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OCCASIONAL
P A P E R

Education and the Asian Surge

A Comparison of the
Education Systems in
India and China

Charles A. Goldman, Krishna B. Kumar, Ying Liu

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Preface

Phenomenal economic growth in China and India during the past few decades has drawn wide scholarly attention to the relative performance of these two countries in various spheres. However, little analytical comparison of their education systems has been done. Given the importance of education in economic and social development, and the fact that these two countries host the world's two largest education systems, this is a critical gap in research. Evaluating their relative successes and challenges will shed light on the effectiveness of the different education strategies of these two countries not only for their own benefit but also for the rest of the developing world.

This examination of the education systems of China and India is part of a comprehensive project conducted within the RAND Center for Asia Pacific Policy—known as the China and India Comparison Project—that compares China and India in demography, education, infrastructure, and the information industry. This occasional paper, like the Project, results from the RAND Corporation's continuing program of self-initiated research. Support for such research is provided, in part, by donors and by the independent research and development provisions of RAND's contracts for the operation of its U.S. Department of Defense federally funded research and development centers.

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Summary

China and India have faced similar conditions and challenges in education during their rapid industrial and social transformation. The two countries started building their national education systems under comparable conditions in the late 1940s. However, different policies, strategies, and historical circumstances have led them through different routes. China has outperformed India in primary and secondary education along a broad spectrum of access, quality, and delivery indicators. India, on the other hand, enjoys a competitive edge over China in higher education. Recently, India has begun catching up with China in K–12 education, while China has already overtaken India in terms of the college enrollment and number of graduates. The respective successes and challenges of the Chinese and Indian education systems offer valuable lessons for both countries and for the rest of the developing world.

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Abbreviations

GDP	gross domestic product
ISCED97	International Standard Classification of Education—1997 version
K–12	kindergarten through grade 12
NGO	nongovernmental organization
PPP	purchasing power parity
Rs.	rupees
UNESCO	United Nations Educational, Scientific and Cultural Organization

Introduction

China and India together are home to nearly two-fifths of the world's population. Their recent performance—in terms of high economic growth and improving socioeconomic conditions—is therefore a heartening development from the point of view of human welfare. Between 1980 and 2000, per capita gross domestic product (GDP), the primary indicator of economic standard of living, more than tripled in China and more than doubled in India.

When two populous countries such as China and India, poor and largely agricultural, embark on large-scale transformations of their economies and societies, one is naturally inclined to compare the strategies they have pursued in the path of development. They face many common challenges. But the social, economic, and political structures and the public policies they have in place are very different. Evaluating their contrasting approaches might shed light on the efficacy of different strategies for development of not only these two countries, which are important in their own right, but also for the rest of the developing world. In this occasional paper, we compare China and India on one of the important dimensions of development, namely, education.

Education influences and is also influenced by such rapid economic growth and the social changes that accompany it. While education by itself is not sufficient for economic transformation, it is one of the necessary ingredients. The East Asian growth “miracle” that preceded the more recent takeoffs by China and India was built on the foundation of solid educational achievement. Research has shown that human capital acquired through education influences economic growth by increasing adoption of new technologies and the productivity of the labor force. Education also influences the evolution of politico-economic institutions. Likewise, anticipation of future economic growth affects enrollment decisions and attainment through changes in the rate of return to education (Benhabib and Spiegel, 1994; Kumar, 2003; Glaeser et al., 2004).

China and India host the world's first- and second-largest education systems. Together, they contain 45 percent of the world's primary school-age children (Rao, Cheng, and Narain, 2003). Though the two countries have completely different political and organizational structures, they face similar considerations and challenges as they undergo rapid industrial transformation. In the late 1940s, their transformations started under comparable conditions, but their different policies, focus, and historical circumstances have led them toward their goals of socioeconomic development at different rates. At the beginning of the 21st century, it is fair to say that China has outperformed India along a broad spectrum of education indicators. India is catching up, especially in the area of primary enrollment, but it will be many years before the increased flow into the education system results in increased attainment in the population at large.

Given China's and India's aspirations to become world-class economies, it is crucial that they have education systems comparable with the best in the world. Therefore, a comparative study of the Chinese and Indian education systems, including their achievements and challenges, would be very useful. Such a study may provide useful insights into the forces that have shaped the inputs and outcomes of their education systems and shed light on the future needs and challenges that both countries face. The emergence of millions of skilled workers in these two globally integrated economies would also have implications for labor in the industrialized economies of the United States and Europe. This is another motivation to undertake such a study.

Our aim is to provide a systematic lens through which to examine the education systems and accomplishments of China and India, and to provide an overall assessment of where they are and where they may be headed. We are not aware of a comparative analysis of the educational situations of China and India along the lines we have undertaken. However, there are studies that compare specific aspects of education—e.g., the work by Rao, Cheng, and Narain (2003); Acharya, Baru, and Nambissan (2001); and Rao and Cheng (2002)—from which we have benefited. We also use information from the many reports issued by the ministries of education and other government branches of both countries, and data from government statistical agencies and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

We first present a brief history of the education systems in China and India in Part Two. The aim is to identify those developments that have had a bearing on their subsequent educational progress rather than to provide a comprehensive analysis. In Part Three, we analyze data from China and India that would allow us to draw conclusions about the strengths of their education systems and the challenges they face. Part Four concludes by presenting a summary of our analysis, listing opportunities that are unique to each country and identifying questions that could be fruitfully researched in the future.

World Bank (1999) lists access, quality, and delivery as the “three pillars of a good education system” (p. 47). Since the framework of Access-Quality-Delivery has the advantages of comprehensiveness, precedence, and simplicity, we follow it as an organizational device in the analysis conducted in Part Three. (See Goldman, Christina, and Benard [2005] for an example of how this framework is used.) Under this framework, we pursue questions of the following nature: Does the education system provide access for all? What are the delivery and governance mechanisms? How is education financed? As in any system of categorization, here too there is the limitation that some issues and questions might belong to more than one category. In such cases, we discuss the issue under the category of highest relevance.

Historical Development

Any attempt to compare the progress of education in China and India and to understand their current strengths and weaknesses must take into account the historical development of their education systems. The world's two oldest cultures and the largest developing countries share much in common in this evolution and also exhibit distinct differences.

China and India have shared three important features in their respective journeys toward a modern national education system. First, national leaders in both countries have long perceived education as integral to their economic development. The first Indian prime minister, Jawaharlal Nehru, declared that the (Indian) education system had to be renovated to meet the national needs and aspirations of building a secular democracy with a state-led command economy (Ghosh, 2000). In China, a similar principle was advocated by Deng Xiaoping with his famous "three faces of orientation": Education needed to be oriented toward modernization, the world, and the future.

Second, both countries had an elitist tradition in education spanning over two thousand years. At the end of 1940s, both countries therefore started with an emphasis on higher education firmly in place.

Third, heavily influenced by the Soviet Union's model of development, both countries have adopted a curriculum focused on science and technology, especially in higher education. This strategic choice has resulted in large pools of talent in science and technology: In 2004, China and India together awarded 463,000 bachelor's degrees in engineering, computer science, and information technology, more than triple the number of U.S. graduates (Gereffi and Wadhwa, 2005).

Their paths started to diverge in the late 1960s. In China, the outbreak of the Great Cultural Revolution (1966–1976) dramatically disrupted earlier progress on secondary and higher education, but unintentionally expanded access to primary education. This shift, and the naturally egalitarian outlook of communism, effectively addressed the problem of mass illiteracy. At the end of the 1970s, when China embarked on land and economic reforms, close to half its population was educated at the primary level or higher.

In contrast, the higher education focus of India proceeded unchecked by egalitarianism or revolution. This has resulted in one of the largest higher education systems and the third-largest scientific and technical manpower in the world. While this allowed India to position itself as a player in the global knowledge economy when it cautiously began its economic liberalization in the 1980s, less than 30 percent of its population as a whole had any level of education. It was only in 1986 that India realized the importance of basic education, a delayed start that set it back considerably in the education race.

In the rest of this section, we review each country's educational development from late 1940s to the early 21st century in greater detail. The primary goal is to shed light on some of the forces that gave rise to their education policies and the intended and unintended consequences of such policies rather than to provide comprehensive histories.

China

Educational development in China during the past five decades has been characterized by “bold moves, major shifts and reversals” (Tsang, 2000). In the first 15 years of the new People's Republic of China, the young Communist government attempted to bring basic education to the masses and simultaneously prepare a “governing elite” through higher education. These ambitious plans, however, were soon aborted when the Great Cultural Revolution erupted in 1966. University education was halted, and preparing cadres with Communist ideals became the primary goal of education at all levels. Only when Deng Xiaoping became the national leader and initiated the Reform and Opening Up in 1978 did China resume its education development.

Early Development (1940s and '50s)

The People's Republic of China was founded in 1949 after half a century of social upheavals and wars. With the adoption of communism, the Soviet Union became the model for economic success and education. Throughout the 1950s, the newly founded Chinese government devoted most of its educational efforts toward restructuring: Comprehensive universities were segregated into a number of specialized colleges and polytechnic universities. As a result, both the number of higher institutions and the number of college students experienced rapid growth.

Primary education first experienced rapid expansion but went into continuing decline beginning in 1958, because of the economic crisis that resulted from the Great Leap Forward.¹ When China severed its ties with the Soviet Union in the late 1950s, the government shifted from the Soviet model to a two-tiered system with a balance between a traditional, Confucian-style and a modern, Western-style education.

The Great Cultural Revolution (1966–1976)

A series of political upheavals in the 1960s caused Mao Zedong to believe that China was in the process of creating a new elite class, which he deemed a hindrance to the Socialist regime. The two-tiered system of education was viewed along these lines, as serving the interests of the elite few at the expense of the masses. Administrators in the “regular” schools were seen as self-serving in perpetuating this elite system (Surowski, 2000). In August 1966, Mao formally launched the Great Cultural Revolution with the aim of reviving the revolutionary spirit of the young Chinese.

¹ The Great Leap Forward was initiated by Chairman Mao and carried out by the Chinese Communist Party from 1958 to early 1962. The plan did not achieve the intended results, led to widespread economic dislocation, and is widely regarded both inside and outside China as a policy disaster.

This great proletarian revolution brought devastating changes in the education arena. The primary goal of national education was adjusted from preparing skilled labor to providing political and ideological preparation for the Communist cadres. During the next three years, campuses were controlled in turn by the Red Guards, the People's Liberation Army, and workers and peasants. A complete cessation of classes resulted. The primary schools were the least affected, and by the fall of 1967 most had reopened. Primary education was shortened from six years to four or five years, and secondary education from six to three years. The curriculum was reconstituted, with subjects such as physics, chemistry, history, geography, and literature giving way to courses in industrial skills and other practical matters. In June 1966, the system of university entrance examinations was halted and the few colleges and universities that admitted new students selected them on the basis of political virtue. Students from the families of workers, peasants, or soldiers were deemed the most "virtuous" (Chen, 2001).

The Cultural Revolution was a very disruptive period for Chinese society and education, destroying China's education infrastructure. Ironically, there was a gain: The egalitarian forces of the revolution and the creation of "commune schools" overseen by agricultural collectives delivered elementary education to large numbers of school-age children (Surowski, 2000). The elitism of Chinese education had been reversed.

Reform and Opening Up (1976 to the Present)

With the death of Mao and the rise of Deng Xiaoping, educational policies reverted to those that had been initiated during the early 1960s. Academic standards were reintroduced. While the emphasis before the Cultural Revolution was on access, quality rather than quantity was now emphasized. To stave off concerns about elitism, a compulsory nine-year education policy was instituted in 1985 and reinforced in 1993.

At the primary level, because of school closings and mergers, some in the sparsely populated rural areas were left without schools, resulting in declining enrollments. In most provinces, enrollments in elementary schools were higher in 1978 than in either 1985 or 1992. After land and other agricultural reforms, families found it economically advantageous to have children work at the farm or home rather than to send them to school.

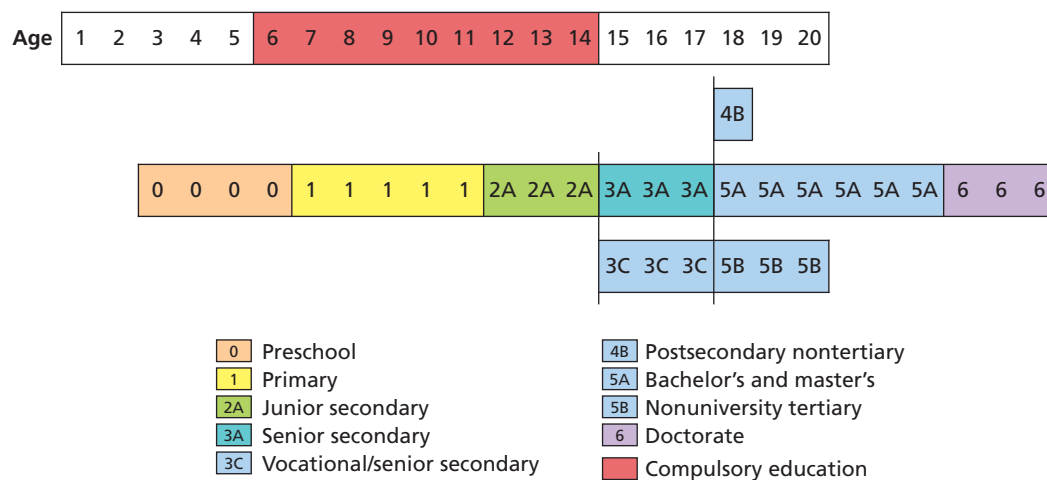
At the secondary level, schools were stratified into four levels, ranging from "key" schools to vocational schools, with decreasing academic intensity. Priority was given to vocational schools so as to reduce social demand for higher education. Vocational education as a proportion of secondary education increased from 18 percent in 1980 to 45 percent in 1989 (Tsang, 2000). However, since the early 1990s, more and more Chinese students have opted for general secondary education, which increases the likelihood of obtaining higher education; vocational school enrollment has been on the decline.

At the higher education level, national unified college entrance exams were restored in 1977. The guiding principles of academic standards and educating for the purpose of social reconstruction found voice in a May 1985 document titled "The Central Committee of the Communist Party's Decision on Educational Reform" (Ministry of Education, People's Republic of China, undated). It called for increasing state funding for education, expansion of vocational education, and greater autonomy for colleges and universities. Since then, the curriculum has broadened somewhat to more closely resemble those in American colleges and universities, and the job assignment role of the universities was phased out. The Education Law of the People's Republic of China, passed in 1995 by the National People's Congress, has built on the policies outlined in the 1985 document, with a commitment to both universal education to produce skilled laborers and higher education to produce scholars and scientists.

Current Structure of Schooling

Figure 2.1 depicts the current structure of schooling in China. Primary education (elementary school) in China encompasses six grades (grades 1–6), or five grades (grades 1–5) in rare cases. Secondary education is broken down into a junior level (grades 7–9) and a senior level (grades 10–12). In addition to general senior secondary schools, there are vocational high schools that provide skill-based education for students who prefer early employment. At the tertiary level, most colleges and universities offer four-year bachelor's degrees. There are also junior colleges that offer two-year associate's degrees. Graduate study in China is divided into two stages: a two-year master's level and a three-year doctoral level. In the past, most doctoral programs only admitted students who already had at least one master's degree. In recent years, some universities have started experimenting with a five-year combined doctoral degree program, similar to those offered in the United States.

Figure 2.1
Structure of the Chinese Education System According to ISCED97



SOURCE: UNESCO (2000).

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India

In contrast to the turbulent upheavals of the Chinese education system, Indian educational development has been characterized by relative stability. Independent India inherited a well-developed higher education system from the British colonial era and continued to focus on it. Primary education received little attention or resources from policymakers. And secondary education was only a stepping stone for the college-bound elite. Since 1986, more strategic priority has been given to primary education.

The Years After Independence (1948–1964)

After India won its independence in 1948, its first prime minister, Jawaharlal Nehru, declared the need to renovate the education system to meet the country's scientific, technical, and other manpower needs for a centrally planned economy. In 1948, the government appointed a university commission under the chairmanship of S. Radhakrishnan. Four years later, a secondary education commission was appointed under the chairmanship of A. L. Mudaliar, which offered various suggestions to reorganize secondary education to serve as a conduit to university education.

From the very beginning, India emphasized higher and secondary education over primary education. These two areas received large allocations of funds and underwent rapid, unplanned, and uncontrolled expansion. High-quality institutions such as the Indian Institutes of Technology and the Indian Institutes of Management were set up. However, in the absence of the complementary technological infrastructure that did not arrive until much later, graduates of such institutes either emigrated or entered the ranks of the underemployed. More important, the problem of mass illiteracy continued to be neglected.

The Kothari Commission and Beyond (1964–1985)

To rectify the unbalanced development of different levels of education, the Indian government appointed a commission under the leadership of D. C. Kothari to formulate a coherent policy of national education. After reviewing the postindependence development in education, the commission concluded in 1966 that the purpose of education was to help construct a self-reliant and modern Indian state. To achieve this, it advocated government-provided free and compulsory education for all children up to the age of 14, the use of national languages, and priority to scientific education and research. Insightful as these prescriptions were, most did not receive the resources necessary to seriously implement them. Only the emphasis on science and technology education continued to be reinforced (Ghosh, 2000).

The New National Policy on Education (1986)

In 1986, then Prime Minister Rajiv Gandhi announced the National Policy on Education. The policy called for increased financial and organizational support for the education system to improve educational access for disadvantaged groups, such as women, disadvantaged castes (designated “Scheduled Castes” and “Scheduled Tribes” by the government), and the rural population, and to raise the quality of education by improving standards. Toward this end, the government stood ready to seek financial support from the private sector to complement its own funds. The promotion of privatization and the continued emphasis on secularism and

science were important legacies of this new policy (Lall, 2005). But perhaps the most important outcome was the (late) realization that basic education for the masses could no longer be neglected.

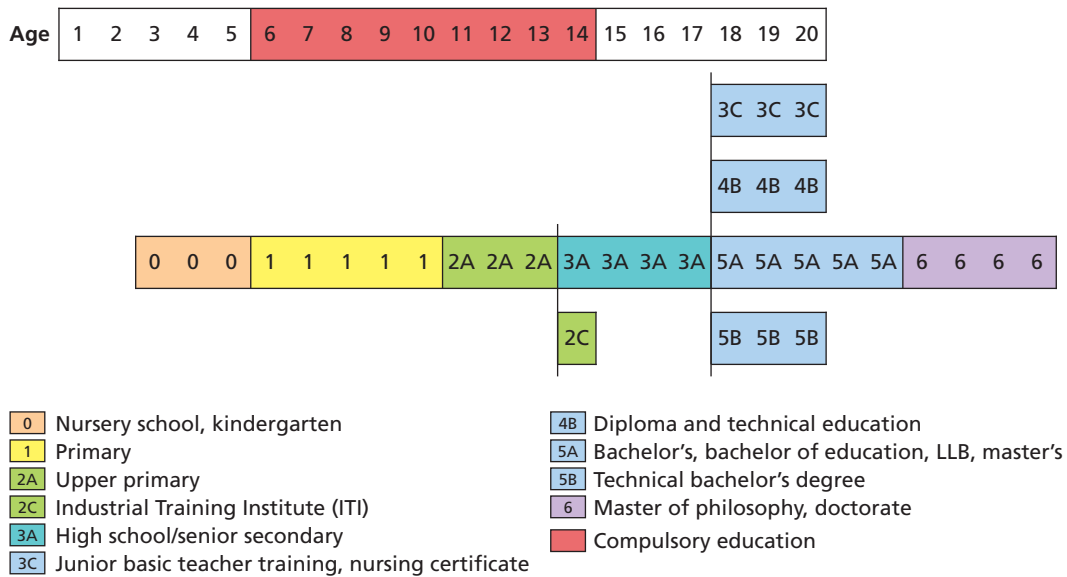
Since the institution of the National Policy on Education, several initiatives have been developed to tackle the problem of low educational quality:

- Operation Blackboard (1987–1988) aimed to improve the human and physical resources available in primary schools.
- Restructuring and Reorganization of Teacher Education (1987) created a resource for the continuous upgrading of teachers' knowledge and competence.
- Minimum Level of Learning (1991) laid down levels of achievement at various stages and revised textbooks.
- The National Program for Nutritional Support to Primary Education (1995) provided a cooked meal every day for children in the primary grades of government-aided and local body schools. The aim was to reduce the perceived cost of sending a child to school and improve incentives for enrollment.
- The District Primary Education Program (1993) emphasized decentralized planning and management, improved teaching and learning materials, and school effectiveness.
- Movement to Educate All (2000) aimed to achieve universal primary education by 2010 through micro-planning and school-mapping exercises, bridging gender and social gaps.
- Fundamental Right (2001) called for the provision of free and compulsory education, declared to be a basic right for children ages 6–14.
- The recent National Common Minimum Program has reemphasized and expanded these programs, particularly the provision of free midday meals.

Current Structure of Schooling

Figure 2.2 depicts the current structure of schooling in India. While schooling prior to college spans 12 grades in India as in China, it is structured differently. While the exact breakdown of the primary and lower secondary stages varies by state, all states adhere to the “10 + 2 + 3” system: ten years of general education followed by two years of preuniversity or upper secondary education and (in a majority of cases) a three-year bachelor's degree (Clark, 2006). Primary education in India is typically five years long (from grade 1 to grade 5), followed by a three-year upper primary education (from grade 6 to grade 8). Grades 9 and 10 constitute lower secondary education and grades 11 and 12 higher secondary education, with board exams offered at the end of each stage. Industrial training institutes offer one-year vocational training after the eighth grade to students who prefer early employment. Nine grades of education are compulsory in India, as in China. Education at the tertiary level is complex and varied. Most bachelor's degrees take three years (unlike the four years in China and the United States), including teacher training and nursing certificate programs. However, engineering, agriculture, and dentistry take four years, and medicine takes five and a half years. Most master's degrees take two years to complete, and doctoral degrees two to three years beyond a master's.

Figure 2.2
Structure of the Indian Education System According to ISCED97



SOURCE: UNESCO (2000).

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Table 2.1 summarizes the important historical developments of China and India that have been discussed above.

We analyze the educational outcomes of China and India in the next section, shedding light on the overall effect that the histories and evolution of policies have had on them.

Table 2.1
China and India: The History of Education

Period	China	India
Late 1940s to mid-1960s	Priority given to higher education Primary education first increased and then decreased	Priority given to higher education Primary education neglected and developed slowly
Mid-1960s to late 1970s	Higher education halted Primary education expanded rapidly	Continued emphasis on higher education Continued negligence of primary education
Early 1980s to early 2000s	Higher education rebuilt and expanded Vocational secondary schools increased and then declined in importance Continued development of primary education	Shift in government priority from higher education to primary education

Access, Quality, Delivery, and Resources: An Analysis

In this section, we analyze data from China and India to assess their relative educational strengths and challenges and to identify opportunities for the future. We draw particular attention to the interconnections among education, economics, and demographics.

As mentioned in Part One, we use the organizational framework of Access-Quality-Delivery in our analysis. This framework, as elaborated in World Bank (1999), has the merits of both simplicity and comprehensiveness.

- **Access** refers to the extent to which a system provides members of a society with opportunities to learn, in terms of both the structure of schooling and the environments that support high-quality learning experiences. Considerations such as access to provision, equitable access to all levels of education, adequate supplies and materials, a leadership interested in education, and a supportive learning environment would fall under this category.
- **Quality** spans inputs, processes, and outcomes of education, with particular attention paid to curriculum, staffing, and teaching and learning at the classroom level. Issues such as flexibility of curriculum, imparting competencies to thrive in the global economy, motivated staff and teachers with adequate pay and professional opportunities, and monitoring with strong quality assurance would be addressed here.
- **Delivery** addresses the institutional mechanisms in place for assuring high-quality education that is accessible to all. Important delivery considerations include governance and information management. Responsibility and accountability, appropriate decentralization, and monitoring and feedback to influence plans are some of the considerations here.

Even though “Resources” falls under Delivery in the original formulation, we include it as a separate category, since the availability and allocation of financial and other resources affect several components of Access, Quality, and Delivery. The need for resources in developing countries such as India and China is particularly paramount. The level and allocation of public funds, the level of private contributions, and the efficiency in the use of resources would be some of the issues considered in this category.

A few words of caution are in order. In conducting this analysis, we face issues about the comparability of data from the two countries similar to those that other researchers have faced. For instance, Bardhan (2003) notes that fewer reliability checks and internal consistency tests have been carried out with Chinese data than with Indian data. Moreover, data availability is

uneven across the Access-Quality-Delivery categories, with most of the data being available for Access.

Access

Below we present and discuss data on educational flow (enrollment rates) and attainment (years of education, percentage of population with education, literacy rates) across the different levels of education. We also discuss disparities in access on the basis of gender, geography, ethnicity, income, and age.

Flow and Attainment: Basic Education

We first review the flow and stock of education in India and China. Education flows, measured by enrollment and intake rates, build up the “stock” of education, measured by indicators such as literacy rate, years of education attained, and percentage of the adult population that is educated.

As can be seen in Figure 3.1, the gross primary enrollment rate in China now exceeds 100 percent, and has done so since 1985.¹ India reached that figure only in 2000. The net enrollment rates are lower, and considerably so in India—95 percent for China and 82 percent in India. The secondary enrollment rate was about 40 percent for both countries in 1985, and has been increasing ever since. However, the rate of increase has been much faster in China than in India. In 2002–2003, the figure was 70 percent for China but only 53 percent for India (UNESCO, undated).

By comparison, South Korea, an East Asian economy identified by UNESCO as a high achiever (Mehrotra, 1998), had a gross primary enrollment rate of over 100 percent as early as the 1960s. Its combined (primary plus secondary) gross enrollment rate has been 98 percent during recent years.

Figure 3.1 shows that the Indian rate is converging, at least in gross primary enrollment rates, with the Chinese rate. This convergence during recent years is also evident from its gross intake ratio (number of new entrants in the first grade of primary education, regardless of age, expressed as a percentage of the population of theoretical entrance age to primary education), which was a whopping 132 percent in India in 2002–2003, compared with 99 percent for China (UNESCO, undated).

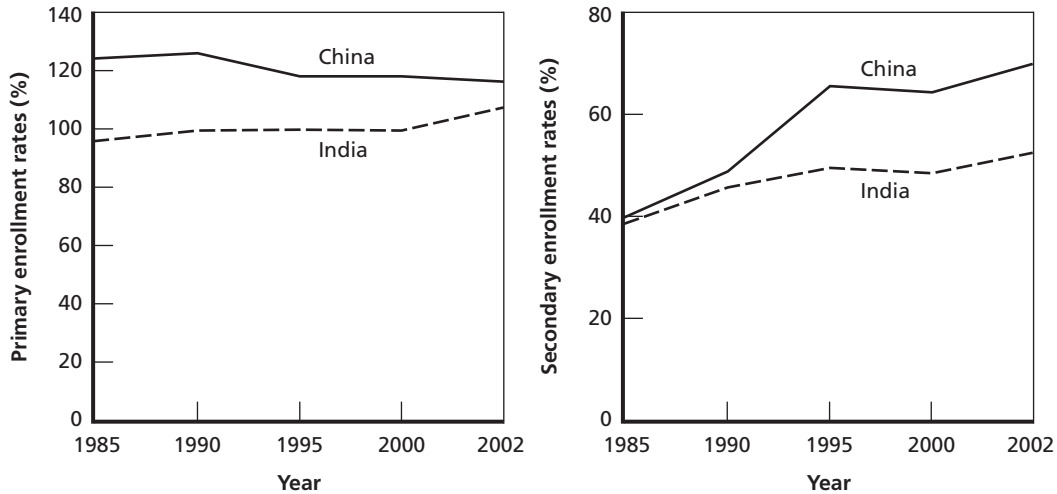
It should be noted that many developing countries experience first an increasing and then a decreasing gross enrollment rate for primary education. When the country first experiences gains in education, students of the appropriate age group for primary education as well as those beyond that age enroll, leading to an increase in gross enrollment rate. As more and more students enter primary school on time, the gross enrollment rate falls back to close to 100 percent. In China, the gross primary enrollment rate peaked at around 120 percent in 1990 and has

¹ The gross enrollment rate is given by the number of pupils enrolled in a given level of education, regardless of age, expressed as a percentage of the population in the theoretical age group for the same level of education. For developing countries, many students start a level of education several years later than the theoretical age. As a result, the gross enrollment rates sometimes exceed 100 percent. For the tertiary level, the population used is the five-year age group beyond the secondary school-leaving age. We choose to present gross enrollment rates rather than net enrollment rates because the latter are not available in the public domain.

since then been declining toward 100 percent. In contrast, the gross primary enrollment rate in India is still on its upward trend.

As a result of the decreasing gap in primary enrollment, India has also, during the past decade or so, been closing its gap with China in youth literacy. As shown in Figure 3.2, while the gap in adult literacy rates between the two countries has stayed nearly the same since 1985,

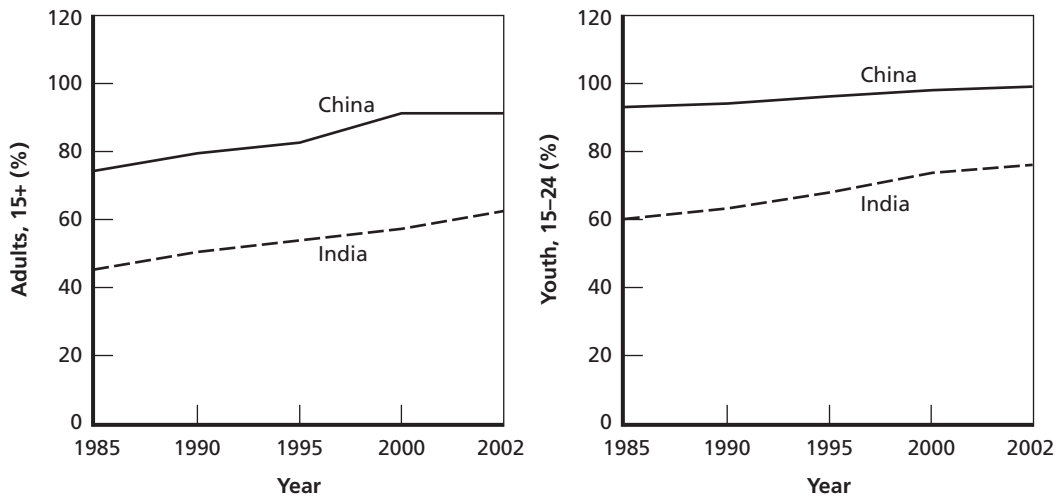
Figure 3.1
Gross Primary and Secondary Enrollment Rates



SOURCE: UNESCO Institute for Statistics.

RAND OP218-3.1

Figure 3.2
Literacy Rates



SOURCE: UNESCO Institute for Statistics.

RAND OP218-3.2

it has narrowed among youth.² But China still enjoys a competitive edge in terms of the *stock* of educated people. China's overall literacy rate in 2000 was 91 percent, compared with India's 61 percent.³

In addition to literacy rate, average years of schooling is another commonly used indicator to measure education attainment. According to Barro and Lee (2001), the average years of schooling in the population ages 15 and older was 6.35 years in China and 5.06 in India for the year 2000. This is a significant difference, given that the average is computed over large and heterogeneous populations. In 2000 in China, 18 percent of the population over 15 had no education, while 33.9 percent of the population had primary education, 45.3 percent had secondary education, and 2.8 percent had college education. In contrast, in 2000 in India, the population with no education was as high as 43.9 percent, while 28.2 percent of the population had primary education, 23.8 percent had secondary education, and 4.1 percent had college education.

Looking at the current flows alone—for instance, the primary enrollment rates—and concluding that India has caught up with China would therefore be misleading. Given the long lags in building educational stocks, sustained enrollment flows over several years are needed for such a catch-up to occur.

One could make the case that the presence of a larger pool of educated labor is one factor that has complemented China's open stance and given it a considerable advantage over India in attracting and retaining large-scale manufacturing plants. China's employment in services and manufacturing in 1999 was about 47 percent of its labor force, compared with 32 percent for India. More than 60 percent of Indian labor is in agriculture, compared with 47 percent in China (International Labour Organization statistics and authors' calculations).

Flow and Attainment: Higher Education

As mentioned in Part Two, India has had a history of emphasizing tertiary education. There has been a 16-fold increase in the number of universities, and a 20-fold increase in the number of colleges, since India's independence in 1947. The annual growth of institutions was about 13 percent in the 1960s and '70s, but decreased to 4.5 percent in the mid-1980s (UNESCO, 2004). There are more than 320 universities and more than 15,000 colleges and institutions of higher learning, with total enrollment exceeding 9.4 million students.

In the 1980s, the World Bank and other institutions took India to task for giving greater priority to tertiary education over primary and secondary education. In 1985, 2.8 percent of the adult population attained postsecondary education, compared with China's 1.2 percent (Barro and Lee, 2001). Admittedly, these are small percentages. However, given the large population, the stock of college-educated, technically savvy, English-speaking labor India had built up provided it with a critical mass to take advantage of the software outsourcing boom

² According to UNESCO, although the definition of literacy may vary from one country to another, it is typically of the following form: "Can [Name] read and write a simple sentence in [Language(s)]."

³ Rao, Cheng, and Narain (2003) caution that the way in which China calculates its primary enrollment overrepresents participation, particularly of girls; figures are collected at the beginning of the year and do not reflect attendance. However, the size of the gap in literacy rates (30 percent) is indicative of sustained higher enrollment rates in China that cannot be explained away by accounting idiosyncrasies.

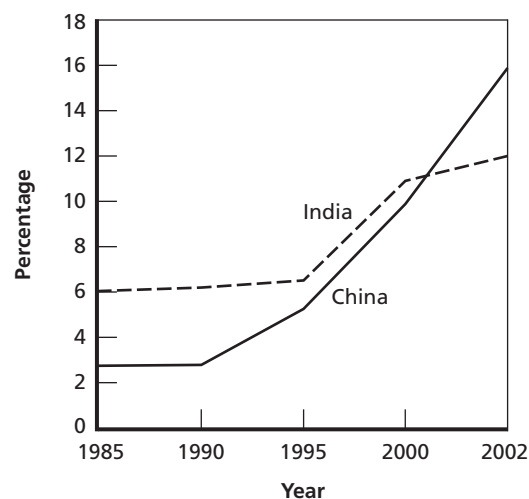
ushered in during the last two decades by falling communications and computational costs (Li and Gao, 2003).

China has not been idle on the tertiary front. As can be seen in Figure 3.3, the gross tertiary enrollment rate in China surpassed that of India in 2000, though these rates—16 percent and 12 percent, respectively, in 2002–2003—are nowhere near the rates of 50 percent and 85 percent seen in Japan and Korea, respectively. In 2000, 4.1 percent of the Indian population over age 15 had some postsecondary education, compared with China's 2.8 percent. However, if one looks at the percentage of the population that has *completed* postsecondary education, the difference disappears: 2.2 percent for India and 2.1 percent for China (Barro and Lee, 2001).

This reversal poses differing challenges for China and India. As will be elaborated below (see **Resources: The Financing of Education** on pages 21–23), better financing options are needed for Chinese college students as they have started bearing an increasing share of education costs. For India, the challenge is to balance the financing of its long-neglected primary and secondary sectors without endangering its comparative advantage in the tertiary-hungry knowledge sector. Having staked its claim as a player in the global knowledge economy, it is both impractical and unwise for it to roll back its advantage in higher education. Criticism of the Indian education system has come full circle, with concerns now being voiced over the shortage as well as the quality of college-educated labor. The verdict delivered by Altbach (2005) is particularly damning: “India’s systematic disinvestment in higher education in recent years has yielded an academic characterized by mediocrity, producing neither world-class research nor very many highly trained scholars, scientists, or managers to sustain high-tech development.”

With primary enrollment rates approaching 100 percent and secondary rates steadily increasing, both countries also need to brace themselves for an increasing demand in the physical infrastructure required for college education.

Figure 3.3
Gross Tertiary Enrollment Rate



SOURCE: UNESCO Institute for Statistics.

RAND OP218-3.3

A Technological Focus. Higher education in China and India has a strong technological focus. In 2002, China graduated 219,000 engineers (the U.S. figure was less than 60,000). This represents 39 percent of all college graduates. When physical sciences are included, this figure climbs to 60 percent of all degrees awarded (compared with 17 percent for the United States) (Gross and Heinold, 2005). India's intake in approved engineering colleges was 360,000 in 2002–2003. The number of college enrollees in science and engineering is more than 30 percent.

With this surge in tertiary education, China has been challenging India's comparative advantage. Saxenian and Quan (2005) report that between 1995 and 2000 alone, the number of doctorates in science and engineering conferred by Chinese universities increased 140 percent, from 518 to 1,247, surpassing India in 1997, with the field of computer science gaining faculty and students rapidly. However, Farrell and Grant (2005) caution that such increases might ultimately prove illusory, since fewer than 10 percent of Chinese graduates would be suitable to work in high-end service occupations because of poor English and theoretical, rather than practical, knowledge.

Given the increasing technological sophistication and aspirations of both economies, the ever-increasing focus on science and engineering in both countries bodes well. At the same time, it is not clear whether particular areas of higher education need to be targeted. For instance, too much emphasis on the study of information technology to take advantage of the current outsourcing trends could backfire if the trend changes. The countries would then be stuck with sizeable populations that have irrelevant skills. Whether higher education should be targeted toward specific areas and whether private institutions are better in anticipating the demands of the labor markets of the two countries are issues worthy of future study.

In addition to catering to local labor demands, universities can become an important source of export earnings, especially by attracting students from neighboring emerging economies who find the traditional powerhouses of higher education, such as the United States and Europe, expensive. Despite a well-developed tertiary education system, India hosts only about 8,000 foreign students in its colleges and universities. According to the Ministry of Education, in 2004 China hosted 110,844 foreign students in its colleges and universities. It would be interesting to explore the steps both countries need to take to achieve world-class status in their universities and thereby attract more students. China is luring foreign-trained faculty to its universities in an attempt to make them among the best in the world (French, 2005). This appears to be a step in the right direction.

Adult Education

Even though current education indicators have improved—as indicated by the enrollment rates and the improved literacy among youth—both countries face the daunting task of getting their significant number of uneducated adult population to actively participate in their modernizing economies. Merely being literate is unlikely to be sufficient for this purpose; and even by this measure, a mere 61 percent of the Indian adult population is literate.

China has employed part- and full-time teachers (45,000 in 1998) to provide literacy education to adults. Adult education has been kept particularly local, with provisional authorities supplying more than 50 percent of teaching materials (Ministry of Education, People's Republic of China, 2001). However, the attention paid to educate the nearly 90 million illiterate adults seems inadequate. The Chinese (and Indian) report presented at the International Conference on Education devotes little attention to this important problem (Ministry of Education, People's Republic of China, 2001; UNESCO, 2004).

The challenge faced by India, which had close to 260 million illiterate people ages 7 and older, is even more severe. Literacy campaigns have been launched all over the country, especially in the educationally backward states of Bihar, Madhya Pradesh, Uttar Pradesh, and Rajasthan. There has been a reliance on the “spirit of voluntarism,” which has worked well in the district of Ernakulam in the state of Kerala (Ministry of Human Resource Development, Government of India, 2000). However, this spirit by itself is unlikely to solve such a massive problem. A more clearly articulated public policy and a solid funding of programs are needed. Unfortunately, the meager resources allocated to address this problem are being further short-changed: The percentage of GDP devoted to adult education *decreased* from 0.05 percent in 1990–1991 to 0.01 percent in 2000–2001, according to education statistics from India’s Ministry of Education (UNESCO, undated).⁴

The demographic projections for the two countries pose different challenges for adult education. As elaborated in Wilson and Purushothaman (2003), the population growth rate in China is on a strong downward trend. The rate in India, while decreasing, is still higher than China’s. UNESCO’s World Education Indicators make projections for the year 2015 of the index change in school-age population ages 5–14, with the index for 2000 set to 100. For India, the index increases from 88 in 1990 to 101 in 2015. For China, the number *decreases* from 91 in 1990 to 82 in 2015. This pattern is evident for all age groups up to 30. Finally, with improving health and longevity, people in both countries remain economically active well into old age. According to statistics from the International Labour Organization, in 1991, China’s and India’s economically active populations in the 60+ age group were 27.6 million and 22.1 million, respectively. Pang, de Brauw, and Rozelle (2004), noting that more than two-thirds of the rural population between the ages of 60 and 70 are part of the formal workforce, argue for more adult education in rural China.

These indicators imply that even if India continues to neglect adult education it might still be able to generate stocks of educated labor for its economic needs by educating the increasing numbers of its school-age population. Given a decrease in this population, China has less leeway in postponing attention to adult education; it will have to ensure that the skills of its current population are upgraded.

The lack of clearly laid-out plans for adult education based on demonstrated strategies for success may be the most serious drawback in the educational agenda of both countries. Studying effective ways to provide adult education as well as literacy and job training should be an important priority for policymakers and policy researchers alike in both countries.

Disparities in Access

Aggregate education indicators can sometimes mask large differences between genders, regions, and ethnic groups. In this section, we analyze such disparities in India and China.

Gender. China’s net primary enrollment rate and its net intake rate are slightly *higher* for females than males.⁵ The respective numbers are 95 percent and 94.3 percent for primary enrollment and 66.7 percent and 65.7 percent for intake rates. The gender disparity index

⁴ Adult education will also help raise HIV/AIDS awareness among the population. China acknowledges that if current trends continue, its HIV/AIDS incidence will reach levels comparable to those in sub-Saharan Africa by 2010 (World Bank, 2002).

⁵ The net intake rate is the number of new entrants in the first grade of primary education who are of official primary school entrance age, expressed as a percentage of the population at that age.

(female-to-male enrollment ratio) increased steadily from 0.982 in 1991 to 0.999 in 1998. (The overall ratio of women to men in the population is slightly less than 50 percent.) This decreasing disparity over the years has reduced the gap in literacy rates: 87 percent of women ages 15+ are now literate, compared with 95 percent of men (UNESCO, undated). The gross secondary enrollment difference is likewise small: 69 percent for females compared with 71 percent for males.

Several factors have contributed to the decrease of gender disparity in educational achievement in China. In the 1960s and '70s, the communist government favored social policies that had a strongly egalitarian outlook, including those that advocated gender equality in school and in the workplace. Both the central government and local governments launched multiple campaigns in rural areas to promote gender equality. Since late 1970s, the implementation of the "One Child Policy" has further helped to bridge the gender gap. With only one child in a typical household, gender becomes largely irrelevant in parental decisions on children's schooling.

Absent such egalitarian emphasis, the gender situation is less rosy in India. Despite improvements, the net female enrollment rate in primary education, at 75.7 percent, lagged behind the male enrollment figure of 88.5 percent. A significant gap is present in gross secondary enrollment rates as well: 47 percent versus 58 percent.⁶ The gap that has persisted over the years is reflected in the large disparity in literacy attainment. Literacy did grow faster for females (14.4 percentage points) than for males (11.2 percentage points) from 1991 to 2001. The difference is, however, still large. The literacy rate for women is 48 percent compared with 73 percent for men. *That amounts to a female literacy rate that is almost 40 percentage points lower than in China.*

Female literacy rate has a wide-ranging impact on the economy and the society. Studies have suggested that increased female literacy decreases fertility (Drèze and Murthi, 2001), decreases infant mortality (Sufian, 1989), and increases children's education and economic growth (Behrman et al., 1999; Burchfield et al., 2002). Given these results, steps in India to improve enrollment among girls and to provide adult education and literacy training for women in their reproductive years are crucially needed. While India has reasonable policy intentions in this regard—e.g., the National Common Minimum Program wants to improve access by paying special care to girls and providing midday meals for all schools—success will depend on effective *enactment* of these policies.

Geography. In China, the eastern, coastal, economically developed areas have fared much better in coverage of compulsory education and other educational indicators. The population coverage ratio for nine-year compulsory schooling decreases from 100 percent in nine provinces in the east to 65–85 percent coverage in seven central provinces. The primary enrollment ratio decreases from close to 100 percent in the east provinces to 98.8 percent in the middle provinces and 98 percent in the west provinces. The lower secondary enrollment rates exhibit much starker differences: 96.5 percent in the east, 81.9 percent in the middle, and 42.3 percent in the west. Quality indicators—such as dropout rates, transition rates, and percentage of qualified teachers—are all higher in the east than in the west. Literacy rates are lower in the west than in the east, with provinces such as Tibet and Qinghai having a female illiteracy rate of greater than 50 percent (Ministry of Education, People's Republic of China, 2001). The

⁶ The use of net enrollment for primary education and gross enrollment for secondary education is dictated by data availability.

coastal bias in Chinese development appears to have made geography the dimension of greatest educational disparity in the country.

In India, while the absolute gap between urban and rural literacy rates has decreased from 1991 (rural: 44.7 percent, urban: 73.1 percent) to 2001 (rural: 59.2 percent, urban: 80.1 percent), a significant gap still remains.

Likewise, while significant progress was made between these two years in literacy rates among states with low literacy (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh, and Uttaranchal [now Uttarakhand]), large gaps remain. Bihar, for instance, has a literacy rate of 47.5 percent, compared with the overall Indian rate of more than 60 percent (UNESCO, 2004). This, no doubt, is a reflection of enrollment rates that have lagged behind in these states (though they have improved in the last few years). For instance, Uttar Pradesh's net primary enrollment rate in 1997–1998 was 46.8 percent, compared with the national average of 71.1 percent. Its dropout rate was 40.4 percent, compared with the national average of 25.8 percent (Ministry of Human Resource Development, Government of India, 2000).

Regional inequality in education is partially a result of vast disparity in states' spending on education. Educational expenditure in India is a "concurrent" issue; i.e., it is a responsibility of both the Central Government and the state governments.⁷ In practice, education is predominantly state funded. For instance, in 1996–1997, Madhya Pradesh spent rupees (Rs.) 881 per student on elementary education, while Kerala spent Rs. 1,909. The countrywide average that year was Rs. 1,207 (Ministry of Human Resource Development, Government of India, 2000). Madhya Pradesh's education guarantee scheme, which provides schools in rural areas when demanded by a critical mass of parents, and Rajasthan's nongovernmental organization (NGO)–initiated programs appear to be good starts toward decreasing regional disparity in education (UNESCO, 2004). However, the Central Government might need to step in when states lack sufficient funds.

The prevalence of NGOs in India offers opportunities for partnerships among the government, the private sector, and NGOs to improve educational access to an ever-widening group. Exploring mechanisms that facilitate such partnerships is worthy of future study.

Minorities and Ethnic Groups. There are 55 minority groups in China who make up 8.41 percent of the population.⁸ Compared with India, which has a highly heterogeneous population in the dimensions of language, religion, and caste, the Chinese population is relatively homogeneous. This fact and concerted governmental efforts have kept educational disparities along ethnic lines in China low. Indeed, the illiteracy rate among seven national minorities is actually lower than the national average (Chinese National Commission for UNESCO, 2004).

China also has large numbers of migrants who move between rural areas and urban centers in search of economic opportunities. A recent study conducted in six major urban centers with the largest migrant populations—Beijing, Shanghai, Tianjin, Shenzhen, Zhejiang, and Hebei—finds that school enrollment among children of migrants varies widely, from 89.3 percent in Tianjin to 100 percent in Hebei. However, these estimates are likely to be optimistic, as the One Child Policy encourages underreporting of children. Moreover, most migrants do not

⁷ We examine education financing in detail in *Resources: The Financing of Education* on pages 21–23.

⁸ Han Chinese is the largest ethnic group in China, accounting for about 92 percent of the total population.

have an urban “hukou,” or identification card, that would allow their children to attend urban schools. These children are unlikely to be represented in the survey data above.

Indian society has been historically structured into subgroups called “castes.” These castes have differed in the degree of social status and access to education and other privileges. The castes that have historically suffered discrimination in India have been accorded special status by the Indian government and fall under the categories of Scheduled Castes or Scheduled Tribes. Literacy rates increased between 1961 and 2001: from 10.27 percent to 54.7 percent for Scheduled Castes and from 8.53 percent to 47.1 percent for Scheduled Tribes. However, these rates fall below the national average and are dragged down by particularly low literacy rates for females.

India has an extensive affirmative action program called “reservation.” A substantial fraction of openings in colleges and firms run by the government are reserved for those in Scheduled Castes or Scheduled Tribes. However, it is not clear how effective such programs to facilitate access at the higher levels can be if access at the basic level cannot be ensured. Under-prepared students who enter colleges based on the quotas reserved for them will find it difficult to cope with the demands of higher education. India’s challenge in this regard is to reach disadvantaged groups early enough for them to benefit from reservation. Applying research on “affirmative action” that has been done in the United States in the Indian context might be a useful endeavor.⁹

In summary, while China suffers from education disparities between urban residents and rural migrants, the disparities faced by the vastly more heterogeneous India are more severe.

Income. There is a high degree of correlation between income and enrollment. In both countries, geographic disparities parallel income disparities. For instance, the low-enrollment interior regions of China and the north-central states of India are also poorer than their high-enrollment counterparts. However, disparities in income even within the region appear great enough to warrant independent attention. Income disparities might matter more as an independent dimension for India, which has not had quite the same egalitarian economic outlook that China has had. China’s inequality is lower, but is higher in rural than in urban areas, a rare phenomenon.¹⁰ The Gini coefficients in rural and urban China in 1999 were 0.34 and 0.29, respectively, while the corresponding coefficients were 0.40 and 0.42 in India in 1997–1998 (Bardhan, 2003).

The incentive to become educated is largely economic, and in a developing country with imperfect capital markets, education is largely constrained by income (see, for instance, Caucutt and Kumar, 2007). Focused increases in educational outlays in the low-enrollment regions are warranted. In India, the Central Government would need to step in when states with low incomes are unable to increase expenditure.

Poor families often expect children to contribute to family income either by working in the field or engaging in child labor. The main cost of sending a child to school is forgone earnings. Whether education schemes such as *Progres*a of Mexico, which subsidizes forgone earn-

⁹ See Kumar, Malik, and Tanner (2006) for an attempt at such a comparative analysis.

¹⁰ A possible explanation might be found in China’s attempts to control the distribution of its population, for instance, through its “hukou” policy. The definition of an “urban” resident is narrower than used elsewhere: Many people who work and live in the city but don’t have a formal “hukou” are still counted as “rural” residents. People throughout the socioeconomic spectrum are therefore counted as rural. In contrast, the urban population is relatively homogeneous.

ings by children in addition to their direct tuition, would improve enrollment of poor children in India and China deserves further attention.

Age. As mentioned earlier, both countries have huge stocks of uneducated people, especially among the older segments of the population. As the two economies develop and the younger workers are better educated, the older uneducated people will find it increasingly difficult to compete in labor markets. Though this issue has not received the attention it warrants, policymakers in both countries should be concerned with the inequality of income by age likely to emerge from current educational and demographic trends. Ignoring it could result in social strife, as well as popular resentment against further economic liberalization and opening up of the economy. This concern further underscores the importance of adult education in both countries.

Resources: The Financing of Education

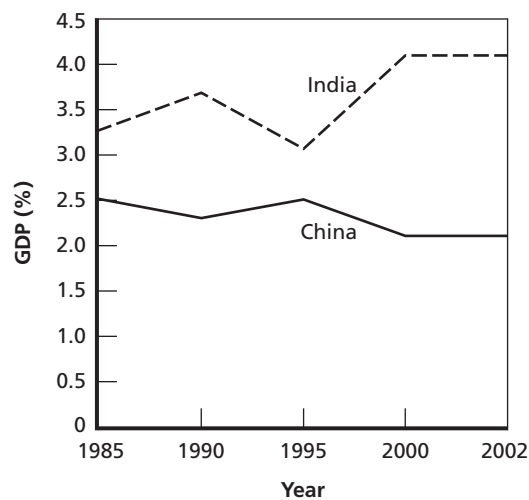
Below we discuss public and private spending on education at various levels. We examine both the total expenditure as a fraction of GDP and the expenditure per pupil.

Funding Versus Provision

As a fraction of its GDP, public education expenditure in India has been higher than that of China during the last two decades (see Figure 3.4).

Education financing in China has become increasingly reliant on tuition and fees instead of the public treasury. In 1991, tuition and fees counted for only 4.4 percent. By 1998, it had increased to 12.5 percent (Ministry of Education, People's Republic of China, 2001). According to data available from the UNESCO Institute for Statistics, after transfers from public sources are accounted for, 55.8 percent of education expenditures are from public sources; the

Figure 3.4
Public Education Expenditure (percent of GDP)



SOURCE: UNESCO Institute for Statistics.

RAND OP218-3.4

remaining 44.2 percent comes from private sources.¹¹ This split is true for all levels of education. In India, in contrast, 96.2 percent of funding is from public sources and 3.8 percent is private. (As a point of comparison, 25 percent of the expenditures are from private sources in the United States.)

A variety of reasons are responsible for the high level of private funding of education in China. First and foremost, during the past two decades the central government has shifted the responsibility of providing compulsory education (grades 1–9) to local governments, which in turn have resorted to levying new taxes and collecting more tuition and fees from students. Second, tuition has become one of the major sources of revenue in tertiary education. The amount of tuition charged to students has increased from nearly zero in the early 1990s to an average of \$890 in 1998 (Woodard, 2000). Finally, many public universities operate financially independent colleges or schools to provide education for adults as a way of generating additional income.

Given the above consideration, a comparison of the purchasing power parity (PPP)–adjusted *total* (public *and* private) expenditure per student at the primary level might be more appropriate. In 1999, this expenditure was higher in China (\$372) than in India (\$303). The secondary-level expenditure in China (\$833) was more than twice that of India's (\$295).

In China, private schooling accounted for only 1.5 percent of the primary enrollment, 3 percent of secondary enrollment, and 9 percent of vocational enrollment in 2001. This low private primary enrollment is comparable to the South Korean figure of 2 percent, though the Korean figures for secondary and vocational education were much higher at 38 percent and 86 percent. In other words, while the *provision* of schooling in China is predominantly public, the *financing* of it has become increasingly private.

The situation is a bit reversed in India. There, nongovernmental bodies manage 51 percent of secondary schools and 58 percent of higher secondary schools (UNESCO, 2004). Even at the primary level, Kingdon (1996) argues that official statistics do not represent private schools unaided by the state government; in urban areas these schools account for 17 percent of all schools. She also provides an oft-cited reason for the growth of private education in India: the poor quality of public schools (also see Das, 2002).

These trends pose different challenges for the two countries. If one believes that private institutions are more innovative, efficient, and flexible, the increased private provision in India is likely to be an advantage. It will allow the education system to better respond to labor market conditions. However, the high burden on public funding is a serious liability, especially during times of large budget deficits; the combined state and central budget deficit in India is greater than 10 percent of its GDP.

While China is on firmer footing in this regard, the increased burden of education falls on families, and financing options such as targeted subsidies and educational loans may have to be made available to maintain access.

¹¹ Chow and Shen (2006) compare data from UNESCO and the China Statistical Yearbook, to conclude that “private sources” used in UNESCO reports include the following categories: (1) Nonbudgetary “government appropriation for education,” which in turn includes (a) taxes for education levied by local governments, (b) educational funds from enterprises, (c) funds from school-supported industries, from self-supporting activities (“qin gong jian xue”), and from social services, and (d) other funds; (2) “funds of social organizations and citizens for running schools,” (3) “donations and fund-raising for running schools,” (4) “tuition and miscellaneous fees,” and (5) “other educational funds.”

Tertiary Education

As mentioned earlier, both countries will face increased demands on tertiary education, because of increased enrollment and graduation at the primary and secondary levels as well as the increasing technological sophistication of their economies.

Tertiary education is much more expensive than primary and secondary education: In China, for instance, the per pupil expenditure at the tertiary level, at 161 percent of the per capita GDP in 1999, is 7 times that of secondary expenditure and more than 15 times that of primary expenditure. This translates to large increases in the aggregate expenditure at the tertiary level. Given the increasing share of tuition, more than 40 percent of this is borne by students and their families. The need for financing options is therefore particularly acute in tertiary education.

Based on China's low public expenditure on education, Heckman (2002) argues that China has favored investment in physical capital at the expense of human capital. Its physical capital investment rate exceeds 40 percent. Physical capital and human capital are complementary inputs into production, and a policy skewed toward the former is unlikely to be efficient. Heckman's criticism suggests one possible source of public funds for tertiary education in China: diversion from physical investment toward education.

India has responded to widespread criticism that it favored higher education at the expense of basic education by decreasing the share of outlays to the former. The Central Government's share of expenditure toward higher education exceeded that of primary education until 1996–1997, even though the Central Government and state governments together spent more on primary education as a percentage of total education expenditure. From a high of 14 percent in 1985–1986, the share devoted to higher education decreased to 11.5 percent in 1996–1997, while the share for primary education increased from 46.3 percent to 50.1 percent during the same period. In comparison, China devoted 15.6 percent of its education expenditure to tertiary education in 1998. The decreasing financing emphasis on higher education in India appears to account for the decrease in the growth of institutions of higher education and the flattening of the enrollment discussed under **Flow and Attainment: Higher Education** (see page 15). While the emphasis on basic education in India is long overdue, given the stake it has claimed on information technology, biotechnology, and other sectors of the knowledge economy, India cannot afford to lose its edge in higher education.

Quality

Below we study the quality of education by examining the dropout and repetition rates of students. We also examine the quality of teachers, which research has identified as an important determinant of student achievement. Given that there is not much participation by Chinese and Indian students on international achievement tests, these are the only measures of quality to which we have access. Even here, data is not always available for the most recent years. However, dropout and repetition rates do capture an important dimension of quality, namely, the likelihood of successful completion, which in turn affects enrollment decisions. Therefore, examining these would allow us to shed some light on how good the Chinese and Indian education systems are, and how this affects the enrollment picture discussed in the section on Access.

For instance, Caucutt and Kumar (2007) show how families take the likelihood of successful completion as well as perceived gains, by way of increased wages, into account while making enrollment decisions. (See also PROBE, 1999.) They further argue that without improving the quality of schools, merely sending all children to school by enforcing compulsory schooling laws will be of little help. The improvement in the quality of education will automatically reduce the number of children who work, since their parents will more readily perceive the benefits of sending their children to school. (There are 14 million children engaged in child labor in India. China has strict laws against child labor.) While these conclusions are reached in the context of sub-Saharan Africa, similar considerations apply to China, and particularly India, where schooling quality is low.

Dropout Rates

Even if India succeeds in enrolling 100 percent of students in primary education, if the current situation persists, only 83 percent of students will reach grade 5. The dropout rate is often used as an indicator of the quality of the education system.¹² While the dropout rate for boys in primary education fell from greater than 60 percent in 1960 to about 38 percent in 1998 in India (Ministry of Human Resource Development, Government of India, 2000), this is still too high. India has some distance to go before it can ensure that the extra resources funneled into primary education are efficiently used. The emphasis in policy discourse needs to be on quality-weighted indices, such as survival rates, rather than on raw enrollment rates.

China has done better at the primary level, with a survival rate to grade 5 of 99 percent in 2002–2003. Even in 1990, China, with a 15 percent dropout rate at the primary level, handily beat India's 38 percent. By 1998, China's primary dropout rate had fallen to 0.9 percent and its lower secondary rate to 3.2 percent. At the secondary level, China's repetition rate in 2002 was 0.3 percent, compared with India's 4.8 percent. In other words, the higher raw enrollment rates in China go hand-in-hand with lower dropout and repetition rates.

Compared with both countries, South Korea had close to 100 percent of its students reaching the final grade of primary education as early as 1989.

Teacher Quality

Research has shown that teacher quality is an important determinant of student outcomes (e.g., Rivkin, Hanushek, and Kain, 2005). Though there is no agreement on measures of teacher quality, for emerging countries such as China and India, teacher training, education, and credentialing are important indicators. In China, the percentage of teachers with required qualifications set by the state has increased from 80.7 percent of all primary school teachers in 1991 to 94.6 percent in 1998. The remaining teachers are reported as "partially" qualified. At the lower secondary level, the percentage of qualified teachers has increased from 46.6 percent to 80.5 percent during the same time period. China's pupil-to-teacher ratio in 2002–2003 was 21, nearly half as much as India's ratio of 42. The presence of a full-fledged State Education Inspectorate that is responsible for monitoring schools, and a teacher wage structure that includes a fixed component as well as a component that depends on student scores, have no doubt played important roles in maintaining and improving the quality of teaching in China.

¹² See, for instance, Caucutt and Kumar (2007).

School choice is often flexible in China, and students can attend schools outside their neighborhood. Schools so chosen receive “choice fees” from students, a portion of which is used to pay bonuses to teachers. Since the choice of schools depends on their performance, competition exists among public schools even though there are no private schools.

According to the National Council of Educational Research and Training’s Fifth All India Educational Survey of 1986, about 87 percent of primary teachers in India have acquired a primary or elementary teacher training certificate of one or two years’ duration or a bachelor’s degree in education (NCERT, 1992). And 58 percent of teachers at the secondary and higher secondary levels have postgraduate degrees, 33 percent have undergraduate degrees, and 9 percent have a lower qualification. However, such statistics mask a pervasive problem in India: teacher absenteeism. Any degree of qualification on paper will be of little help if a teacher does not actually teach. According to Kremer et al. (2004), in a nationally representative sample of primary schools, 25 percent of Indian teachers are absent; only Uganda, with 27 percent, has a higher absenteeism rate in the list of countries for which they present data. The absenteeism varies from 14.6 percent to 41.9 percent across the states, with absenteeism decreasing with state income. Ease of access to school by way of better infrastructure (such as roads) and an increased frequency of inspection are found to decrease absenteeism, more so than compensation or local control. Given that absenteeism decreases with inspection, the monitoring role of the Village Education Committees set up in many rural areas acquires particular significance. Incidentally, the findings by Kremer et al. (2004) indicate that in addition to demography, infrastructure has educational ramifications.

As a fraction of its GDP, India spends more on education than does China and even South Korea. The high dropout rates and teacher absenteeism indicate that Indian expenditures on education are not being utilized effectively. Improving the quality of its education system is one of the largest challenges India faces. Higher quality of teachers, lower student-to-teacher ratios, better monitoring, and competition fostered by school choice all appear to have played important roles in keeping the quality of basic education in China high.

Relevance

Is the education imparted to students relevant for these two economies? For countries with diversified economies, the system must provide a variety of education alternatives relevant to the different occupations the economy demands. Students would then self-select into the education alternative suitable for them based on their interests, abilities, and incomes. As discussed earlier, the emphasis on science and technology at the higher level by both countries seems warranted, given the ambitions of both countries to become integrated into the modern global economy.

Vocational, or skill-specific, education could provide an alternative to university education and directly cater to the labor market. In China, the percentage of public education expenditure spent on vocational education increased from 3 percent in 1991 to 11.7 percent in 1997. In 1978, enrollment in technical and vocational education made up only 5 percent of the total enrollment. However, by 1994, of the junior secondary graduates who continued their schooling, 56 percent entered specialized technical or vocational schools, a total of more than 3 million students (Ministry of Education, People’s Republic of China, 2001). Since 1988, India has created 20,600 sections in 7,300 schools, capable of providing one million students with an alternative to the higher secondary education, which is more geared toward preparation for college (UNESCO, 2004).

Without detailed data on supply of and demand for vocational education, it is difficult to assess whether the above provision is sufficient or not. However, it is reasonable to presume that readily available vocational education can facilitate adult education and training, which, as mentioned earlier, is a crucial requirement for both countries.

Delivery

Education Infrastructure

Increasing enrollments at the primary and secondary levels, and the pressure this places on tertiary enrollment, argue for increased physical infrastructure in education in both India and China. The Ministry of Education, People's Republic of China (2001) identifies "grossly inadequate educational input" as one of the main problems facing Chinese education. The situation in India, especially in the rural areas, is even more dismal, despite the institution of schemes such as Operation Blackboard in 1987 to improve school infrastructure. While problems with infrastructure should not be overemphasized, schools that lack even the basic amenities are unlikely to encourage enrollment and completion.¹³

Given funding constraints, both countries may need to think creatively to find solutions, such as forging partnerships with the private sector and using existing infrastructure in "shifts" to deal with the provision of adequate infrastructure.

Technology

The governments of China and India both report increased technological content in their education (UNESCO, 2004). Indeed, an argument has been made that the technology integrated into the curriculum in India is too high and even inappropriate (Konana and Balasubramanian, 2002). Technology, in addition to being integrated with the curriculum, also needs to be viewed as a *tool* for reaching a larger segment of students. Falling costs of computing and communication (including television broadcasting) provide opportunities for distance learning, especially in rural areas. What is more encouraging is the fact that 20 percent of all higher education enrollees in India are in distance education (UNESCO, 2004). How best to provide distance education in China and India—gaining increased access while dealing with the lack of face-to-face contact—is an area worthy of further study.

Governance and Implementation

It is widely believed that the provision of primary and secondary education is better governed locally (see, for instance, Welsh and McGinn, 1999). Local needs can then be best understood and education can be provided effectively and efficiently. In the United States, for example, local school districts are responsible for management and oversight of schools, even though the curriculum is set by states.

Ironically, for a centrally planned economy, China decentralized the governance of schools much earlier than India. Village and local townships were given ownership of primary education when market-oriented reforms began in the late 1970s. Local governments under the leadership of the State Council administer education at the secondary level. Acharya, Baru, and

¹³ Rao and Cheng (2001) report no relationship between mathematics achievement and physical facilities and state that even makeshift schools that provide much-needed education in rural areas are better than no schools.

Nambissan (2001) credit decentralization as one of the main reasons for China's significant progress in the provision of basic education.

Indian attempts at decentralization, especially at the primary level, have been slow, while Indian colleges and universities have always enjoyed a great degree of autonomy. Only in 1986 did policymakers in India realize that the neglect of basic education contributed to its backwardness. At that time, school governance was decentralized to block and village levels (Acharya, Baru, and Nambissan, 2001; Rao, Cheng, and Narain, 2003). The greater prevalence of private institutions in India should aid the process of decentralization and curriculum innovation further.¹⁴

China's governance problem is one of bloated bureaucracy. According to the Chinese government's yearly statistical data, only about 50 percent of the total staff in institutions of higher education in 2003 were engaged in teaching full-time. The figure for specialized secondary schools was only slightly better, at 57 percent. The remaining staff were administrative personnel, logistics personnel, and auxiliary teachers.

¹⁴ An illustration of why innovation in curriculum and delivery might be needed comes from Rao and Cheng (2001). Their observation of math teaching in a sample of schools led them to conclude that teaching is more teacher-oriented in India, rather than student-centered as it is in China. In addition, Das (2002) notes the widespread emergence of private schools in India; they are no longer the urban phenomenon they once were.

Conclusions and Future Directions

We summarize in Table 4.1 the education indicators discussed earlier that exhibit marked differences between the two countries.

China's achievements in improving basic educational attainment have been spectacular. India started late, but has made great strides in basic education during the last few years. Secondary enrollments are far from 100 percent in both countries, especially so in India. A significant reversal has been in tertiary enrollment, with China exceeding India's enrollment ratios by the early 2000s. However, both countries will have to pay serious attention to the problem of educating their adult populations as well as making their colleges and universities comparable in quality with those in the industrialized countries.

China has made great strides toward gender equality. Gender inequality is severe in India, especially when adult literacy is considered. China's main disparity is in the geographic dimension, with the coastal populations better educated than those in the interior. The Indian rural population and those living in economically backward states are considerably less educated than those in urban areas and economically advanced states. While China is relatively homogeneous ethnically, India is diverse, and those who belong to the Scheduled Castes and Scheduled Tribes lag behind in enrollment and attainment.

Table 4.1
China and India: Education Profiles

Category	Indicator	China	India
Access	Net primary enrollment (2002–2003)	95%	82%
	Gross secondary enrollment (2002–2003)	70%	53%
	Gross tertiary enrollment (2002–2003)	16%	12%
	Adult (15+) literacy rate (2000–2001)	Total: 91% Male: 95% Female: 87%	Total: 61% Male: 73% Female: 48%
Resources	Public education expenditure (% of GDP, 2000–2001)	2.1%	4.1%
	Public + private expenditure per pupil in 1999 PPP \$ (1999)	Primary: 372 Secondary: 833	Primary: 303 Secondary: 295
Quality	Grade 5 survival rate (2001–2002)	99%	84%
	Primary pupil–teacher ratio (2002–2003)	Primary: 21	Primary: 41

SOURCE: All data are from UNESCO's Education Statistics or World Education Indicators.

China spends less as a fraction of GDP on education than India, but evidence indicates that China is using resources more efficiently. In India, dropout rates are high and teacher absenteeism rampant. Chinese schools are primarily state run, but there is a greater degree of decentralization in school governance than in India. India has significant private provision of basic education since government-run schools are of indifferent quality.

Important Strengths

Based on the above analysis, we conclude that the following are the main strengths of the education systems in China and India.

China

- With a history of egalitarianism and poverty reduction, China's achievements in primary education have been spectacular. The primary enrollment rate is close to 100 percent. This has allowed large segments of the Chinese population to benefit from manufacturing- and service-sector employment in a fast-growing economy. In this sense, China's recent emphasis on higher education has been the culmination of an "organic" growth process that has evolved bottom-up from an initial emphasis on primary and secondary education.
- The reduction in the gender gap in education has been equally impressive. Given the importance of female education and literacy in economic development, China has built a strong foundation for sustained growth and development. Education equality along ethnic lines has likewise been impressive.
- The decentralization of schooling administration, despite state-run schools and a bloated bureaucracy, coupled with an incentive-based wage structure for teachers and school choice have helped in quality delivery of education.

India

- A strong tradition of higher education coupled with an English medium of instruction has put India on the map of the global economy. It has allowed it to position itself as a knowledge-driven economy with emphasis on information technology and biotechnology.
- India's belated realization that elementary education cannot be neglected has already produced results, with increases in primary enrollment and attainment.
- The large-scale prevalence of private education provides India a flexible platform on which to enact curriculum and other reforms, even if this advantage has not yet been fully realized. The tendency toward innovation, such as the school-on-demand scheme of Madhya Pradesh, augurs well for Indian education.

Important Challenges

China

- The challenge of educating close to 90 million adult illiterates and integrating them into the modern economy is a daunting one. However, with low fertility rates and an aging population, this is a priority that cannot be ignored. Given the greater prevalence of illiteracy in the interior, indicators of regional inequality are much worse than those for gender and ethnic inequality.
- Further improvements in enrollment in secondary education and the quality of its delivery are needed. China still has some distance to go to catch up with other East Asian countries such as South Korea. Strong growth in productivity is crucial for sustained economic growth; this demands a better-educated labor force.
- As educational emphasis moves to tertiary education, and financing moves toward tuition and fees, better financing options need to be available to students and their families. China's opening up in the financial sector has not kept pace with its opening up in manufacturing; the financial sector needs to open up further in order to facilitate the provision of options such as student loans.

India

- Education of girls and improvement of literacy among the young adult women is of primary importance. This would result in benefits such as decreased fertility, decreased infant mortality, increased education, and increased HIV/AIDS awareness.
- Increasing enrollments will count for little if quality indicators are not improved. Dealing with dropouts, repeaters, and teacher absenteeism is crucial. An incentive-based wage structure for teachers and more intense monitoring of schools are required.
- Inequality along all dimensions—gender, geography, and ethnicity—needs to be reduced. Without a uniformly well-educated labor force, India's "demographic advantage" of a youthful population will remain illusory. Broad-based education is more likely to build a consensus on economic liberalization, as more people would benefit from the forces of globalization.

Important Opportunities

China

- With stellar achievements in primary education, China has the opportunity to take education to the next level and join the ranks of economies such as South Korea's by increasing secondary and tertiary education.
- Increases in tertiary education and English education would allow China to compete with India as a global outsourcing destination in the knowledge sectors by increasing the relevant labor base.
- As its universities expand, China can not only retain its own students who go to the United States and Europe for university education but also attract foreign students.

India

- Given its reputation in higher education, India can increase its export earnings by positioning itself as a destination for foreign students who desire quality university education at a more affordable cost.
- India's information technology expertise and improving communication infrastructure can be used to increase access to education in remote and rural areas.
- Private education, which is already widely prevalent in India, can be expanded to provide quality education responsive to market demands.

Future Directions

Throughout the analysis in Part Three, we allude to issues that deserve further attention. These are summarized below:

- Given their technological aspirations, a natural question that emerges is whether China and India should target higher education toward specific areas. Indeed, there is evidence that both countries are focusing their energies on graduating more students in information technology. What are the costs and benefits of such a strategy? What is the role of private institutions in responding to the demands of the labor markets of the two countries?
- India has a preponderance of NGOs in education and other sectors. How best can partnerships among the government, the private sector, and NGOs be structured to improve educational access to an ever-widening group?
- On a related note, China, despite a lack of private schools, has fostered a spirit of competition among schools by allowing freedom of choice among public schools. India has a preponderance of private schools, to which parents seeking quality flock. How do these different models compare in enhancing educational access and quality? What is the scope of private–public partnerships in education in these two countries?
- Can education schemes such as *Progresá* of Mexico, which subsidizes forgone earnings by children in addition to their direct tuition, be adapted to the Indian situation to improve enrollment among poor children?
- Distance education might provide an opportunity to increase access to education in the remote rural areas of China and India. How, and at what levels, can distance education be provided? What are the pros and cons of such a strategy?
- In addition to providing educational access to their own citizens, would it be profitable for China and India to become effective exporters of higher education, especially to the developing world?
- Can the lessons learned in the United States about the stage of the student life cycle at which affirmative action programs are likely to be most effective be applied to India, which has an extensive affirmative action program?

The progress that China and India make on education will be watched with keen interest around the world. Economic reforms have energized millions in their labor forces, and the con-

sequences are already being felt in the global labor market at either end of the skill spectrum. Low-end manufacturing jobs as well as high-end technology jobs in industrialized countries face stiff competition from China and India. Similarly, the potential explosion of inventions and innovations that could result from this great movement is of importance not only for the inhabitants of these countries (who constitute nearly two-fifths of the world's population) but also for the world as a whole.

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