extent, some of the strengths of both countries are that they developed strong technological capabilities before they liberalized. Because of their high absorptive capabilities and critical mass in education, they have been able to benefit from that liberalization. Therefore it is helpful to review more carefully the nature of the industrial policies and infant industry protection that they followed. Building on what has been presented so far the key to explaining China's greater performance has been its much greater use of FDI as well as greater trade integration.

The justification for the infant industry argument is that a country has to protect the new industries while they learn how to reduce costs and improve quality so that they can compete with established foreign producers. It is expected that over time they will learn by doing and attain scale economies to be able to compete with foreign rivals. From an economic welfare perspective it is argued that the protected industry must become more efficient than the foreign producer to offset the higher costs incurred by domestic consumers during the protection period.

There are typically four types of problems to develop an infant industry.¹⁶ The first is that the acquisition of knowledge for production involves costs and that the knowledge may not be appropriable by the first firm that invests to produce the good or service domestically. The second is that they incur costs in training workers for the new industry and that they may not be able to retain those workers, who may in fact move to other firms. The third is that once the first firm is successful in producing locally, this provides information to other firms who can also invest and drive profits down. The fourth and most common one is that the domestic industries do not grow up to be as efficient as the foreign producers.

The success of the Chinese industrial strategy was to entice foreign firms to locate in

export processing zones in China. Since the foreign firms already had the technology and the experience and the links to foreign markets, their costs of learning to produce in the local context were minimal compared to domestic firms that also would have to develop the technology. The government provided infrastructure and fiscal and financial incentives to attract the foreign firms. Once the first firms were successful and discovered that it was in fact more profitable to produce in China than in their other locations, more foreign firms came. Thus the typical technical and market costs associated with infant industries were transferred to the foreign firms. The central and local government absorbed the fiscal and infrastructure costs. But China benefited from massive labor employment and export revenues. China also benefited as workers trained by the foreign firms were lured away and Chinese joint venture partners learned the technology and organization and set up their own firms. In addition, the government initially imposed local content requirements. Unlike the experience in Latin America these local content requirement worked because domestic suppliers quickly developed the skills and the scale economies to supply inputs and components competitively.

In the case of China, it can be argued that since the government was the main force behind the development of the country, and the country has been growing at more than three times the world average, it one of the most comprehensive examples of successful industrial policy. It could be further argued that the selective liberalization of the economy starting in the late 1970s was part of this industrial policy. A counter argument, of course, is that if China had started these reforms earlier (as was done for example in neighboring Taiwan and Korea), it would have started growing faster earlier.

In the case of India, it could be argued that the slow growth of the Indian economy until the late 1980s was an example of poor industrial policy because of all the constraints the

government placed on the growth of the private sector. The subsequent speed-up in the Indian rate of growth can be attributed to the gradual removal of excessive regulatory constraints on the private sector. India's slower rate of growth compared to China until recently could also be attributed to its lag in liberalizing the economy.

However there are three key issues that merit closer attention regarding industrial policy. These are: how were the countries able to avoid having their industries become permanent infants, what was the role of lax intellectual property protection, and to what extent are they going beyond imitation to technology development.

Avoiding permanent infants

Here a distinction needs to be made between China and India. By relying heavily on FDI China was able to avoid this problem much more than India. By trying to develop technology indigenously India did not develop as broad or as sophisticated industrial sector as China. Also India's industrial sector is much less competitive than China as is revealed by its much smaller export sector in relative and absolute terms. One element of why China and India have been able to develop competitive industries behind trade protection is their large market size. That has led to considerable competition within the domestic market even when there was protection from trade.

China's relatively stronger performance has come from greater competition than in India. This has come from three sources. One is the greater openness of the Chinese economy and its greater structural integration through trade into the global economy as has been already discussed in this chapter. A second has been the much stronger emphasis on exports in the case

of China.^{17,18} As noted, these started with special export processing zones which were multiplied over time. They were complemented with special export incentive including duty drawbacks, subsidized infrastructure, one stop shops on regulations for setting up enterprises, importing and exporting, etc. India does not have a very well developed export promotion system. In addition, as noted earlier, as part of the package of joining the WTO China has drastically reduced tariff and non-tariff barriers on imports and has a much freer trade regime. This also makes importing and exports much easier in China. Having to export in competition with the rest of the world also forces exporters to keep up with the new products, designs, and process technologies, quality improvements, and even new business models of competitors. Also, having close exposure to foreign goods and services provides greater opportunity to copy and reverse engineer them.

It should also be emphasized that by being more integrated through trade, China has also developed a much larger industrial sector which is servicing global markets rather than just in domestic needs. China's industrial sector is an astounding 48% of GDP which is an outlier even by the standards of the former socialist economies.¹⁹ That large export oriented industrial sector has been instrumental in absorbing millions of workers from the lower productivity agricultural sector and contributed significantly to modernization and rapid rise of per capital income. India, because it has been more autarkic, as well as because of a much more regulated labor market in the industrial sector has not has such a dramatic expansion of industry and is still a much more agricultural and agrarian economy (see Table 12.7).

A third elements has been the anti big business and pro-small scale industry in India. The governments reserved a good deal of the commanding heights of the economy (power, telecommunications, railways, airlines, chemicals petrochemicals, fertilizers, steel, and heavy capital goods primarily for state enterprises. It severely controlled the growth of domestic

enterprises. In addition some 1500 products were reserved by law for production by small and medium enterprises. As a result much of its industrial base was not very competitive. The 1980s saw the introduction of pro business reforms initiated by Indira Gandhi and later carried out by Rajiv Gandhi. These included easing restrictions on capacity expansion by large firms, removal of many price controls, and the reduction of corporate taxes. These were followed in 1991 by a more significant liberalization of the economy as a result of severe balance of payments crisis. These reforms included liberalizing imports, reducing investment licensing, privatizing some state owned enterprises, allowing automatic approval of direct foreign investment in some sectors, and reducing the number of products reserved for small scale industry.

China also promoted large state owned enterprises and for a long time suppressed private business. However the hybrid township and village enterprises (TVEs) that developed during the 1980s and the 1990s proliferated very rapidly. There was very strong competition among them and between them and the larger often more inefficient state enterprises. In fact the government strategy eventually turned to growing out of the plan by capping the size of the state sector and allowing growth to come from the expansion of these dynamic TVEs, and eventually the growth of small private firms.²⁰

Intellectual property rights

There is no doubt that lax intellectual property rights have been a very important element in the rapid catch up of these two giant economies. Lax intellectual property rights laws, and when these were upgraded to international standards, weak enforcement, have been key elements of the development strategy of both China and India. Copying and reverse engineering technology

from more advanced countries were critical for the rapid catch up of the US, Japan, Korean and Taiwan when they were behind the technological frontier.²¹

Both countries have begun efforts to align their IP rules with international norms, but enforcement is still weak. The complaints about IP violations tend to be stronger regarding China. This is largely because of the greater capability of its firms to reverse engineer or outright copy proprietary foreign technology. Although most multinationals investing in China and India know that their IP is likely to be pirated, they often cannot afford not to be in the Chinese or Indian market. They make their investments with the hope that they can innovate faster than they can be copied, but this is becoming increasingly difficult as the technological capability of these countries continues to improve.²²

In China, because of the lax enforcement of intellectual property rights a lot of this technology leaks to domestic producers. Nevertheless the foreign firms continue to bring their best technology because they are competing not just with domestic firms, but with global world class manufacturers. They try to limit the technology spillover not having all the elements of their technology package in one facility. However domestic Chinese firms are catching up quickly. The MNCs cannot resist the advantage of producing in China, even though they realize that their intellectual property is likely to leak out.

In India, strong domestic firms which are now becoming global players, such as Tata, Reliance, Dr. Reddy, and Ranbaxy developed behind strong trade protection and favorable intellectual property right policies. The development of the strong Indian pharmaceutical industry is particularly relevant. After independence from England the Indian Government changed the patent regime they had inherited from the British. They continued to protect pharmaceutical process patents, but not pharmaceutical product patents. Since it is relatively

easy to find the molecular composition of drugs and to find alternative manufacturing processes, this allowed Indian pharmaceutical firms to patent alternative ways to produce pharmaceuticals. This asymmetrical type of patent protection led to the development of strong Indian pharmaceutical industry. When India was finally forced to extend intellectual property to pharmaceutical products in 2005, it already had strong Indian pharmaceutical companies. The most successful of these have many new drugs under development, and some of them have even gone on to buy firms in Europe and the US as part of their global expansion.

This whole issue of intellectual property rights is becoming more important for global competitiveness. In the past quarter century the pace of the creation and dissemination of knowledge has accelerated. The nexus of global competitiveness has shifted from natural resources and other static advantages to innovation. The market for knowledge and innovation has become increasingly global. Research is being done in more places, scientific and technical papers are more likely to have coauthors from different countries, and strategic technological alliances are more likely to include firms from more than one country.

Multinational corporations are becoming truly global, conducting R&D as well as production in many countries.²³ This dispersion of high-level activity is generating anxiety about protection of intellectual property (IP) The reigning economic assumption has been that as firms from developing countries gain greater capability and begins to move up the value chain, firms from developed countries can keep ahead by investing more in high-level human resources and in R&D for innovation. That assumption must now be reconsidered in the light of reduced transportation and communication costs, the digitization and outsourcing of knowledge services, and the increasing ability for firms in developing countries to copy and reverse engineer. No longer able to simply outrun the competition from the emerging economies, the United States

and other developed countries will have to pay closer attention to IP issues in their relations with China and India.

From imitation to innovation

The final issue is the role of R&D and going from imitation to innovation. Both China's and India's catch-up strategies have benefited from acquiring knowledge that already exists. Overall, tapping into global knowledge has been much more important in improving the productivity and growth of these economies than has innovation coming from their R&D effort. However this is beginning to change as they are catching up in many areas and have to make global innovations to get ahead.

Initially, in both countries, R&D was initially focused on indigenous innovation and on mission oriented programs in defense²⁴ and basic industries. Nevertheless a lot of R&D in public labs and universities as well as productive enterprises has focused on tracking, assessing, acquiring, and adapting foreign knowledge.

China has followed a five pronged strategy. One was to import a massive number of turnkey plants, first from the Soviet Union, then turnkey plants and capital goods from the West. A second has been to copy, reverse engineering and otherwise borrow as much foreign knowledge as possible. Like Japan, and Korea earlier, this has been facilitated by investments in human capital. A third has been to disseminate knowledge internally.

This included the Spark Program to diffuse rural technology and the Torch Program to disseminate high technology. The fourth was to tap foreign knowledge through trade and through direct foreign investment. Now that it is catching up in many sectors and that it is being

seen as a major competitor the fifth is beginning to innovate on its own account by increasing investments in R&D. In 1998 R&D spending was .85% of GDP but it started to ramp up R&D spending in 2003. By 2004 it was spending 1.4%. In 2005 China announced its 15 year Science and Technology Plan with the aim of having R&D expenditures reach 2.0% of GDP by 2010 and 2.5% (the level of advanced countries) by 2020. Essentially it announced that rather than to rely mostly on foreign technology it was going to invest more in developing its own technology. At the end of 2006 spending had increased to 1.6% of GDP and in PPP terms China surpassed the R&D expenditures of Japan to become the second largest spender (after the US).²⁵ Although the efficiency of its R&D spending is still low, it is working on improving the administrative and incentive system and getting the productive sector to do more.

China has been increasing its number of scientific and technical publications very rapidly over the past few years. In 2003, it had more than twice as many publications as India, but only 14% of the U.S. total. India has also been increasing its scientific and technical publications, but not as fast as China. In addition, citation analysis reveals that China's output is of higher quality than India's.

India has not grown as fast or made as massive an economic transformation as China. India had an inwardly oriented industrial policy for a longer period than China. Like China, it built a lot of technological capability and industrial competence during this period. However, it combined this protectionist trade regime with a protectionist technology regime. It strictly controlled FDI as well as technology imports. However, one of the great successes of this period was the green revolution. The public agricultural research efforts of Indian institutions working with other public research institutions world wide led to significant improvement in wheat varieties with higher productivity. The dissemination and use of these new improved varieties

turned India from a grain importing country with periodic famines to net agricultural exporter.

The impact of the trade liberalization of the economy in 1991 was significant. Firms which had not had to worry much about efficiency in a protected and over regulated domestic market suddenly woke up to the needs to improve their products and services and to reduce their costs. Some parts of the public research infrastructure responded to the change in the overall incentive regime. The impact of growing competitive pressure was also reflected in an increase in the number of private firms doing R&D, and in the increase in their R&D relative to sales. In addition, in the last five years an increasing number of multinationals (MNCs) are not only producing in India, but are setting up their own R&D centers in India, attracted largely by the lower cost high human level capital available locally, as well as the possibility of working round the clock with their other research centers thanks to digital networks.

In India, for 20 years R&D spending as a share of GDP oscillated between 0.8% and 0.9%, and more than 70% of funding came from the government. However, in the past two years there has been increasing spending by the private sector, particularly in information and communications technology, autos, and pharmaceuticals. The bulk of the increase has come from multinational companies that have discovered India as a very cost-effective location for R&D. Recent estimates are that taking into account the recent inflows of R&D by MNCs and the increase R&D by domestic firms, R&D expenditures in India are now 1.1% of GDP, and nearly 50% now comes from the private sector.²⁶

In China there are now more than 750 R&D labs. Part of the reason for the R&D in both countries has been the need for MNCs to do R&D locally to adapt their goods and services to the domestic markets. In addition, MNCs increasingly have begun to set up R&D centers aimed at developing products and services for the global market. The initial motivation was the cost

effectiveness of hiring relatively low-wage Chinese or Indian scientists and engineers. However, the rapidly growing demand has revealed that the supply of high-quality researchers was smaller than expected and salaries are rising rapidly. The limited supply of qualified researchers is this becoming a constraint on MNC-funded R&D, particularly in India.²⁷

Thus both countries now have a have critical mass in R&D and are working on increasing as well as improving the efficiency of that R&D. The number of scientists and engineers doing R&D in China is now second only to the United States. The number for India is about an eighth of China's, but there may some problems in the definitions. China has been ramping up R&D expenditures significantly since 2002. Moreover, unlike the typical developing economy, and much more like a developed economy, the bulk of the spending (65%) was by the productive sector, while in India it was still mostly the public sector.

Although both countries have made impressive advances in the last five years and have important achievements in international patenting and global innovations, they still have a long way to go to be major global innovators. There are also some indications that as their R&D base gets larger the researchers and public and private labs are becoming more concerned about IPR. The governments of both countries are also making more efforts to enforce IPR legislation. However, from a narrow economic perspective it appears that both countries still stand to gain more from copying and reverse engineering the large and rapidly growing stock of global knowledge than from enforcing strong IPR to stimulate more domestic innovation. Therefore it is likely that the bulk of their R&D efforts are still going to focus on tapping and adapting global knowledge than in pushing forward the frontiers of science. However they are already doing more basic research in specific areas and are likely to do even more as they catch up in many areas and need to do fundamental work to deal with some of their unique challenges. More

generally they are also facing the difficult problem of how much R&D to invest in new fields such as biotechnology and nanotechnology which may be very critical for new techno-economic cycles that may eventually replace the current ICT lead growth paths.²⁸

Table 12.7. R&D Inputs and Outputs

Indicator	China	India
Researchers in R&D, 2004	926,252	117,528
<i>R&D researchers per million population</i>		
1995	445	157
2004	708	119
Spending on R&D (US\$ billions)		
US \$ billion nominal 2005	32.7	6.8
US \$ billion in PPP 2005*	58.9	18.0
Spending on R&D (percentage of GDP)		
1995	0.85	0.8
2004	1.44	0.85
Scientific and technical journal articles		
1995		
2003	29,186	12,774
<i>Scientific and technical journal articles per million population, 2003</i>		
1995	7.69	10.29
2003	22.7	12.0
Patents granted yearly by U.S. Patent Office, (average 2001-2005)	448	316
<i>Patent applications granted by U.S. Patent Office per million population</i>		
1991-1995 average	0.05	0.04
20010-2005 average	0.35	0.30

*Based on the new 2005 PPP series.

Source: Compiled from data in KAM 2007 and World Development Indicators 2007

Challenges to Development Policy

There are three sets of challenges from the Chinese and Indian development experience for development policy advice.

The *first* challenge is that in many ways these two countries do not conform to many elements of the Washington Consensus, yet have had admirable growth performance. China has been growing at 9-10% for more than 30 years, India for the last 4 years – and not directly linked to major policy changes. The main areas in which they have diverged from more neoclassical policy prescriptions have been in having long periods of protection, restrictions on direct foreign investment, and lax intellectual property rights. Neither country would be as strong as it is now if it had not had this type explicit industrial policy. Trade protection and control of FDI allowed these countries to develop strong domestic capabilities in many sectors before being exposed to global competition. Lax IPR has allowed them to catch up to more technically advanced countries in many areas much faster than they could have through their own effort. They have also invested in education and R&D so they now have a critical mass of engineers and scientists and in R&D based innovation which they are now beginning to deploy. However, as noted this industrial policy has been done differently with different degrees of success and with different strengths and weaknesses and some differences in industrial structure outcomes.

A *second* challenge is the novelty that India has managed to achieve very high growth based high level human resources and a service led development strategy. This has a lot to do with the early investments elite tertiary education and the rise of the ICT sector. The service sector, led by ICT enabled services has been the backbone of the recent surge in the growth rate of the Indian economy from the 6% average of the 1990s to the 8% since 2003.²⁹ ICT enabled services by themselves are still a very small part of the Indian economy. They employ only one million out of the total Indian labor force of about 450 million, and directly contribute only about 1% of Indian GDP. However they have had multiplier effect on the economy and have also put India on the global map. Multinational corporations have discovered India as a very cost

effective place to do many skill and knowledge intensive operations. Many investment banks such as Morgan are hiring and locating a large part of their investment analysts in India. Thus it not just arms length off-shored, ICT enabled services anymore, but FDI in the service sector to supply their global operations. There has also been a rapid increase in the establishment of R&D centers by multinationals in India, attracted by the lower costs and good quality of scientists and engineers In addition, the reputation India has attracted in ICT enabled and in knowledge intensive sectors has been leading to increasing investment by foreigner, non resident Indians, and domestically based Indian capital. The ratio of investment to GDP has increased from 22% in 2002 to 30% in 2006.

Some observers have made much of the role of the IT enabled service sector in India's growth arguing that it represents a possible third path of services led development. However it should be noted that the service sector growth in India has been much broader based than ICT enabled services. Five of the 15 sub-sectors in the Indian Governments classification of services have been responsible for the higher than average rate of growth of the services sector and accounted for 60% of the service sectors growth. They are business services, communications, banking services, hotels and restaurants, and community services. In 2003, business services, which include the IT enabled services accounted for only 1.7% of GDP. It needs to be emphasized that the growth of the Indian service sector has been closely tied to the growth of the overall Indian economy and is related to the higher income elasticity of demand for services, outsourcing of services activity from industrial activity (domestically and from abroad), as well as by domestic economic reforms involving liberalization of business activity and international trade. The prospects for continued rapid growth of the service sector in India are good provided that India can reform education (particularly higher education), and improve the overall business

and trade environment.

The *third* major challenge to policy advice to developing countries is that speed scope and impact of China and India's reemergence on world stage are preempting some traditional development advice to other developing countries because of first mover advantage and economies of scale.

China is having four impacts on the global economy. First, the competitiveness of Chinese manufactured exports is reducing the price of labor intensive manufactured goods to the world as a whole. This benefits consumers in all countries. Second, however, China's competitiveness in manufactured exports is putting a lot of pressure on other exporters of labor intensive manufacturer, which is a negative for many other developing countries that also export labor intensive manufactures. African countries are feeling the heat of Chinese manufacturing competition. One of the few manufacturing industry from African countries was textiles and garments. However, since the removal of the country textile export quotas in 2005 that were part of the multi-fiber textile agreement, many of the exporters and local producers have been put out of business by the more competitive Chinese exporters. Brazilian, Mexican, and many manufacturer exporters in other Latin American and Caribbean countries are also facing very strong competition in their home and third markets from growing Chinese competition.

Third, because China is very resource scarce and needs to import natural resources and basic commodities, its rapid growth has increased global demand and raised global prices for commodities. This has provided a windfall for all natural resource and commodity exporters worldwide, from developed and developing countries. While this has stimulated many African and Latin American countries whose growth was stalled or marginal, it is creating a false sense of optimism. Commodity prices are cyclical. Prices will eventually come down. Unless these

countries invest these temporary windfalls wisely in strengthening their economic and institutional regime, and investing in education and innovation capability, they are going to be facing much tougher competition in the future. Unfortunately most of these countries are not using these windfalls to strengthen their future competitiveness. Finally, the rapid growth of China offers export and investment opportunities for other countries. However, other than raw materials and commodities, China's imports are components and capital goods. The components are produced mostly by more advanced East Asian economies such as Korea, Malaysia, Singapore, and Taiwan. The capital goods are supplied mostly by Japan and other more advanced countries. In addition, many of the companies that were making the components in neighboring countries are moving their operations to China to realize the scale economies.³⁰

It is questionable whether the typical advice to developing countries to export labor intensive manufactures is still valid given the tremendous competitiveness of China in manufactures. China's advantage is not just low labor costs (and it has 250 million more underemployed workers in agriculture that it can shift into manufacturing), but economies of scale and logistics, and the fact that it is already well integrated into global supply and distribution chains through MNCs and its vast Chinese Diaspora. In addition, China, and for that matter India are moving up the technology ladder and exporting more technology intensive goods.

Likewise it is hard for latecomers from developing countries to break into the ICT enabled service market given India's very strong head start with its advantage of the English language, global reputation, well established links with foreign buyers of their services and its own strong global companies such as Infosys, Wipro, and Tata Consulting.

Both countries are also having a major impact on relative wages. Their entry into the

global market, added to that of the former Soviet Republics, is doubling the global labor force.³¹ This means that the relative returns to labor are falling as these hungry new workforces enter the global market at low wages. Moreover, this is not just through the export of labor intensive products. Any labor services that can be provided digitally can now be off-shored. As noted, India is becoming a strong off shoring center for skill and knowledge intensive services, scaring the world with the prospect that any jobs that can be done digitally may be off shored to India and other countries with plentiful educated people who can be accessed through the internet.³²

Concern from the New International Regime

Having seen the importance of industrial policy and lax IPR protection for rapid catch-up strategies there are two concerns about the implications of the new international regime for other developing countries.

The first is the concern that comes from the tighter international regulatory regime which to some extent these two countries ignored in their development, but which is becoming more binding. The global trade rules have reduced the degrees of freedom that developing countries have to use some of industrial policy elements successfully used by China and India, and other economies before them-Korea, Taiwan, Japan, even US and Germany. This has four components. The first is that there has been a steady pressure from the global system to reduce tariff and non-tariff barriers. Since GATT there has been a trend towards increasing liberalization of trade policy among most countries. In developing countries the average tariff levels have fallen from 34.4% in 1980-1983 to 12.6% in 2000-2001; in developed countries they have fallen from 8.2% in 1989-92 to 4.0% in 2004.³³ The second is that there has also been strong

international pressure to adopt stronger protection of intellectual property rights which are more consistent with the regimes of advanced developed countries. The third is that there are also stronger rules about what is permissible in terms not just of tariff and non-tariff barriers, but also subsidies and other indirect support to special industries. The fourth is that there are much stronger teeth in the enforcement mechanisms for both the trade and IPR rules. Countries that do not comply can be hit by countervailing duties. Thus, many of the instruments of industrial policy which were very important for the development of domestic capability in China and India³⁴ have been outlawed by the evolving international regime. This makes it much more difficult for new players (whether firms, sectors, or whole economies) to enter into existing industries.

The second concern is that the whole global system has become much more demanding. The market economy is a much more global market because of reduction of transportation and communication costs, tariff and non-tariff barriers. The share of imports and exports has increased from 38% of global GDP in 1990 to 57% in 2005. Multinational corporations account for 27% of global value added, two thirds of world trade (half of which is intra-firm)³⁵ and more than 50% of global R&D.³⁶ They are main agent of globalization and integration of global markets. Because knowledge is not consumed its use, for the producers of knowledge there is a strong incentive to exploit over the largest possible market in order to amortize the costs of producing it. There is thus as strong incentive to exploit it on worldwide scale to get maximum returns. There are large economies of scale in purchasing, branding, advertising and distribution. Speed to the market and quality are of increased importance to remain competitive. The global trade system is increasingly organized in terms of production and distribution networks controlled by MNCs.³⁷ To take advantage of this rapid change

countries have to have a high elasticity or response – to be able to redeploy resources from less productive uses to more productive one. They need modern and efficient communication systems to be up to date in real time about what is happening in product markets and the international financial system. They also need to coordinate activities and to reduce transactions costs across regions within a country as well as between clusters in the country and abroad. They also need efficient port and transport infrastructure to get products and services to the market.

China and India exemplify some of characteristics necessary to be successful in the new international regime. These two countries have been able to overcome some of the challenges due to their large size and the critical mass of skilled people and innovation potential. Most developing countries are being left behind. They do not have the capability to take advantages of the opportunities opened up by this increasingly dynamic and demanding global system. Whole parts of world are being left out except for current boom in commodity prices favoring natural resource exporters. However, commodity prices are very cyclical and they are likely to come down again, which will stifle the recent spurt of growth in many natural resource exporting countries.

Conclusions

The rise of China and India are somewhat unexpected from the perspective of traditional development policy. They have followed different development paths that challenge the Washington consensus on infant industry protection, control of FDI, and intellectual property rights. It is unlikely that they would have been able to become such strong global players if they

had not first had a period of trade protection and control of FDI, and lax IPR policy to build up domestic capability. Nevertheless, both have benefitted greatly from tapping global knowledge and finding appropriate ways to insert themselves into global production and distribution chains.

Their success may also be pre-empting development options for other developing countries. Moreover, their strategies may be hard to replicate. Their protectionist policies, control of FDI, and IPR strategies are much harder to do now because of the tightening of international rules through WTO, TRIMs and TRIPs. Moreover, much of their success stems from their large market size, and their critical mass in high level human capital and R&D.

While some of the lessons from the development are quite specific to each of these countries (besides their very large size; in China, a strong development oriented state; in India, having inherited and kept English as an official language which makes it possible to sell services to the rest of the world) others lessons are more general.

One lesson is the importance of opening up to access global knowledge, although they did this at different speeds and with different sequencing. China appears to have benefited from greater effective use of FDI and the multinational company than India. Some observers argue that Indian firms have more capability than Chinese firms and that therefore India's more indigenous based strategy may have been better than China's which is too dependent on FDI.³⁸ However China has been able to catch up faster as a result both of relying on FDI to show they way, and then taking advantages through supplier and market linkages as well indirect externalities of informal knowledge flows through copying and imitation. Thus it appears that if the country can capture the externalities of having FDI it may be able to leverage its growth faster.

However there are two caveats to the superior performance of China in the use of FDI.

The first is that China was able to bargain effectively with the MNCs because of the tremendous leverage of its large market size. Smaller countries would not have such leverage. The second is that it has been able to capture many spillovers from FDI because it has had a greater capacity to reverse copy and reverse engineer both for products it imports, as well as from FDI in China. The reasons for this greater absorptive capability are the much higher level of average education than India, and the great capability of its domestic R&D and production capability.

A second lesson is the importance of gradual trade liberalization in order to allow domestic industries to develop the capabilities necessary to compete with foreign firms.³⁹ However, as noted, there are marked differences between China and India. China has gone much further and benefited much more than India. China also appears to have had an advantage over India in having pursued a more export oriented strategy starting in the 1980s than India which was much more inward oriented until the 1990s. Thus it appears that at least in the case of these two countries, export promotion has led to more rapid technological learning than import substitution, when combined with effective use of the capabilities of foreign investment, and a competitive domestic environment. More generally China's superior growth rate is partly explained by its much higher investment rate. Combined with heavy imports of capital goods and heavy reliance on FDI, this has allowed China to adopt more modern technologies much faster than India.

A third is their strong investments in education though different in focus and sequencing. Without its early investments in engineering education, India would not have been well placed to take advantage of the Y2K problem to leverage its growth by expanding its knowledge intensive exports. Similarly, without its massive investments in basic and secondary education China would not have been able to move so quickly from agriculture into industry, or to become such

an export powerhouse in manufactured products. Moreover, the critical mass of highly educated professionals are what are powering both country's rapid move up the technology ladder to become important global powerhouses.

A fourth lesson is the importance of strong investments in ICT, although again with different emphasis. China has become a major hardware producer and exporter, India in programming, software and other IT enabled services. Moreover both countries have invested heavily in the use of ICT. Good ICT infrastructure is allowing them to become major global exporters. The ICT infrastructure connected to logistics and global networks has allowed China to become a major supplier in global production and distribution chains where customer demands in developed countries automatically trigger export production in massive manufacturing centers in China. Likewise, broadband internet connectivity is what has permitted India to export knowledge intensive services as part of the second unbundling mentioned earlier. A well developed ICT infrastructure is becoming a critical new infrastructure to compete in the more demanding and rapidly changing international competitive environment.

Fifth, lax IPR legislation, and once the legislation was updated in both countries, lax enforcement, have been important for both countries to play rapid catch-up. Copying and reverse engineering have been very important for domestic Chinese enterprises to catch up very fast. In India, the example of the pharmaceutical sector is an excellent example of the importance of weak IPR to be able to catch up.

Sixth, lax IPR has not meant that R&D effort is not important. Both countries show that it has been important for rapid catch up as it serves to monitor, assess, acquire and adapt global knowledge to local conditions. Furthermore, as countries catch up to the global frontier, more fundamental R&D is going to be increasingly important to stay competitive. Both countries are

going to face lots of pressures on IPR from developed countries as well as from the growing base of domestic R&D performers, and the balance are likely to turn towards more protection as more global frontier shifting R&D is done in these countries.

Seventh it also appears that industrial policy is easier during the catch-up phase than for countries that are closer to the frontier as can be anticipated by the problems over IPR. But it is important for leaders also because market does not always provide correct signals about dynamic as opposed to static efficiencies.⁴⁰

Finally, the differences in their strategies imply that there is more than one way to development. However what they have done is difficult to replicate, and their very success is a challenge for the development of other countries. Finding appropriate ways to insert themselves into the global system is very important. China has done this primarily by becoming part of global manufacturing supply chains controlled by MNCs. India has done this primarily by exports of ICT enabled services and skilled human capital, partly through its growing ICT companies, but also as part of off-shored services to MNC in manufacturing and services. Therefore we need to carefully rethink what is the most appropriate advice to give other developing countries.

Notes

¹ These are based on the International Comparison Program's new PPP figures announced in December 2007 which actually reduced the estimates for GDP by 40% for each of them.

² However both countries still have large poor populations. In India 80% of the population earns less than \$2 a day, in China, 47%.

³ See Pack (2006) as well as Cimoli, Dosi, Nelson and Stiglitz (2008) in this volume.

⁴ However, as important as direct industrial policy has been indirect industrial policy which covers the broader macro economic and institutional regime issues including: the rate of investment, the cost of capital, the cost of labor, the exchange rate, physical infrastructure, direct and indirect business taxes, and bureaucratic transactions costs. These can be as important as direct elements of industrial policy in affecting competitiveness or growth and will be addressed as necessary.

⁵ In 2005 the share of merchandise and service trade in GDP was 63.6% and 7.1%, respectively for China, and 62.4% and 12.8% for Germany. Thus China was more integrated in merchandise trade but less in service trade. Because of the faster rate of growth on both types of trade China will soon overtake Germany in both the share of trade in GDP and in the absolute volume of trade by 2010.

⁶ For a good analysis of China's progressive entry into the global system see Barry Naughton (2007), Chapter 16: "International Trade," and Chapter 17: "Foreign Investment," pp. 375-424, in *The Chinese Economy: Transitions and Growth*.

⁷ Gil and Kharas (2007)

⁸ Motorola, for example was forced to develop an extensive training program for the management of the 1000 largest Chinese State owned enterprises. (Dahlman, Zeng and Wang, 2007)

⁹ Dahlman, Zeng, and Wang (2007).

¹⁰ OECD (2007c).

¹¹ This is based on firm surveys in China and India done as part of investment climate surveys carried out by the World Bank—see Dutz (2007).

¹² See Dahlman, Zeng and Wang (2007).

¹³ Pack and Saggi (2006).

¹⁴ Gregory, Nollen, and Tenev (2007).

¹⁵ See Baldwin (2006) for an explanation of the two unbundlings—manufacturing due to the reduction of transportation costs, and of tasks that can be digitized and done at a distance through the internet.

¹⁶ See Pack and Saggi (2006).

¹⁷ The role of a strong export orientation in helping to avoid permanent infants has been well developed in the literature. See Westphal, Rhee and Purcell (1981).

¹⁸ Another important element of export promotion in the case of China has been the exchange rate. China has pegged the Yuan to the dollar for many years. As the US dollar has been depreciating relative to most currencies since 2001 the value of the Chinese Yuan has been appreciating. There was a one time 2.5% appreciation of the Yuan against the US dollar in mid 2005. Through the end of 2007 the Yuan has appreciated a total of about 12% vs. the US dollar. Many economists argue that the Yuan may be still 20% to 25% undervalued relative to the US dollar. It is also argued that China has an explicit policy of undervaluing the Yuan in order to support its dramatic export expansion. The real value of the Indian Rupee has been maintained more or less constant since the major devaluation of 1991. However, with the recent boom in foreign and domestic investment in India the rupee has started to appreciate in 2007.

¹⁹ The average GDP weighted share of industry gdp was 43% in the countries of Europe and Central Asia (the World Bank grouping of the former Soviet Economies) in 1990, which was before the fall of the Soviet Union. Their share of industry in gdp since the reforms has fallen to 32% as many of them are de-industrializing. This is particularly true of Russia where the share of manufacturing has been shrinking as Russia become more specialized in oil and gas and other natural resources.

²⁰ Naughton (2007).

²¹ See Chang (2002) for details on the US.

²² Thursby (2006).

²³ For an excellent exposition on the new conception of the global company from the CEO of IBM, see Palmisano (2006).

²⁴ It should be remembered that both China and India are nuclear powers, and that China is one of only three countries to have put men in space.

²⁵ This was announced by the OECD in 2007 based on the old PPP conversion figures.

²⁶ Dutz (2007).

²⁷ See Dutz (2007).

²⁸ See Perez (2002) for more on techno-economic paradigms.

²⁹ See Gordon and Gupta (2005), and Singh (2007) for good discussions of the important role of the service sector in India's more rapid growth in the 1990s and the most recent period for more details about the linkages, opportunities, and constraints to the growth of the Indian service sector.

³⁰ Gil and Kharas (2007).

³¹ Freeman (2006).

³² See Blinder (2006).

³³ UNCTAD (2004).

³⁴ Infant industry protection and stealing, copying and reverse engineering technology were also critical in the development of the US, Japan, Korea, and Taiwan in their catch up phase. See Chang (2002).

³⁵ UNCTAD (various years).

³⁶ UNCTAD (2005)

³⁷ See Stewart and Lester (2003), Pack and Saggi (2006), Gill and Kharas (2007).

³⁸ Huang and Khanna (2005).

³⁹ More generally an important lesson is that they have moved more gradually rather than try to develop a globally integrated market economy all at once as has been the advice often given by textbook economists. For example this was the advice given to the former Soviet Union by key western advisors such as Andreas Schrieffer and Jeffery Sachs; and institutions, such as the World Bank and the IMF.

⁴⁰ See Pack and Saggi (2006) and Cimoli, Dosi, Nelson and Stiglitz (this volume) for more on these issues.

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