



THE CHALLENGE FROM ASIA



The Challenge From Asia

Mark Tucker

National Center on Education and the Economy

April 2006



Preface

This report was prepared as part of a research program designed to inform the work of a commission assembled by the National Center on Education and the Economy in the spring of 2006. Our task was to analyze the dynamics of the global economy and the implications of those dynamics for education and training in the United States. This work was undertaken not least because of the rise of China and India as major players on the world economic stage, and the ability of those countries to field a growing number of highly skilled professionals willing to work for wages far below those prevailing in the United States for comparably skilled workers.

In addition to an extensive review of the relevant literature, this paper draws heavily on field research done in China in October 2005 and in India in March 2006 as part of an international comparative study conducted by the National Center on Education and the Economy. The research team for the current study, in addition to the author, included Judy Coddling, Barbara Rivard, Betsy Brown Ruzzi, Susan Sclafani and Mark Troppe for NCEE; David Marsh, Associate Dean of Academic Programs at the Rossier School of Education at the University of Southern California; Karthik Muralidharan, a doctoral candidate in economics at Harvard University; Ben Vickery, of the National Institute for Standards and Technology and Yong Zhao, Distinguished Professor at Michigan State University. I am indebted to Judy Coddling, Betsy Brown Ruzzi, Mark Troppe, David Marsh, Karthik Muralidharan and Yong Zhao for their extensive comments on the drafts of this paper.

This research was supported by the Hewlett Foundation, The Bill and Melinda Gates Foundation, the Annie E. Casey Foundation and the National Center on Education and the Economy. This paper also draws on material gathered by Marc Tucker and Judy Coddling during a number of earlier trips to China and Southeast Asia. We also want to acknowledge our debt to the Asia Society, which sponsored several extended trips to China and India in which Coddling and Tucker took part and which also contributed to our knowledge of these two countries. Our fieldwork in India was considerably aided by a descriptive essay on education in India prepared by Betsy Brown Ruzzi and Gretchen Rhines Cheney, also available from the National Center on Education and the Economy. We are indebted to Betsy Brown Ruzzi for her careful and thorough work in planning our visits to these two countries, without which our research would not have been possible.

While the research on which this report is based is the result of a team effort, the author takes sole responsibility for the conclusions drawn here.

The Challenge from Asia

Summary

The paper begins by observing that the rise of Asia in recent year invalidates the arguments made by the 1990 Commission on the Skills of the American Workforce that the United States could assure a high wage, high employment future for itself simply by raising the educational achievement of its workforce to the levels achieved by the highest performing nations in the West, because China and India can produce large numbers of well educated professionals willing to work for substantially less than their American counterparts. It goes on to explore in detail the nature of the economic challenge from China and India, identifying points of strength and weakness in each country's approach, with particular attention to the likelihood that the education system of each country will be able to continue to support the current steep trajectories of economic growth. The two countries are then explicitly compared to each other with respect to their short and long term prospects. Finally, conclusions are drawn as to the nature and seriousness of their economic challenge to the United States and the implications for education and training policy in this country. In sum, the author concludes that, while the near term challenge may have been exaggerated by the press and many analysts, the long term challenge should not be underestimated and could result in a steady downward pressure on the standard of living of most Americans unless strong measures are taken now to not only raise educational achievement in the United States, but also change the goals of our education system.

In 1989, prompted by the long term decline in the average real wages of working Americans, the National Center on Education and the Economy created the Commission on the Skills of the American Workforce, to examine the causes of the decline and the implications for education and training policy in the United States. The Commission's report, *America's Choice: high skills or low wages!*, released in 1990, captured the imagination of the country and resulted in major changes in national and state policy.

Based on extensive comparative research in Asia, Europe and North America, the report concluded that the globalizing world economy was resulting in the development of a world wide market for people with only the skills needed for low-skilled work, and that world wide market would drive down wages for such people to those paid by the lowest cost countries in the world. The only way for

the United States to compete in that market would be to lower our wages for low- skilled work and increase their hours worked until they matched the wages and hours of the lowest cost producers.

The alternative to that path, the Commission said, was to abandon low-skill work and turn the United States into a producer of high value added products and services for consumption at home and abroad. But, in order to implement that strategy, the United States would have to embark on a major, sustained effort to greatly upgrade the skills of the majority of the work force until they reached world class levels. Based on the National Center's extensive comparative research on other nation's education and training systems, the Commission proposed the creation of standards based education and training systems in the United States that would incorporate the best features of the standards based systems observed by our research team in those countries with the best performing education and training systems.

The unstated assumption made by the Commission was that only the advanced industrial nations had the resources required to develop world class education and training systems at national scale. Because that was so, and all of the advanced industrial countries wanted to maintain relatively high wage structures, they would not compete on the cost of labor.

No one then imagined that less developed countries could field highly educated and trained workforces of any significant size, so we all assumed that the advanced industrial countries would have the market for high value added products and services for themselves and could continue to pay high wages while enjoying high employment at the same time.

But we were all in for a surprise. When the first reports of the Third International Mathematics and Science Study came out in the mid-1990s, it was clear that Singapore, Hong Kong and Taiwan were among the highest performers in school mathematics and science worldwide. But these were city-

states, nowhere near large enough to challenge the major North American, European and Australasian countries in a serious way.

But then came the rise of China as a world center of manufacturing and of India as a leading software services supplier and operator of call centers. Suddenly, we were told that China was producing 600,000 engineers a year and India was producing 400,000 more, a total of one million engineers a year to our 60,000. Both countries had mastered nuclear technology and other advanced technologies and both were sending school children to the United States who were testing at two or three years ahead of their middle school and high school peers in some of America's leading school systems. To everyone's surprise, and seemingly overnight, these countries had succeeded in producing large numbers of workers who could claim to be among the best educated in the world. As if we needed proof, some of our leading multinationals began to locate advanced research laboratories in those countries.

Not only were these countries developing large numbers of young people with world class skills and knowledge, but these young people were entering their economy willing to work for a small fraction of the wages commanded by similarly educated Americans. The analysis made only 16 years ago by our Commission was no longer valid. It was still true that those who left our high schools with low skills could confidently look forward to ever lower wages. But now it was also true that those who left with high skills could not be confident that they would be earning high wages. Could it be true that we are all looking forward to a low-wage future, no matter what we do?

So the National Center on Education and the Economy decided to create another commission, to revisit the issues addressed by the first one in the light of what had happened in the intervening period and report to the American people. Our first task was to try to assess the character and extent of the competitive challenge from Asia, especially China and India, and to analyze the implications for American policies and practices in education and training. This paper is a preliminary report on that research.

CHINA

Years ago, when Deng Xiaoping took the reins of power in China, he concluded that there would probably not be a new world war and so decided that the country's leadership could safely make economic growth their primary goal. Deng then authorized some experiments in Guangdong Province that proved to be the entering wedge of the introduction of the market economy in that country, which of course led directly to China's explosive economic growth.

In recent years, our business press has been nearly obsessed with the dramatic rise of China, a natural consequence of the steady transfer of American manufacturing jobs to that country, the unprecedented and growing trade imbalance with China and the increasing American debt held by the Chinese.

In the early years of China's rise, many people assumed that, when everything was sorted out, China would end up being the world's factory for low value added products, but the West would continue to produce the high value added products and services that sustain high employment, high wage economies.

Over the last year or two, however, we have heard of more and more multinational firms transferring their R&D operations to China, and in the last few months, that giant semiconductor fabrication plants and hard disk manufacturing plants are being located there.

At the same time, we have been reading reports that Chinese universities are turning out hundreds of thousands of capable engineers every year from their burgeoning university system, on the order of six to seven times the number of engineers produced every year in the United States. And we have heard, too, of a comparable increase in the number of new managers emerging from their new business schools.

No one was surprised to learn that the Chinese were unwilling to accept their assigned status as producer of low value added products for the world, while the West retained the right to produce the high value added products on which real wealth depends. What was surprising — and frightening — to many was the news that China might be well on the way toward building the kind of highly trained workforce that would enable it to run away with the grand prize: an economy that could corner the market on the whole range of manufactured products, including the most advanced that the world has to offer. It looked as though China might be creating an economy that could run on the slogan of high skills *and* low wages, thus putting it in a totally impregnable competitive position.

So five of us went to look. We read an enormous amount of material and, in two grueling weeks of field research, talked to over 200 people in government at every level, businesses, educational institutions and other think tanks. We attended seminars, watched presentations, read the English-language newspapers daily, walked around factories, visited research parks, and sat in on classes. We talked at length with students at every level of the system. We got the official line and heard what the critics had to say. We read everything we could get our hands on.

China is an enormous country undergoing tumultuous change. It is highly decentralized. The result is constant surprises. So we reserve the right to change our minds about almost anything as our research continues.

The Chinese economy and education system are two sides of one coin. All the way through, you will find a kind of on-the-one-hand-but-on-the-other-hand quality to this narrative. That accurately reflects our investigation and our intense conversations with each other as we ranged through Beijing, Shanghai, DongGuan, Shenzhen, and Hong Kong, adding to what we had learned from earlier trips to these places, Xian and other places in urban and rural China. One moment, China looks like a juggernaut and the next like Gulliver. So get ready for a bumpy ride.

Judging from the front pages of our press, China is the world's 800 pound economic gorilla. There are some respects in which this is true and others in which it is not. The next few paragraphs sum up a recent article in the Far Eastern Economic Review that will help us to keep things in perspective.

China's economy has been growing at a real rate of 9.5 percent for the last 25 years. Lately, Chinese exports have been growing at a rate of 20 percent a year. But China is still a poor country. Its per capita income is in the same range as that of Egypt, Syria and Paraguay. Its exports are still lower than those of Germany and the United States. And Japan, Germany, Canada, Ireland and Norway all run higher trade surpluses.

What is important about China's export profile is that it is highly concentrated in a few industries like electronics, electrical equipment, home appliances, garments, textiles and footwear. Because its share of world exports in these industries is as high as 50 percent, it is causing a great deal of unemployment among workers in these industries in those countries that used to dominate these industries, including the United States. The rise of some of these industries in China has taken place with lightening speed.

The impression we have is that everything we buy in these industries — from consumer electronics to refrigerators to the clothing on our backs — is now "Made in China." That is not so. That is what the label says, but the label is misleading. Many of the components are actually made in other parts of Asia and sent to China for final assembly. This is particularly true of the high value added components. So it turns out that China's towering trade surplus with the United States is in large part offset by China's growing trade deficit with these other Asian countries. Stuff, in other words, that we used to buy directly from Thailand and South Korea and other Southeast Asian countries is now sold to China, and then resold to us as components of things that we buy from China. The margins on the assembly work that China does are often lower — sometimes much lower — than the margins on the work done by these other countries. The

value of these other countries' exports to China has been increasing at an annual rate of 20 percent to 30 percent in recent years. When you look at the whole picture, the competitive threat from China is more modest than it at first seems, both because it is confined to a relatively short list of industries and because this 'workshop of the world' includes among its producers not just China, but many other countries of the Pacific rim as well.

And then there is the question of who exactly we are competing with. Deng Xiaoping's strategy for export-led growth relied heavily on attracting foreign firms to set up shop in China, drawn there by its low labor costs and investor-friendly policies. But one of the results is that, thus far, and in real contrast with India, few Chinese firms have been successfully launched on the world stage. Sixty percent of China's exports still come from foreign-invested enterprises. They typically do their R&D, design, component production, marketing, sales, logistics and distribution outside China. These offshore companies, many from the United States, typically make much more from Chinese exports than Chinese firms do, because the cutthroat environment of business in China leads to very small margins for Chinese firms.

Still, you might say, a 20 percent per year growth rate in exports is phenomenal, as is an overall growth rate of 9.5 percent, year after year after year. Won't China's very low labor costs and its inexhaustible supply of labor ultimately enable it to deal a devastating blow to the American way of life as it gradually comes to dominate industry after industry? And what, you might ask, is to prevent the Chinese from doing their own R&D, logistics, supply chain management, design and all the rest of the high value added jobs in the economy?

The answer, it turns out, has to do with human resources. The manufacturers we talked to told us that they were having a hard time finding engineers who could do what international firms expect them to do and they were in a state of full-fledged panic when the subject turned to finding competent managers. The best engineering graduates of the leading Chinese universities are not available; they

typically head for jobs in the advanced industrial countries. Because most Chinese engineering schools don't have the kind of budgets they need for equipment, and because Chinese education traditions value theory over practical applications, Chinese engineers frequently come to the job never having laid an eye on the kind of equipment they are expected to use. One employer told us that engineers coming into the printing industry were trained on a cardboard cutout of a Heidelberg press (still the industry standard), because their school could not afford to buy the real thing.

There are over 2,000 universities in China. Of these, 100 have been designated national research universities. Of these, the top 31 are intended to be world class. The business executives we talked with said that many graduates of the top 10 went abroad, and few below the top 31 were qualified to work in international firms. This imposes a real constraint on the growth of Chinese industry. Despite an annual production of hundreds of thousands of engineers, the Cherry Automotive Company of China, the country's largest automotive company, is reportedly importing engineers from the United States.

But that is not the most important constraint, even from a human resource point of view. The biggest problem is managers. Many foreign-owned firms set up shop in China with business plans that called for starting with a cadre of expats as senior managers, to be replaced with Chinese, at a much lower cost, within two or three years. It is not working out that way. The highest status in the Chinese system goes to engineers and scientists. Managers are much further down the totem pole. So only those young people who cannot get into engineering programs go into the management schools.

China has a very authoritarian culture. This comes in part from its Confucian roots, which place a very high value on veneration of one's parents and ancestors and on respect for those in authority, and in part from the Communist government. One cannot understand modern China without understanding that the Communist Party has not given up its control of Chinese society. To take one important example, the party officials in the universities, not their presidents and

provosts, have the last word on who gets hired, including into professorial posts. We were told that people who seem likely to take an independent line on anything the Party cares about will not be hired, and those who have been careful to curry favor with the Party officials in the university are more equal than others when positions are filled. Thus economists who have explanations for economic behavior that do not fully accord with Marxism-Leninism need not apply. In these and many other ways, those with ideas in many other fields that do not conform to the orthodox are weeded out and almost everyone learns from an early age that conformity pays.

One consequence is that Chinese managers tend not to show much initiative, defer to their superiors whether or not their superiors are worthy of deference, and wait around to be told what to do. Education generally is not very hands on and Chinese management schools, unlike American ones, do not require that entering students have some actual management experience. So graduates of these schools come to work not knowing much and waiting around to be told what to do and how to do it. This may be a caricature, but it was told to us so often by the Chinese and foreign business executives with whom we talked, that we came to believe that there is more than an element of truth to it.

Because capable managers are in short supply, it is a sellers' market. Incumbents are always looking for their next job. Tours seem rarely to last more than a couple of years and, with surprising frequency, executives depart for their next job within months of accepting their last one. It is not uncommon for capable people to get offers to double their salary on the spot. The result is that foreign-capital firms are paying native Chinese managers with the right skills and experience as much as they paid expats to do the same work.

This problem, combined with the swiftly escalating costs of land in the coastal provinces and rising costs of commodities on the world market, is driving up the cost of doing business in those provinces very quickly. In Tianjin, the "Diamond of the Bohai Gulf," a major industrial and port city near Beijing, the fully loaded labor costs are twice what they are in other parts of Southeast Asia. Investors

continue to come to China because of the enormous internal market, modern deepwater ports, good infrastructure, excellent logistics and generally supportive government officials. In time, this closing of the gap between the cost of doing business there and in the West will make China less of a threat to the rest of the world. In the meantime, the problem of finding engineers who can meet international standards, and, particularly, the challenge in finding capable managers, will impose real limitations on the continued growth of Chinese enterprises.

Or maybe not. One possible solution to at least some of the problems I have just described seems to be emerging in the form of what might be called the superregionalization of the Chinese economy. Up to now, Beijing's policy seems to have been to set every jurisdiction in China into competition with every other one. But that is now changing.

One of several examples of superregionalization is the case of the Pearl River Delta. Hong Kong island sits just south of several other islands that, in turn, lie just to the south of a vast region through which the Pearl River and its associated tributaries and offshoots drain. The cities and provinces in this region, including the Hong Kong special administrative region, recently joined together, with the active encouragement of Beijing, to promote the economic growth of the region. The concept, as related to us by top Hong Kong officials, is for Hong Kong to become the 'brains' of the region, with the other provinces supplying the brawn. This is a very powerful idea. It has been very difficult, up to now, for foreign firms to do business here because, among other reasons, the mainland Chinese do not feel bound by the provisions of the contracts they sign; because there are a bewildering array of potential suppliers and it is very hard to assess their capabilities and because the mainland Chinese, notwithstanding the provisions of the WTO treaty, have very little regard for copyright restrictions. And then there are all the problems of getting quality management and other professional staff mentioned above.

But Hong Kong is full of very capable managers, understands international finance, is in a position to assess the capabilities of mainland suppliers, will stand by a contract, respects intellectual property rights (more so, at least, than the mainland) and so on. Hong Kong, in other words, is in a good position to provide the high value added business services that are in such short supply on the mainland. Properly married to the extraordinary resources of the mainland, the combination could be dynamite. Or at least that is the theory, still to be tested.

Please note, the size of the population whose governments are signatories to the regional treaty just described is somewhat larger than that of all of Europe! And there are several other conurbations of coastal provinces that have much the same potential as the Pearl River Basin, including and especially the collection of provinces around the Yangtze River basin, combined with the resources of Taiwan.

It is not unimportant to note that we have never seen anything to equal the sheer determination and energy of the Chinese with respect to economic growth. Whether or not superregionalization ends up defining the future path of Chinese development, this determination will be a force to contend with. When the government in Beijing understood that competitiveness in many countries, especially in Europe, would depend on meeting international quality standards, it simply mandated compliance with those standards on the part of its companies producing for export. When QuangDong's leadership saw that its firms could not compete for labor with the provinces in the interior, it mandated a 17 percent increase in wages. Little wonder that more than 80 percent of the refrigerators sold in the United States are manufactured in Quangdong.

There is more to be said about the Chinese economic challenge, but it is time to expand on the subject of education and training in China, from the perspective of their contribution to the nation's modernization.

One can only begin by commenting on the Herculean effort that China has made to extend compulsory schooling through nine years, improve school attendance in the compulsory years and reduce illiteracy in the working age population. The proportions by which these gaps have been closed, combined with the numbers of individuals affected, even if one is quite skeptical of government claims, is breathtaking.

One must remember, too, that in the late 60s and up to the late 70s, during the Cultural Revolution, schools and universities everywhere were closed down. Many faculty hid out in the mountains; many others were sent to the countryside to work doing manual labor. In 1978, when the Cultural Revolution was over, university faculty slowly returned from the countryside to reclaim their campuses and started to rebuild their shattered institutions. Even as recently as 1993, university faculty could be found living at the end of muddy unpaved roads in dormitories with leaking roofs, with communal toilets and kitchens in the common hallways, working for the equivalent of \$100 US a year.

Deng Xiaoping, who was deputy premier during the Cultural Revolution, became the power behind the throne afterwards. It was Deng who played the key role in opening China to the West. For Deng, the key to China's future lay in economic growth and the key to economic growth lay in education, science and technology. The challenge he faced was how to jump start a nation that was very far behind the West and whose intellectual resources had been largely destroyed by the cultural revolution. His strategy for addressing this challenge was to arrange a massive transfer of intellectual capital from West to East. The first step occurred in the late 70s, when he began sending people abroad in large numbers to be educated in the West. It is estimated that some 80 percent of the current top leadership of China, right down to department heads, was educated in the West, predominantly in the United States. And, just as Deng hoped, they brought back Western ideas when they returned. It is arguably the case that one of China's biggest and most important educational revolutions took place right here in the United States.

Later, as Deng found the money to invest in the development of higher education in China, he embarked on round two of his program of intellectual transfer; he insisted that Chinese universities establish units in the office of the president of those universities with the express purpose of fostering serious, long term exchanges and partnerships with major Western universities. This was a natural extension of his initial strategy to jump start the Chinese education system by directly accessing the best intellectual resources in the West.

In time, Deng set a goal of building 100 research universities in China, each of which would have at least one department or discipline regarded as world class. Later, his protégé, Jiang Zemin, established the goal of having a smaller number (now 31) of universities of the first rank. Of those 31, two, both in Beijing, have been designated as the best in the nation and receive the highest levels of investment.

But all university systems are no better than the systems of primary and secondary schools that supply their students. So what can we say about China's schools?

I begin with the observation that Hong Kong scored among the top four countries in the recent PISA (OECD) international comparisons of educational achievement in mathematics as well as in problem-solving. Mainland China has not thus far agreed to participate in PISA (we are told this is because of the poor performance they expect from their rural provinces), but the people in Hong Kong in a position to know thought that mainland Chinese children would score even higher in mathematics than the Hong Kong children did. The limited data that are available from the Stevenson-Stigler study suggest that this might in fact be true.

That is, of course, just plain extraordinary for a very poor country. There are two reasons for it. The first reason is the very intense pressure on Chinese children to do well in mathematics (a subject to which I will return in a moment). The second is the high quality of mathematics teaching in their schools. The quality

of mathematics teaching in China is not news. Jim Stigler, Harold Stevenson and Liping Ma have written eloquently on this subject over the last several years. The essence of the story has to do with the heavy emphasis on early and continual mastery of the key conceptual foundations of mathematics. In a nutshell, the Chinese end up understanding how and why the mathematics works while our students are learning to do the operations with little understanding.

The part of the story that has not been widely reported has to do with the extraordinary pressure that Chinese students are under to learn mathematics. This story actually begins in the Chinese universities. These universities are finely graded by status by the Chinese Ministry of Education. Every year, students in Chinese high schools who want to go to university take the entrance examinations given by the central government and the provinces. All students must take exams in Chinese, English and mathematics. The score on the mathematics part of the university entrance exam counts for not less than 25% of the total score, whether that students wants to study engineering or music. Each university is allocated a certain number of slots by the Ministry of Education. The candidates are sorted by their scores on the exams. Thus, the students with the highest scores are allocated to the universities at the top of the status hierarchy and then within the university by the status of the department within the university (so Peking University gets higher scoring applicants than almost all other universities and the school of engineering gets higher scoring students than the school of management).

So, voila! Performance on the mathematics exam turns out to be one of the most important factors in determining a student's future, irrespective of what that student might want to do in life. Only the score on the exam matters. Students are not interviewed, nor are their extracurricular activities taken into account. No one cares whether they demonstrated leadership or have had experiences that might make them better people. Nothing else matters. Little wonder that a great many students all over China at every level of the system are working like blazes to do as well as possible in math.

When I say, “works like blazes,” I mean exactly that. By our rough count, corroborated by observers who know both countries well, Chinese secondary students typically spend twice as many hours a year studying as American students do. And it is not just time. We interviewed secondary school students wherever we could, and a large fraction reported very, very high anxiety about their exams, especially their mathematics exams. They clearly work very hard at mastering the material.

The exam itself is designed for sorting, not for finding out whether the student has learned the kind of math that might be useful to him or her. Many prompts are actually trick questions, designed to trip up the unwary and often require knowledge of some abstruse, obscure point that would rarely be used by a student during the rest of his or her life.

We interviewed a very impressive dean of an engineering department at one of China’s leading universities who told us that his department had applied to the Ministry for permission to change the admission standards for his department. He and his colleagues wanted to be able to find out whether applicants were likely to have leadership abilities, could think out of the box, could work effectively in groups, use their engineering knowledge to solve unexpected problems — all qualities that their customers, domestic and foreign firms, had told them that they badly needed. The Ministry turned them down.

Why? The people we interviewed in the Ministry know that the exams are flawed and they know that China badly needs the very kind of qualities that this dean and his colleagues wanted to sort for. But the exam enjoys overwhelming support from Chinese in all walks of life. This is because, in a highly corrupt system, the exam seems to many to be the last redoubt of objectivity and merit.

It is, by the way, possible for the authorities to jiggle the exam results to a degree to accommodate party officials and other powerful people, but, on the whole, the extent of such corruption is small compared to the corruption in other parts of

the education system. What do I mean by corrupt? Almost all the students in the top 100 universities in China are products of the “key” high schools. These elite schools are designated by the provinces and cities, just as the “Key” universities are designated by the Chinese Ministry of Education. Elite universities and elite high schools are designated for extra state investment. But they are also permitted to set aside a certain proportion of slots and use them to enroll students who do not meet the entrance standards they have for regularly enrolled students. These slots are allocated to students whose parents are prepared to pay substantial tuition charges. The lower the student’s score on the high school entrance exams, the higher the tuition charge. Thus these schools are, in American terms, a combination of public and private school. In some schools, the charges for the tuition paying students have permitted these schools to build up very large endowments, build very expensive buildings and pay their teachers much more than teachers are paid in the regular state schools. In this situation, it is easy to see why parents who could not pay such charges are afraid that if there were no exam, their students would not stand a chance of going to good schools no matter how strong their record was.

In many of the same schools, students who do not need any tutoring are tutored nonetheless, because their teachers, who make additional income by tutoring, are known to deny needed opportunities to students who refuse to get tutored. This not so subtle form of blackmail is apparently endemic in the better schools and provides even more reason for parents to believe that the exams are a vital bulwark of fairness in their education system.

The Ministry of Education and the top officials in the big city systems will tell you that there are no “key” or elite primary or junior middle schools. But everyone else will tell you that they are alive and well, despite official discouragement, because the provincial and local officials find it in their interest to give extra funding to the schools in which they have a right to enroll their own children. They may not be called key schools, but they walk and talk like key schools.

Though ordinary Chinese schools are public, that does not mean that they are free. Tuition is charged virtually all students, in addition to a wide range of other fees. These charges and fees represent a very heavy burden for poor rural families, which is why many rural families do not send their daughters to school after the first few years, despite the requirements of the compulsory education law. The tuition and fees are voted and collected by the — typically unelected — village councils, who often stuff the schools with incompetent relatives and supporters, thus increasing the tax load on the farmers and foisting incompetent teachers on their children. This system accounts for some measure of the simmering resentment in the countryside.

These comments about tuition in public schools lead to another point. Whatever rights a Chinese student has to an education in the public schools is limited to the province or city in which their parents are registered. The children of migrant workers (that is, workers who migrate from the interior of China to the wealthy coastal provinces in search of work), of which there are now vast numbers in China, do not have the right to go to the public schools in the provinces or cities to which their parents have gone to work. Any education they do get they must pay for in full. Thus private education in China is often education for the very poor. Its cost, if they choose to pay it, is often a very large fraction of their incomes, and the schooling is typically of very low quality. There are exceptions to this rule. Provinces and cities can choose to turn immigrants into citizens, but this right is typically awarded only to government workers and other relatively well educated (and therefore upper class) people who are invited into the province or city to fill professional positions in the workforce. As much as fifty percent or more of the population of some of the coastal provinces is made up of such migrant workers and their families, and these restrictions on their rights has the same potential for social dynamite as we have seen among the second and third generation guest workers in France and other European countries.

Some observers describe Chinese classrooms as brutal, places where students are bullied and yelled at by their teachers. We did not see any of that. What we did

see is a curious — for us — blend of a very demanding classroom manner on the part of teachers combined with an embracing pastoral care. Teachers expect a lot in class and make those expectations very clear. But, at the same time, the school staff, particularly in the boarding schools, readily accept a responsibility to support the students in all the dimensions of their personal, moral and physical development. Whereas our teachers are accustomed to a very sharp line between their responsibilities and those of the students' parents, in China school staff see themselves having personal responsibility for the development of the whole child. We saw this everywhere, but nowhere more than in the boarding schools, where the faculty is responsible for the students 24 hours a day.

But all of this is in the context of a very authoritarian environment. I pointed out above that Confucius strongly emphasized the responsibility of children to obey and venerate their parents and of adults to acknowledge and accede to the authority of the state. However much the Communist state may have hated religion, it nevertheless created an environment in which it could be and often was fatal to challenge authority. The results can be seen not just in the universities, but also in the primary and secondary schools.

Everywhere we visited schools in mainland China, students made very impressive performances for us, but often, when questioned on their performances, were unable to talk about them in a way that convinced us that they understood what they had read, could think independently about it, or were willing or able to challenge the version of reality with which they had been presented. Very often, we discovered that the performance we had seen and heard had been memorized by students who were at sea when asked to do anything other than recite.

So we ended up with something of a paradox. The Chinese may well be producing some of the most mathematically adept population in the world, and therefore have the potential for producing one of the world's most capable workforces in the vital fields of science, mathematics and engineering. But, at the same time, they have a culture and an education system that may make it

singularly difficult for them to cultivate the creative, innovative and entrepreneurial abilities that may prove most important to economic success in high wage societies in the future.

The Chinese are very aware of this paradox and determined to do something about it. And they may have the means. I have been careful to refer here to mainland China. If you were to construct a dimension line extending from mainland China to the United States on the variables I have been discussing, you might want to place Hong Kong halfway between the two. We got plenty of stiff, memorized performances from Hong Kong students, too. But when we asked the Hong Kong students to talk about what they had said in their presentations, they had no trouble doing that. Hong Kong is busy revising its curriculum and changing its exams to take account of the problems we have described on the mainland, without lowering their standards. The Hong Kong authorities have studied the West very carefully and are determined to get the best of the West without giving up any of what they value most in their own culture and traditions.

If Hong Kong succeeds in its alliance with the mainland Chinese provinces bordering on the Pearl River Delta, its education system could provide the kind of intellectual and managerial leadership that the alliance will need for the next stage of development. Over time, the other provinces could adopt many of the educational policies and practices that have enabled Hong Kong to join the ranks of the most highly developed societies in the world.

All through our most recent visit to China and after, our team furiously debated whether the glass was half empty or half full — whether the problems we saw would prevent China from rising to the economic front rank among nations or whether China was likely to overcome those problems to do exactly that.

The progressive educators among us were very put off by the intense anxiety among the very large fraction of the secondary school students who lived in daily fear of shaming their parents by poor performance on the exams, the

deflated attitudes of the students in the ordinary secondary schools who had given up because they had not managed to get into a secondary school with a strong record of getting its students into university, the crushing inequities of a system in which wealthy “key” schools existed literally right across the street from impoverished ordinary schools at the same level, the appalling unfairness of the system that prevents the children of migrant workers from gaining access to the public schools, the rampant corruption of a system in which places in good schools were sold to the wealthy parents who could afford them, and the lack of anything approaching real academic freedom in the universities, to say nothing of engineers trained on cardboard cutout models of the equipment they were supposed to be able to operate, university hiring decisions being routinely made by political operatives, and systematic underinvestment by the authorities in the education system as a whole.

But, at the same time, we had to acknowledge that astounding advances had been made in a very short time in school attendance rates and adult literacy, universities and research parks were being constructed and put in operation at dizzying rates on an enormous scale, mathematics achievement was remarkable and the production of engineers far outstripped the rate in the United States.

It is all too easy to be smug when viewing China from a Western perspective. But China has a way of holding up the mirror to our own country. Which of us would profess to be shocked when told that school district payrolls in this country are often stuffed with incompetents who just happen to be relatives or supporters of people on the school board? Or that very wealthy (ostensibly public) schools accessible only to the children of the very wealthy families that can afford to live in those communities exist only a few miles from very poorly equipped and staffed schools serving only the very poor? Or that many students in our system whose parents expect them to attend the best private universities in the land are driven by the same anxieties that drive the best Chinese students? Who is to say which is worse — a system that expects very little of most students and so puts very little pressure on them or a system that expects much and puts much more pressure on them?

Most of the problems we saw in the Chinese education system are problems that the Ministry has acknowledged and is trying to solve. They want their students to be more independent, to be able to apply what they have learned to real world problems, to be more creative. They want to put an end to rote learning and promote problem solving and critical thinking. They are very worried about the inequities in their system, particularly for the rural schools in the interior and the children of the migrant workers in the coastal cities, and are trying to redirect resources to address them. They want to build a more effective vocational education system. And they want to eliminate the defacto system of favored elite primary and lower secondary schools.

These are all daunting challenges. But, given the Chinese record of success over the last three decades, one would be foolish to bet against them. The most serious issues, though, are not on this list. They have to do with the deeply rooted nature of the authoritarian system in China, briefly discussed above. It is precisely that high regard for authority that has enabled China to make such striking progress on such an enormous scale. But it is that very set of values and its influence on individual behavior that may constitute China's greatest obstacle to success in the years ahead. We will return to this issue below.

INDIA

Until recently, India was something of a standing joke among economists, the appallingly poor country that produced, and kept on producing, a highly educated elite, who, year after year, had to leave the country because there were no jobs for them. No one is laughing anymore.

While India's growth rate in its first four decades averaged around 4 percent, it zoomed up to about 7 percent over the last fifteen years, and is now about 8 percent. Top Indian officials, several of them trained as economists in the world's leading universities, are talking confidently about pushing it to 10

percent over the next couple of years, a rate that would match China's torrid rate of growth.

Just as China can be divided into the economy of the coastal provinces and the economy of the interior, India's economy can be divided by a line that runs from about 11:00 am on a clock superimposed on the country to a point at about 3:00 pm. Overall, India's standard of living matches Nigeria's. Northeast of the line just described, however, India's standard of living is roughly comparable to that of sub-Saharan Africa. To the southwest of the line, it roughly matches the standard of living of Indonesia, much better than India's northeast, but still below the standard set by the wealthier economies of Southeast Asia.

It would be hard to overstate the optimism in this, the largest of all democracies in the world, embracing over a billion people. The Indian stock market gained almost 50 percent in value over the last ten months. A succession of the world's leaders — George W. Bush, Tony Blair, Jacques Chirac, among others — have paid homage to India with highly publicized visits to Delhi over the last year. To many Indians, it is obvious that India's turn has come on the world's stage, just as it is obvious to many Chinese that this will be the Chinese century.

But, just as in the case of China, we came to the conclusion that the truth is a little more complicated, and the future full of challenges for India. And just as in the case of China, we came to believe that the future will depend in very important ways on what they do about education.

Given the terrible state of the Indian economy in the decades following 1947, the year India gained its independence from Britain, one might conclude that Indian business managers suffer from many of the same shortcomings just described among the Chinese. This is not the case at all. In the Indian caste system, the gurus-scholars are at the top, followed by the warrior class, followed by the businessmen and traders, with other castes below. Over the centuries, this trader class developed formidable business skills which were put to good use in the Raj, when Britain ruled India. In that period, right up to independence, several key

families, most from the Northwestern state of Gujarat, built great industrial empires. On the eve of the First World War, India's jute industry and cotton industry were among the largest in the world. After the war, India's great Gujarati families invested their profits in Indian industry and manufacturing output grew at a rate of 5.6 percent a year. India was on a roll.

When independence came, however, Jawaharlal Nehru took control of India's government as Prime Minister. Nehru was in many ways an English elitist, a product of Harrow and Cambridge. But his elitism was of the Fabian strain, which made him a committed socialist. This was reinforced by the overwhelming image of capitalism as a tool of the former colonial oppressor, an engine used by the owners of capital to exploit the Indian worker for their own benefit. Finally, given that the only available example of rapid economic modernization in the first half of the 20th century was the Soviet Union, he turned toward a Soviet-style vision of state-led economic activity as the model for the India economy.

Not trusting the market to allocate resources, he created a giant civil service to do it. Following the Soviet model, he set out to make India self-sufficient, closing India's borders to both imports and exports. Like the Soviets, he believed that the way to build a strong national economy was to make the state the chief entrepreneur, and to drive growth with state-owned and operated heavy industries. Like many romantics before him, he distrusted large enterprises, and so declared that a whole range of industries would be reserved for very small firms only. Sixty percent of the budgets of India's governments at every level are used to pay civil servants' salaries. Seventy percent of Indians in the organized sector work for state-owned enterprises.

Private companies were not made illegal, but they might as well have been. Would-be entrepreneurs had to get a license to go into any new line of business, to purchase land, to build buildings, to import foreign materials or parts or machinery, to export anything, to earn foreign exchange. And on and on and on.

It routinely took four to five years to get a telephone line or to open a business. Just as in the Soviet Union, monopoly providers had no incentive to create and use new technology, to make productive use of the resources available to them, to build products that worked or provide services that met the needs of their customers. Entrepreneurs were thwarted at every turn. Eventually, the temptation for those giving out the licenses to require bribes became irresistible, with the result that nothing could be accomplished without paying this hidden — often very large — tax.

Their reward for successful enterprises was tax rates that sometimes exceeded 100 percent. So many of the great Gujarati trading families left India, building enormous — and highly successful — conglomerate firms abroad.

Before he died, Nehru arranged matters so that his daughter Indira would take the reins of government. She in turn arranged to have her sons succeed her. A Nehru dynasty was formed which, with only a few interruptions, goes on to this day, with Indira's Italian-born daughter-in-law, Sonia, calling the most important shots for the Congress Party, which holds the most seats today in the Indian Parliament.

But the Nehru family succeeded in running the Indian economy into the ground. By 1991, India was bankrupt. The point was brought home to the government in the most vivid way possible when it was forced by its creditors to load up a plane with almost all its gold reserves and send it one night to the vaults of a London bank. In the circumstances, the government had to turn to the IMF for help.

That help was forthcoming, but at the usual price. India had to cut its spending, build up its reserves and bring its economy back into balance. The Congress Party, which had held power from independence, intended to do only the very minimum of what the IMF required, and turned to the aging Narisima Rao to run a caretaker government to get the country through this rough spot.

But Rao surprised everyone, including himself. Taking the bull by the horns, the new Prime Minister turned to Manmohan Singh, a Cambridge- and Oxford University-trained economist, to right the economic ship of state. Singh, the new Finance Minister, brought in Montek Singh Ahluwalia as commerce secretary and P. Chidambaram as commerce minister, both also trained as economists at leading universities. These four realized that they had a once-in-a-lifetime opportunity to free India from the stranglehold of the its Soviet-style economic system. Inspired by China's success under the reforms that Deng Xiao Ping had set in motion, this close knit team worked at a feverish pace to launch what became known as the 'liberalization' of the Indian economy. The economists worked out the plan and Rao sold it to his party.

But they only got so far. As the pressure from the IMF receded and the Congress Party drew a second breath, the pace of reform slowed. Though many of the barriers to trade had come down, taxes had been redesigned, and many license requirements rescinded, all the civil servants who had an investment in the detailed regulation of the economy still had their jobs and a great part of the regulatory apparatus remained in place, along with the attitudes toward private enterprise and profit that had animated government before the liberalization.

India is not China. China's state-owned enterprises constitute a similar problem. But the Indian civil service is not only enormous — it votes! The bottom 90 percent of its incumbents are paid four to five times what the same jobs in the private sector command. The top five percent are paid a small fraction of what the same jobs in the private sector pay. The result is that it is very hard for a new government to attract capable people at the top and the great mass of civil servants will make enormous trouble at the polls for any government that dares to suggest that government should be trimmed back, because most civil servants would make only a small fraction of what they are now making if they lose their government jobs. That is what made it so difficult for the top ministers to finish the economic revolution they had begun.

We must remember that their pay package is only part of their compensation. The other part is the bribes they take as the price of stamping the endless array of documents still surviving the reduction of the 'license Raj.'" Thus, this political class has a big vested interest not only in keeping their jobs but also in perpetuating what is left of the Soviet-style economic regime that strangles enterprise.

If this were the end of the story, articles on India would not be gracing the pages of all our business magazines. To pick up the other thread, we need to go back to the days following independence.

Recall that Nehru envisioned a self-sufficient Indian economy powered to greatness by heavy industry. Heavy industry requires engineers. India had nowhere near enough to realize Nehru's vision. So, picking up on the recommendations made in a report issued before independence, Nehru asked a number of Western leaders, beginning with Konrad Adenaur of Germany, for assistance in building what became the Indian Institutes of Technology. Nehru established an independent board of industrialists, scientists and other prominent individuals to oversee the IITs and saw to it that these new institutions were much more handsomely funded than any other Indian higher education institutions. Tuition was set very low (it is now only about \$700 per year), which made these institutions an extremely attractive destination for Indian students graduating from the nation's elite private schools (in India, what we call private schools are called public schools, following the English usage, but we will use the American practice here).

Some of the graduates of these institutions did indeed go on to staff the engineering requirements of India's heavy industry, but many chose instead to go on to graduate school in Western countries, especially the United States. Two factors accounted for this development. First, the IITs had put together their own entrance examination, known as the Joint Entrance Exam (JEE). Because there were only a few places available in the new institutions and demand was high, the exams were deliberately made very difficult. The only subjects

examined were math and science. The result was an enormously talented group of freshmen being admitted every year. The second factor that resulted in many of the graduates going abroad for graduate study was the fact that in the 1960s and 70s, USAID was offering very generous fellowships for foreign nationals to do graduate work in the United States. So generous, in fact, that Indian youngsters who received such fellowships, after paying tuition and all their other expenses in the United States, had enough left over to send home so much money that they were often able to double their parents income! The incentives offered by the graduate fellowships made the U.S. the dominant destination for IIT grads. The quality of IIT grads meant that a very large fraction of those who applied to US graduate schools got in. Once they were in the United States, they realized that, for all the reasons just described, they had many more opportunities in the United States than in India, and so they decided to stay. It should surprise no one that a very high proportion of those who undertook graduate study in the United States and then went on to become remarkably successful in the Silicon Valley explosion of the 90s were Gujaratis. The United States had become the beneficiary of India's wholly counterproductive economic policies and very productive elite higher education policy.

In ordinary circumstances in a democracy, the IITs would have been shut down as soon as an opposition party realized that these very expensive institutions were sending their graduates abroad, apparently never to return. That did not happen because of the personal interests of the people running the country.

Well to do Indians send their children either to special government schools reserved for the civil service and the military or to government-aided or private schools, mainly the latter. The best of these schools pay their teachers what teachers in the government schools are paid and, with some exceptions, are not very expensive. In many other developing countries, the wealthy have no alternative but to send their children to prep schools abroad as well as for their undergraduate and graduate education, usually at great expense. In this case, though, the IIT's were available. They cost next to nothing and drew their classes from India's best lower schools. So the governing class made sure that

the IITs remained autonomous, continued to provide an elite education and did not raise their fees, not because they were fulfilling Nehru's vision of providing India with engineers, but because they were providing their children with a direct route to the good life in the United States, at very low cost.

In a strange way, though, Nehru was going to have the last laugh. By no means did all of the IIT graduates go to the United States or other countries. There were not enough fellowships for that. Many stayed, and many of them had gained strong software engineering skills. When companies and government agencies in the West realized the damage to their computer systems that might be caused by the turn of the clock to the year 2000, there was a rush to find the thousands and thousands of software writers who could make the necessary changes to the code in their machines. That was when the world discovered that India had become a world treasure trove of competent software writers who were willing to work very hard to make the necessary patches on Western software at a small fraction of the cost for the same service in the West.

It was in this period that Jack Welch, the Chairman of General Electric, realized that this newly discovered Indian capacity could be put to many other uses, essentially constituting a highly competent, low cost back office capacity for a wide range of functions at GE. The word got around about what GE was doing and many other American firms followed suit. As business process outsourcing gathered steam, IIT graduates began to create firms to train Indians in computer skills at every level of sophistication. This was relatively easy to do, because of the high level of mathematics ability among many secondary school graduates, and the eagerness of young Indians to take advantage of the dazzling opportunities in software services. Not everyone had to be an IIT graduate to participate.

International consulting firms saw an opportunity to make money connecting Western firms interested in reducing their back office costs with these new Indian entrepreneurs and their firms. The graduates of the Indian Institutes of Technology and their sister institutions, the Indian Institutes of Management, as

well as others, saw great entrepreneurial possibilities in creating new firms to take advantage of the burgeoning demand. Some realized that Indians, unlike the Chinese, spoke English. Call centers were the natural result. Over time, a whole range of business process outsourcing businesses developed in India. Some, like software development, accounting and investment analysis required high level skills and others, like call centers, much lower skills.

In time, other entrepreneurs began to see opportunities in fields outside software development and business process outsourcing. One good example is Biocon, a world-class biotech firm formed by a brewer's daughter to build on what she knew about brewing and bioengineering to exploit yeast-based processes in the creation of new molecules for a variety of medical purposes, as well as to conduct pharmaceutical field trials at a fraction of the expense incurred by Western firms.

None of this would have happened without the development of the IITs, the Indian Institutes of Management, the All India Institute of Medical Sciences and the Tata Institute of Fundamental Research. It was these elite Indian institutions and their feeder institutions that provided the pool of software engineers, scientists, managers, and physicians that constituted the highly trained, low cost labor pool the existence of which was vital to the economic revolution that was sweeping India. In the end, the institutions had in fact turned out to be vital to the economic growth and development in India, just as Nehru had hoped. Not, as it turned out, because they provided the engineers for a Soviet style closed economy, but rather as the engines of the very kind of open, capitalist economy he feared and despised.

There was something else that made the economic renaissance possible. India's vast civil service bureaucracy, for once, had been looking in the other direction. All of the established industries had matching bureaucracies that continued to hamstring their growth and development, much as they had before, though not quite to the same degree. But there was no ministry for software services or business process outsourcing or biotechnology, because such things had not

existed. So the new industries slipped through the cracks of the bureaucracy before it realized that there was something there for them to regulate, license and skim.

And there was still something else. Software services, business process outsourcing and biotech can be done by companies that do not need much modern industrial infrastructure. Hardly a day passed while we were in Delhi that the lights did not dim or go out because of the chronic electricity shortages. There are height limits for building in many cities in India because of the lack of sufficient pressure in the municipal water systems to get the water to higher floors, to say nothing of the now famous contamination of much of the municipal water in India. The roads, though better than they were, are still generally poor and we saw nothing resembling a modern limited access superhighway. The railroads are antiquated and no one uses them for freight anyway, because their freight charges have been jacked up to astronomical levels in order to keep the passenger fares artificially low. The ports are improved, but the lack of good long haul roadways makes that irrelevant for all but the few firms that have the political clout to locate their facilities in the industrial parks at the ports. While the new competition among Indian airlines has driven prices down and usage up, the airports are still lingering monuments to the inefficiencies and frustrations of Soviet-style “service” establishments. Only the revolution in telecommunications has produced an unqualified win in the infrastructure column. It was actually easier for us to get a strong mobile phone signal in all the cities we visited in India than in the United States, and one no longer has to wait five years for a land line in India.

Software and business process firms’ electric power requirements are modest compared to manufacturing companies, so they can buy their own backup diesel generators, and therefore do not have to depend on municipal supplies. They are drilling their own wells so that they do not have to depend on municipal wells either. Because their product flies along the ether, the lack of competitively priced, dependable rail service and good roads is not a problem.

All of which explains why business process outsourcing has taken off, but manufacturing, with a few important exceptions, has not.

The government knows that the lack of decent infrastructure is a crucial problem for India, but it faces major obstacles in doing anything about it, all political. When government declared its intention of turning the airports over to private ownership and management, the unions that staff them went out on strike. It was said that the urinals could be smelled for miles around. Government put its plan on hold. Generations of Indian politicians have bought votes from the poor by promising them water and electricity at below market rates and simply ignoring the wholesale theft of these municipal services by poor people everywhere. Government's solution to the utility problem is to turn them over to private enterprise, but no private company will buy these utilities as long as their services continue to be stolen or sold at concessionary rates, and the politicians do not yet know how to stay in office if they discontinue these giveaways.

No economist we talked with thought that India can overcome its poverty and develop a world class economy without creating a healthy manufacturing sector. And no one could explain how it will do so until it overcomes the problems just described.

We should point out that, though India's manufacturing sector is small compared to what it needs to be, it is hardly nonexistent. India is one of the world's largest producers of auto parts. It is also host to one of the world's largest motorcycle and scooter industries (producing 60 million 'two-wheelers' per year!). The Tata motor car firm, once known for its rickety Soviet style cars, is now producing attractive machines that run well. There are successful manufacturers, but there are not enough of them. This problem will not be solved until the infrastructure problems are solved.

Indeed, India has too many people involved in low-productivity agriculture (some of it still being done exactly as it was in the middle ages) and too few involved in high productivity manufacturing. Solving the manufacturing

problem will also entail solving the rural agriculture problem. Both will require solving the education problem, because it is impossible to solve the productivity problem without raising the education and technical skill levels of a vast number of Indians who are now barely educated at all.

And so we return now to the question of whether India has the pool of educated and trained people it will need to power its economy to the next stage of growth.

When the British arrived in India in force to establish the Raj, they were few in number relative to the number of Indians they proposed to govern. Because they could not do so alone, they had to rely greatly on Indian civil servants for many governmental functions. This was, in some ways, a match made in heaven. As we noted above, the highest status rung of the caste ladder was occupied by the Brahmins, who were scholar-sages. They were expected to lead and they were expected to be the best educated Indians. This was the ideal material for an Indian civil service.

The British, however, had no regard whatever for Indian traditions in education, notwithstanding the fact that much in their education system was very high quality. Lord Macaulay, who was responsible for rebuilding the education system to prepare the civil service to serve the British, deeply believed in the “intrinsic superiority of the Western literature,” famously observing that “a single shelf of a good European library [is] worth the whole native literature of India....” He relied on the British missionary organizations to set up British-style private schools for the Indian elite that would provide direct support to the English colonial masters, and government schools for the lower levels. No one else, in their view, needed an education. The best of the Indians who came through the convent schools were sent off to Britain for their higher education. That is how Nehru came to go to Harrow and Cambridge.

The system just described is still in place today. There are three classes of schools. Government schools are entirely funded by government and completely subject to government regulation. This is where the vast majority of poor people

send their children. Government-aided schools are partially funded by government and subject to government regulation. These schools are typically attended by the burgeoning middle class. Private schools are covered by the same standards and examinations as other schools, but are largely outside the system of government regulations. These schools are mainly attended by the Indian elite (although, as you will see, a new and very different kind of private school has emerged to serve the rural poor). The government-aided schools are largely former convent schools. The term 'convent' covers all church related schools (though many newly opened private schools that are completely unrelated to the church append the term 'convent' to their names due to the association of the term with quality education). Many were actually Jesuit schools. In some cases, the government provided the land on which the school buildings stand, and little else. In the greater number of cases, the government provides and pays for the teachers, while the school trustees provide the land and buildings.

Government schools come in many variations. What is most important for our purposes here is to understand that one of these classes is schools established to serve the children of particular government agencies and institutions. In the Soviet Union, and in China, these schools for top civil servants received lots of extra resources. Something of the same sort happened in India, though, not, apparently, to the same degree.

But the vast majority of Indian government schools are awful. In the rural areas, where 60 percent of the Indian people live, schools must be located no further than a short walk from the children's homes (there being no other way to get to school for many children). So most schools have no more than two teachers for a school that serves students from grade one through grade five. There are no school books. Students use a slate and chalk. A World Bank study showed conclusively that one quarter of the teachers in these schools do not show up for work on an average day. Another quarter show up, but are not engaged in teaching activity. Over 95 percent of current educational expenditure is on

teachers' salaries. So 50 percent of 95 percent of the total budget for the rural schools goes right down the drain.

The principal reason that the teachers assigned to the rural government schools do not teach as much as we might expect are two-fold. First, people who have a choice do not want to live in India's rural areas. They prefer to live in the cities. When the graduates of India's teacher training institutions get their teaching certificate, they must be assigned to a school by the government before they can teach and collect a paycheck. To get an assignment, they must typically pay a bribe on the order of 80,000 rupees to a low level government official who, when asked why it is so much, replies that it is because of all the people above him who expect a slice. The average beginning salary for a teacher is 4,000 rupees a month, so 80,000 rupees is a lot of money. In return, the neophyte expects not just an assignment, but some choice in assignments. So more teachers are assigned to the cities than they need and fewer are assigned to the rural areas than are needed. Even if the candidate is assigned to a rural school, he or she will still choose to live in the nearest city. But the nearest city may be far away and, the roads being bad, they often decide not to make the trip. Why should they? They have the job for life, whether they show up or not (this has recently been tested in the courts and settled in favor of the teacher, with back pay awarded). They report to state officials who are themselves miles away and cannot verify whether the teacher actually showed up or not. And they are affiliated with one of the most powerful unions in India, on which the dominant party depends for votes, so they see themselves as impregnable. And, lest the reader be put off by this recitation, their pay is often months in arrears, and they see no reason why they should provide services to an employer who is often months late in sending their paychecks.

When they do teach, the government teachers typically teach in strict rote learning style, using the cane on the children and often ask the students to perform work for them that is unrelated to their academic program, such as it is. The students, for their part, are frequently taken out of the school to work in the fields, and many families do not send their daughters to school in any case. It is

little wonder that no more than half of Indian children make it beyond the fifth grade.

Depressing as this picture may be for an American audience, it still represents real progress for India. Between the 1950-51 school year and the 2001-2002 school year, literacy in India rose from 17 percent to 62 percent (ranging from 39 percent in Bihar State to 90 percent in Kerala), the number of primary schools grew three-fold, and the number of upper primary (what we would call middle) schools grew 16 times (one would think, by the way that, given its excellent record in education, Kerala would boast the best economic growth rate in India, but it actually has one of the worst, because it is a Communist state and so it exports its well educated graduates to other parts of India in great numbers). There are now six hundred thousand primary schools and two hundred thousand upper primary schools.

One might expect that the picture would be very different for the government schools in the big cities. But that is not the case. Take the situation of Mumbai (the city that used to be called Bombay). Sixty percent of the people who live in this West coast city of 12 million people make their home in the slums. These slums have no counterpart anywhere in the United States. They are outdoors, not indoors, constructed mostly on the sidewalks and on the sides of streets without sidewalks, living under roofs made of tarps, or pieces of corrugated tin or cardboard, held up by flimsy bamboo or metal poles. Twenty or thirty thousand people might live in one of these slum villages. Thousands might share one set of makeshift toilets, an illegal water tap spouting contaminated water and a few pirated electric lines. These facilities are typically provided by a criminal syndicate that charges for their use. Each family or group of families lives in the sort of makeshift hut of the sort just described in a 10-foot square space without windows or air conditioning, sometimes in temperatures of 110 degrees Fahrenheit or more and very high humidity.

Though some families may live in these slums for two or three generations or more, these slums do not have static populations. About two hundred fifty

families, on average, arrive to live in these slums in Mumbai every day and an equal number move out.

The reason that so many move in is because they are leaving conditions, often in the rural Northeast states of India, that are far worse. The reason that they move out is because they have been able to improve their condition to the point that they can afford to join the new Indian middle class (defined as people who are earning at least 8 dollars a day). Thus the slums stand as mute testimony to both the awful poverty of the countryside and the power of the new Indian economy to improve their lot.

The social structure of the slums is tripartite. At the bottom are the beggars. The next layer consists of the people who work as servants in the homes of the middle class or in comparable jobs elsewhere. At the top are the people who work in the posh hotels, drive taxis and work in other situations in which there is real money to be made by unskilled people. Unskilled except in one respect: one cannot rise to the top layer of this social structure without speaking English, a point to which we will return below.

The Mumbai municipal corporation is responsible for the education of these children. In fact, these slum children are virtually the only children for whom the government schools in Mumbai are responsible, because virtually the whole middle class and upper class send their children to government-aided and private schools. The schools for these slum children often have leaky roofs, non-working lavatories and floors with holes in them. They are lucky to have blackboards and books of any kind. Their teachers, like those in the rural schools, typically teach a low-level rote curriculum, administering a rough discipline that went out in the United States a century ago.

Most government-aided and good private schools are in the cities. All students everywhere in India who stay in school through the tenth grade expect to take their board exams at the end of the tenth grade. If they do well enough, they will go on to take another set of board exams at the end of the twelfth grade. This is

India's inheritance from Britain, which for so long based its system on the "O levels" at the end of tenth grade (O for Ordinary) and "A levels" at the twelfth grade (A for Advanced). In Britain, multiple private organizations offered these syllabus-based examinations and scored them as well. Schools could choose which exams they wanted their students to study for. This is the system in India today.

But in England, of course, everyone speaks the same language (although Cockneys are not always easily understood by the people of Lands End in the far west of England). That is not true in India. There are four major language groups in that country, and many dialects within each of them. It is typically the case that people speaking one dialect cannot understand people speaking another.

When India achieved independence, each of the Indian states was required to develop its own board examinations in its own regional language. At the same time, the central government created an institute to develop model exams that the states were encouraged to use as the basis of their own. Most have chosen to do so, though their examination standards vary widely. At the end of tenth grade, students studying for the state boards take the Indian Secondary School Certificate exam offered by their state. Alternatively, a school, typically a government aided or private school can decide to use an examination offered by a national board instead. Among their choices are exams offered by the Central Board for Secondary Education, the Council for Indian School Certificate Examinations and the National Open School Board (for distance learning students). The two main certificates offered by the national boards, the All-India Secondary School Certificate and the Indian Certificate of Secondary Education, differ mainly in their treatment of English. The Central Board's exam examines on functional English, while the CISCE requires a serious study of English literature. The national boards' standards are well above those of the states, though the states standards vary widely. That said, although the national boards require a command of knowledge comparable to that required by the very demanding Cambridge University International General Secondary Certificate

Examinations, they do not reflect that exam's demands with respect to problem solving and applications, a fact that may come back to bite the Indian economy, given the nature of the changing demands of work in that economy.

Students who complete year ten and go on to upper secondary school will study for their year 12 exams. These students are divided into three streams. The first is math and science, the second is commerce and third is humanities. These students usually sit for the Higher Secondary Certificate Examinations. Alternatively, a few upper secondary schools have chosen to prepare their students for the International Baccalaureate exams, the Advanced Placement tests or the Cambridge University IGCSE exams just mentioned. Students electing to go to a school offering the latter set of exams have, of course, already made a decision to leave India for their college education, since none of those examinations are accepted by Indian higher education institutions. Entrance to most Indian higher education institutions is based solely on the scores on the Higher Secondary Certificate Examinations. But entrance to the elite institutions, including the IITs and the IIMs are based on examinations produced by those institutions.

Each year, about 30 million Indian children begin primary school. More than 95 percent make it through the end of primary school, or fifth grade. But, of those who entered, 10 million have to leave school by the end of grade 10. About eight million complete grade 12, or about one quarter of those who began primary school. Of the 8 million who complete upper secondary school, 1.5 to 2.0 million complete college each year. So somewhere between 5 percent and 6.5 percent of the cohort begins higher education.

The reader will be forgiven for wondering, given what has been said so far, how India could possibly have produced a remarkably large number of young people who would go on to astonishing success in Silicon Valley and elsewhere around the world, including, in recent years, India. Here is how it happened.

We return first to the story of the IITs and the IIMs (the Indian Institutes of Management). From the beginning, these institutions were a passport to the best opportunities both within and outside India. Internally, it was the graduates of these institutions who went on to occupy the key positions in India's space program and its atomic energy program. Outside India, in the 1960s, as the United States began to offer the fellowships for graduate study in the United States that were described above, the news got about every corner of India. Recall that the Indian economy was moribund. The American institutions quickly learned that the graduates of the IITs were superb students. So admission to an IIT became the only ticket Indians had to the good life. Not only that; the IITs, because they had been set up as autonomous institutions, ran the only thoroughly meritocratic admissions process in India. Students knew that if they were good enough, they could get in.

The exams that the IITs created test only mathematics and science. Almost overnight, the pressure to get in became intense. It is impossible to get any two people to provide the same numbers, even the directors of the IITs, but there is broad agreement that somewhere in the neighborhood of three hundred thousand students apply every year for admission to only about 3,500 openings in the IIT freshman classes every year.

The mathematics and science being tested in these exams is truly daunting. The incentives to get in are so strong that students who set their cap for this target know that they will have to put in an enormous effort to stand any chance at all of success.

The best students in the best schools typically set their cap for the IIT exams. Seventy percent of the students in the best private schools go into the math-science stream, 20 percent into the commerce stream and 10 percent into the humanities stream. Those that go into the math-science stream study very little besides math and science. But even this kind of concentration on mathematics and science among the best secondary students in the country was not enough to get them into the institutions of their choice.

So, new organizations sprang up to prep students for these exams. Exam prep became a way of life. Some students do the work after school, others before school. For those in the latter group, the routine is to get up at 4:30 am every morning and put in three hours on IIT exam prep every day before going to school. Others put in four hours every night. Some do a combination.

The best of the exam-prep firms decided to recruit only those people applying for tutor positions who could pass the IIT exams themselves. Not a single Indian school teacher, whether from a government, government-aided or private school could pass the exam. So they started hiring IIT graduates and paid the going rate for engineers, not for teachers, to be their tutors. Their firm grew into a billion dollar business.

Others entered the field. But rating agencies grew up and those tutoring organizations that had the best records of getting their students into the IITs became widely known. The result was that they developed their own admissions test, taking only the best of the students who wanted their tutoring program. Now there are tutoring organizations that prepare students to take the admissions tests given by the best of the tutoring organizations for the IIT exams. All of this preparation focuses on the two years of the upper secondary program. Even in the very best private upper secondary schools, it is understood that the students will be absent from class as much as 25 percent of the time, in order to prepare for the IIT exams, which typically demands about four hours a day of the student's time, for the full two years.

There is even an entire city in the center of rural India that specializes in preparing students for the IIT entrance examinations. Students are sent to residential schools in that city by their parents for two years in the hope that this investment will make the crucial difference.

This intense competition for the limited slots at the IITs does not affect just the students. We were told that, as the exam period approaches, adult attendance at

the hallowed cricket matches falls off and parents of competing students shut down their social lives in order to help their children prepare for the exams. And when the students actually take the exams, it is not unusual for the extended family to go the exam center and wait the entire six hours of the exam period for the student to come out and report on how he or she did.

When village children make a score on the exams that will get them in, entire villages stop everything to throw a big celebration party. Urban families do much the same thing. Little wonder. Extended Indian families are very close, and the young people who make it are often expected to share their wealth with their families. Getting into the IITs, IIMs and the major medical training institution is a lot like winning the lottery. Except that it does not happen by chance. It is the result of intense extended effort on the part of the student. This competition does not affect only those who succeed in getting into the most prestigious institutions. The process of studying for these exams over a period of two to four years ensures that even those who do not get into the IITs have a much higher level of math and science preparation than they would have had in the absence of such a rigorous entrance examination.

And the results of this effort do not just show up at the end of the process. We heard from well positioned people in Indian society about serving in various posts in the United States and taking their young teenage children to the United States with them. Again and again we were told that when the upper crust suburban systems tested their children they wanted to jump them ahead by three grades on the basis of their test performance.

It is not unusual for those who took the IIT exams and failed them to apply to multiple Ivy League colleges in the United States and be accepted by them.

In many ways, the stars are lined up for high performance for these young people. Consider the implications of the Indian tradition of arranged marriage (which, by the way, is not, as often perceived, tantamount to forced marriage, but rather involves parents carefully screening suitable candidates for children

before the children get the final say). Our advisor for our trip to India, Karthik Muralidharan, pointed out that a girl's parents are much more interested in the earning potential of a possible mate than in his romantic charms. In a system like that, the nerd is much more likely to get the most desirable girl than in our system. The reader has already learned that the nerd is more likely to get the job than his less academically inclined classmate. So, in Indian society, the nerd is more likely to get both the most desirable job and the most desirable girl than in the United States. Imagine what that does for —male — student motivation, especially in high school!

In the best private schools we visited, the students made it very clear that the teachers they most admired were those who, in priority order, had mastered their subject, could teach it well, and, last, liked them. In the United States, the order would have been reversed. The students also made it clear that the students they had the least use for were those who cheated, who cut up or who in other ways made it more difficult for them to succeed in their classwork. When we asked these students what they liked most about their school, they said it was the competition. When we asked them what subject they liked best, they said mathematics.

The cumulative message is clear. There is enormous social support for students to take tough courses and study hard in the better Indian schools, and little room for the student who chooses not to do so.

We asked senior people in world class Indian firms what they thought of the IITs. Most said that they thought that the IITs added less value than was widely believed. That is, the quality of the teaching and equipment does not match that in the best Western universities. But that does not matter they said, because the screening function served by the IIT exams, combined with the enormous pressure to get into these institutions and the effort that students therefore make to prepare for the entrance exams, combine to produce a student body that is in some ways the equal of those found in the best universities in the world.

This is a crucially important point. American secondary school students probably have the weakest incentives of any in the industrialized world to take tough courses and study hard. In India, strong student motivation outweighs any weaknesses of the secondary and postsecondary institutions to produce world class professionals.

But the question that interested us most was the capacity of the Indian education system to keep up with the swiftly rising demand for quality education and professional training in the country. It struck us that the availability of adequately skilled labor could be the single most important factor affecting the capacity of the Indian economy to scale up to world class status.

The evidence for this conclusion is everywhere. When IIT students graduate, officials at their universities stage a multi-day event at which firms are allowed to recruit them. The universities divide the firms seeking graduates into batches. The most prestigious and desirable firms are in the first batch, the next most desirable in the second batch and so on. Students who accept an offer in the first round cannot change their minds in a subsequent round. The first round firms that we talked with told us that they are now unable to get enough software engineers to meet their needs. Their solution is to take engineers trained in some other discipline — say mechanical or civil engineering — and retrain them as software engineers, which they typically do in six months or less.

Only leading multinationals and the very best Indian firms wind up getting first round picks in this system, of course. We talked with smaller, newer Indian firms to find out what they are doing to meet their needs for software engineers.

Its tough. One head of a rapidly growing firm employing about two hundred people told us that he had been looking for five engineers for six months and had been unable to find a single one at any price. So he was about to fly to the United States to recruit the engineers he needed at the wages prevailing in the United States. We asked how he could be competitive doing that. He told us that, while

these engineers would cost him U. S. wage rates, his other employees would be making Indian wage rates and so his average costs would be competitive.

How long this will be true is not clear. Because of the water pressure problem, which leads to the building height limits described earlier, and the widespread rent control policies in Indian cities, the cost of urban real estate is extremely high. In Bangalore, the epicenter of India's software industry, it costs \$250,000 to \$275,000 for an 1800 square foot apartment for a family of four, with air conditioning and access to a communal swimming pool. The best firms are paying \$4,000 to \$7,000 per year for software engineers. While this is far below the entry salary for American engineers, it is not enough to pay the downpayment or mortgage on a decent apartment in Bangalore with very small bedrooms.

These pressures are forcing Indian employers to expand outside Bangalore, Delhi, Chennai, and Mumbai into cities in the next tier down, where costs are lower, which is, of course, slowly spreading the new economy through India.

The IITs are not, of course, the only universities in India supplying engineers to industry. The numbers we got varied, but India may be producing as many as 400,000 engineers a year. Most, as in China, are of very poor quality. But the people we talked with in the most prestigious software firms told us that there is a whole tier just below the IITs which produces engineers of a quality almost indistinguishable from those that graduate the IITs. Among them are the products of the college of engineering at Delhi University, for instance, where we found students undertaking the same sort of projects that one would find at some of the better engineering schools in the United States, though not perhaps, with the same kind of resources available to them.

But the outlook as a whole for increasing the supply of first-rate engineers is clouded. The IITs were designed as the apex of the whole system for producing technical talent in India. Because they are state institutions, the salaries they pay are on the civil service scale. They are not set by the market. The result is that

the starting salaries of most graduates exceed the pay of their former professors. Consulting fees pay some of the difference, but rarely all of it. In order to teach at these or other engineering institutions, one must have a doctorate. But because professors' salaries are kept so low as a matter of government policy and salaries in the private sector are going up fast, good graduates have no incentive to go on to get doctorates and teach at the university level in India. Those that go on to get advanced degrees abroad have tended to stay abroad. Those that return to India are not coming back to teach in the universities. So this short-sighted government policy is drying up the supply of the only people who can increase the supply of qualified engineers at the moment they are most needed. The Indian government can solve this problem by allowing the market to work, just as it can solve many other problems with the same strategy, but, so far, it shows no inclination to do so.

We have seen that the best Indian firms are addressing their problems by retraining the people who have gotten through the IIT screen. Clearly, what they are doing is taking advantage of the very high education level of entering IIT freshman that is the end result of the Indian pressure cooker we described earlier. And we noted that some 300,000 young people take that exam every year. So the real pool of very capable young people is at least that large. And we were told that just below that pool is another group of young people only slightly less able.

So the most obvious ways to address the looming crisis in availability of high quality university graduates is to expand the number of IITs and to improve the quality of the other Indian universities. But neither seems to be happening. Though there has been talk of expanding the number of Indian Institutes of Technology, the institutions themselves are opposed because they believe they are having a very hard time getting the resources they need to stay afloat now and see it getting much harder with more mouths to feed. Besides, the biggest constraint is the lack of high quality faculty, who simply cannot be attracted at standard civil service salaries. This situation would change if government charged something close to a market rate for tuition, instead of the \$700 per year

charged now, but the political opposition would be fierce, so there is no appetite for that. The result is that things go on as they were, with no expansion of the IITs and no other solution in sight, either.

But the problem is deeper than that. Faced with its five decade long failure to reach its goals for elementary and secondary education, and having very limited resources, the Indian government has been cutting back for years on the higher education sector, with the exception of the IITs and IIMs. Phillip Altbach, Director of the Center for International Higher Education at Boston College, says that “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.” Altbach contrasts these policies with those of China, Singapore, Taiwan and South Korea. The governments of all of these countries have for years been working hard to create first class universities to drive their economies forward. The result, Altbach points out, was there for all to see in a recent ranking of the top 200 universities in the world published by the London Times Higher Education Supplement. One of the IITs appeared on that list at position 44, compared to 3 for China, 3 for Hong Kong, 3 for South Korea, and 1 for Taiwan.

As we will see in a moment, most of the growth in India is coming from the private, non-governmental sector. This is as true at the higher education level as it is at the lower levels of the system. But it is very unlikely that the private sector will be able to muster the kind of resources needed to build world class research universities, and only research universities will be able to power the Indian economy in the years ahead. As Altbach points out, India’s competitors understand this and have mobilized their national resources to build the kind of universities they need. The Indians we talked with seemed to be basking in the reflected glory of the worldwide reputation of their IITs, unaware of the dynamics of rot in their higher education system that could bring their economic revolution to a halt. India’s higher education board has declared its intention to create five additional world class Indian universities. But it is unclear whether

this will actually happen or whether, if it did, it would be enough to address the challenges just described.

Surely the most efficient strategy for greatly increasing the supply of world class professionals in India would be to raise the quality of the Indian higher education sector across the board. But, as we pointed out above, only about 10 percent of the cohort has access to higher education, which, though a large number of people, is low compared to 15 percent in China or to the average for less developed countries worldwide. To increase the size of the pool eligible for higher education, India would have to increase the size of the cohort participating in upper secondary education.

Most Indian students in upper secondary schools preparing for college are in government-aided and private schools, and the latter are growing fast. Under Indian law, only not-for-profit institutions can provide education. But, as with so many other government edicts, there is a workaround for this prohibition. Upper secondary has in fact become a big and rapidly growing for-profit business in India.

Here is how it works. An individual or company will form a not-for-profit trust to get a license to operate a school. Then it will form a for-profit company to purchase the land and construct the buildings the school will require. The trust then leases the buildings and land from the for-profit at rates determined by the owners of both entities (this is hardly an arms length transaction). Because real estate prices are rising fast in the most developed parts of India, the company can make a comfortable profit on the leases and a fortune on the land when it is ultimately sold. Because the economics of these plans are very sound, companies formed on this plan have found it relatively easy to get the mortgage loans they need to make them work. In some cases, these schemes are used to build single schools, in others, whole networks of schools.

What makes this whole development possible is the rapid growth of the Indian middle class, which is producing a burgeoning demand for quality secondary

education, which neither the government schools nor the convent schools have been able to meet.

It is also true that other actors have entered the market who are not motivated by profit. In some cases, Indians who have made fortunes abroad are returning home determined to give something back to their native land. In other cases, wealthy Indian families who have made their money in India are doing the same thing. Indian values have a lot to do with this development. One cannot rise to the top of the status hierarchy in India by gaining wealth. Real status comes only through giving something back to Indian society. Many Indians we talked to who had established new schools were quite candid with us in making it clear that their aim was to acquire the kind of status that could only be acquired in this way.

In any case, the result is the establishment of trusts for the operation of one school or entire networks of schools run according to philosophies agreeable to the families who endow the trusts. In some cases, these schools are for children from poor families. In others, they are open to everyone. Some are for the elite. Most charge tuition, a few do not, though very bright poor children may sometimes be subsidized. In many cases, a representative of the family has an office at the school and plays a role, sometimes in the foreground, sometimes in the background, in the operation of the school. In some cases, the children of these wealthy families attend the schools they have endowed in this way.

Because wealth is growing rapidly in India, there are more and more such schools. While we do not have a good idea as to how many such schools there are, we were told of a web site that contains a directory of more than 2,000 trusts operating schools in India now. We read of philanthropists who were buying enough land in the countryside to build networks of schools that could serve 20,000 students or more. Though numbers of this size are clearly at the top end of what is being planned, it is clear that, even in a country of one billion people, this is more than a drop in the bucket, especially if we focus on what it might do to increase the pool of students who make it through upper secondary education.

This is all the more important since we could find no evidence of a serious government plan to raise the quantity and quality of primary and secondary education.

Because of the great variety of origins of the government-aided and private schools in India and the range of philosophies and motivations of their operators, it is virtually impossible to characterize their education programs in any detail. In general, we found, as one might expect for a developing country, more of an emphasis on rote learning than one would find in the typical American school, facilities of a lower standard and teachers with inferior training. The best private schools are very good indeed, though not perhaps up to the standard of the very best American suburban and private schools.

In a way, it is surprising that the better private schools are as good as they are. By all accounts, the quality of teacher recruits and of the training they receive is not very good. We have seen that, on average, the government teachers are paid substantially more than what people in comparable private sector jobs are paid. The same teachers from the same pool teach in the government aided schools and are typically government employees, making what other government teachers make. The best private schools pay about the same. Those just below the top pay less. Their principals told us that they get teachers who are typically female and married to upper middle class husbands on whom they depend for the family income. They prefer to teach in the private schools because they get motivated students and more freedom from the culture of the bureaucracy, much like the better independent schools in the United States. It is hardly clear that they are better teachers than those who teach in the government schools, though they may get better supervision and direction. Even in the private schools, government rules make it very difficult to fire anyone, so private school officials there, like public school officials here, try to put their poor teachers in places in which they can do the least harm.

But what we said concerning the elite universities applies here as well. The enormous hunger for learning among the students, the drive to achieve real

competence — not just get good grades — the willingness to tackle really tough subjects like mathematics and science, and the support that these students get from one another and from their parents, all this more than makes up for whatever deficiencies they might encounter by way of science labs that are not quite state of the art or media labs that don't have the very latest software.

And there is something else a little less tangible that must be added here. Whether we are attending the daily opening gathering of faculty and students at the Delhi Public Schools (New Delhi's most prestigious private school), or listening to the dean of the Delhi College of Engineering describe his institution in muted tones in his office, one hears that the primary purpose of Indian education is not to produce people who have the skills needed to accumulate great wealth but to produce "good human beings." There is a spirituality, a felt need to develop in students an obligation to contribute to the welfare of the whole community as well as a tendency to see the world in holistic terms that is pervasive and very real. It gives educated Indians a singular quality we encountered everywhere we went. Educated Indians — irrespective of the religion they embrace — seem more often than not to have a core set of values that serve them well in business and in life, and their schools, including their higher education institutions, have a lot to do with imparting these values.

We have just been, for the most part, talking about the Indian upper secondary schools, mainly the government-aided and private upper secondary schools. It is true, of course, that many of the trusts that run the government-aided and private upper schools also run schools at the lower levels, and much that has just been said about them applies at the lower grade levels as well.

The vast majority of Indian primary schools are government — in fact, state — schools of the kind described above. But here, too, there is a decided shift toward provision by private schools and away from the government schools. That should surprise the reader, because the parents of these children, whether they are the rural poor or urban slum dwellers, make only a few rupees — or less than \$1 — a day. Why on earth would they take even one of those precious

rupees and spend it on private education for their children if there are free public schools?

It is because the government schools have failed the rural poor in all the ways described above — because a quarter of the teachers do not show up, another quarter do not actually teach, and when they do, the quality of the teaching is indifferent at best. It is also because English is taught in only four percent of the government schools. The reader will recall that people are moving from the impoverished rural areas to the urban slums for a better life and the way up in the slums is through jobs many of which require English. Even the poorest of the poor know this and want English for their children but cannot get it in the rural schools.

In many villages, enterprising locals, often retired teachers, have set up private schools and engaged young people to teach in them who have just graduated from rural colleges and do not yet have jobs. These young people are eager to teach to make some money. The government teachers are accountable only to state officials who are many miles away and often corrupt, and cannot be fired in any case. These new college graduates can be fired if they do not show up and, because they live in the same villages as their students or only a few kilometers away, are much more easily held accountable for their behavior. Recall that the government teachers are paid anywhere from four to five times what similar jobs would command in the private economy. That means that ten new college graduates can be hired at the same cost as two government teachers. Considering that only half of the government teachers actually teach, these villagers are getting 10 times what the government gets for its money. And they get English, and motivated teachers.

So private schools of this sort are spreading. The obvious question is why the government cannot simply pay for the new private schools. The obvious answer is the anger that would promote among the government teachers, who would stand to lose their jobs. But several courageous elected state officials, despairing of reforming the civil service and eager to be responsive to the desire of their

constituents for a decent education for their children, are going right around the civil service. Gurcharan Das, the former head of Proctor and Gamble in India who is now a widely read columnist for one of India's leading newspapers, reports that, for example, that the education minister of Madhya Pradesh, the seventh largest Indian state, initiated a policy under which the village pranchayat councils in that state can assume power over their local schools.

Let's step back for a moment to review the bidding. India's post-secondary students represent an unusually small proportion of the total population, even for a less developed nation, and what it does have will require a massive improvement in quality if India is to avoid seeing its labor price advantage evaporate and its economic growth slow to a crawl.

The upper secondary pool on which the all-too-narrow postsecondary sector rests is no bigger than the size of the post-secondary sector, expressed as a proportion of the total cohort. It, too, needs to be greatly expanded. Almost all of the schools at this level are either special government schools that serve elite civil servants, government-aided schools (the former convent schools) and, most important, private schools. The quality of these schools is all over the lot. The teaching force on which they draw is, on the whole, badly paid and ill trained and receives very little if any continuing training after their initial preparation. The vast majority of primary schools are simply awful.

In sum, although there are good government schools, they are largely confined to those set up to serve certain elite segments of the civil service (the staff of the IITs, for example) and the military, most are very bad and not improving. It is hardly surprising that the most astute commentators believe that, when even the poorest Indians are voting with their feet to leave the government schools, the only solution to the performance problems of Indian education is privatization. There are even some in government who seem to agree, but with a twist. Legislation has been proposed that would require even private schools to set aside a (large) set proportion of spaces for poor and minority children. The government, under this legislation, would reimburse the private school in an

amount equal to the lower of the private school fee and the per pupil spending in the government school. To some people, this represents an admission that the government has totally failed. To the operators of the government-aided and private schools that would be affected, this measure is an enormous threat, entailing not only an across the board dilution of resources and obligation to educate very hard to educate children without the resources to do it, but also — and maybe even worse — the implicit threat that fine grained government regulation of the private schools would come along with the children. If the latter turned out to be right, that segment of India's education providers that is doing the best job would be destroyed and, along with it, India's hopes for a better future.

Some people have suggested that a scheme of this sort might work if the government put its current education budget behind the children and allowed them to take their government funding along with them into the government-aided and private schools. This, of course, would defund a substantial part of the public system and therefore directly threaten the livelihoods of all the teachers in the government schools. This would clearly provoke an enormous fight and most likely lead to the private schools having to adopt the civil service teachers and the whole rotten bureaucracy that would come with them, just as the private schools fear.

It is more likely that the current trends will continue, with a gradual but accelerating trend toward privatization of schools in India at every level, with various schemes to provide government subsidies to parents for this purpose while avoiding a direct challenge to the existing civil service teachers. In this way, India might just be able to muddle through.

THE COMPETITIVE CHALLENGE: CHINA AND INDIA COMPARED

The reader might be asking why this section exists at all. As we reported above, the visitor to China's great seaboard cities sees an endless sea of yellow construction cranes, gleaming new plate glass and stainless steel-clad buildings with chic postmodern decorative elements, deep water containership terminals that are among the biggest and most modern in the world, miles on miles of magnificent highways and first class airports, even in second rank cities. In our three weeks in India, we saw not one construction crane — anywhere — and only a handful of modern office buildings, often cheek by jowl with piles of stinking trash on the sides of dirt roads serving as major arteries. And then are the endless slums in India, like nothing we saw in several trips to China.

Next to India, China appears as a juggernaut. The *Economist* points out that its economy is two and one half times as big as India's, and it is growing faster. Per capita income in China is twice that of India. In each of the past four years, the annual increase in China's foreign trade has exceeded India's total merchandize trade. And, last year, China received about ten times as much foreign direct investment as India did.

It was, of course, Deng Xiao Ping's decision to open China to direct foreign investment that proved to be the catalyst for China's astonishing rise. And one can argue that it was Nehru's decision to close India's economy that prevented India's rise and the failure of the reformers to completely reverse that decision that has since held India back.

But the story is more complicated than that. In the March 2006 issue of the *Far East Review*, its editor, Hugo Restall, in an article titled "India's Coming Eclipse of China," argues that China's apparent strengths are in fact signs of its weakness. Yes, China has attracted an unprecedented amount of foreign direct investment, but that investment is just 'passing through.' That is, what is really

happening is that high value added components are being shipped to China, “snapped together” in that country, and then shipped out, with very little value being added in China. He points to the fact that there are only a tiny handful of home grown Chinese firms that are big players on the world stage as a symptom of China’s failure to grow its own indigenous capacity for development. In fact, he says, it is China, not India that most resembles the Soviet Union now, in the sense that China’s surging economy is the result of the mobilization of capital (in this case from all over the world), rather than productivity improvements in the Chinese economy.

Because wages are rising in both India and China, both countries are beginning to outsource some of their production to lower cost countries like Bangladesh and Vietnam. We have now come to recognize this as a natural progression up the value chain. As their people become well enough educated and their managers more capable, they can add more value to the products they make and the services they sell. That enables them to charge more for their services, which prices them out of the market for low value added products and services, which they then outsource to others. But if China is unable to add enough value to compensate for its rising wages, then the world will not pay for its higher costs, and its rise will slow down and perhaps even stop.

In the same issue of the Far Eastern Economic Review, Yaheng Huang, of MIT’s Sloan School of Management, points out that a remarkable turnaround has taken place in the position of the two countries in the World Economic Forum’s Business Competitiveness Index. Ahead of India by two places in 1998, China is now behind India by 17 places. And the gap on return on invested capital is growing, too, in favor of India. According to the Beijing National Accounting Institute, two thirds of the firms listed on the Shanghai exchange have failed to earn their true cost of capital. Return on capital might even be negative in China. Which no doubt is one of the reasons that the Shanghai stock exchange has been falling, while Mumbai’s has been rising dramatically. Investors will go where they can get the best return on their money.

Huang, explaining these trends, makes the same point we just did: value is being created in India but not in China. The reason, he says, has nothing to do with a reluctance to provide the kind of education on which the progression up the value chain partly depends but, instead, with the reluctance of the people leading China to trust the markets. In this sense, the widely observed embrace of capitalism by China is misleading. There are entrepreneurs in China who have ideas that might make it possible to improve the productivity of Chinese industry. But they are not being funded by the Chinese banks, which are state controlled, because the Chinese government prefers to loan money to state-owned enterprises that it can control.

And this gets to the heart of the matter. China evidently hopes that it can rebuild its state owned enterprises into the powerhouses of the Chinese economy, thereby retaining political control as well as economic control of the country. If this is true, then the irony is that China really wants a variant of Nehru's solution and India wants the solution the world thinks China has embraced.

The nub of the matter is that China has tried to embrace capitalism without democracy and India started out, after independence, embracing democracy without embracing capitalism. This contrast in approaches was on dramatic display in a large ballroom in a Mumbai hotel while we were there, in the audience, captivated.

Thanks to the generosity of the Asia Society, we were invited to the 16th Asian Corporate Conference, held in Mumbai on March 18 and 19, 2006. It was opened by Indian Prime Minister Manmohan Singh. On the second day, participants heard from Bo Xilai, the Chinese Commerce Minister. Prime Minister Singh used the occasion to express justifiable pride in India's current growth rate and the health of its stock market and to announce his goal of achieving an economic growth rate equal to China's as well as a plan to make the rupee fully convertible on the world's currency markets.

At the close of the Chinese minister's remarks, a reporter from the Asian Wall Street Journal asked him whether China could achieve its economic aims without becoming a democracy, the way India had years ago. There was a hush in the hall as Bo Xilai said nothing. Then, rather theatrically, he turned to the questioner and, grinning, thanked him for his question. Asking his own translator to take the stage, to make sure that he was accurately translated, he said that China is a democracy, Chinese style. China, he said, listens to what its people want, and what its people want is prosperity. And that is what its government is giving them. Democracy, he said, is not counting votes. It is giving the people what they want. Then, without saying it in so many words, he characterized India's approach as chaotic. China, he said, was not going to be chaotic. Its people did not want chaos. They wanted growth and stability.

He was right about the chaos, the presence of it in India and the absence of it in China. And thereby hangs the tale.

The failure of government to provide good infrastructure and decent services in India has led to a fabulous welter of "workarounds." In education, we encountered an extraordinary array of new private schools, everything from fly by night vendors of insubstantial dreams to remarkable efforts by creative, capable people to put together everything from new fascinating kinds of universities to centers for slum children that were turning the lives of those children around. Some were conceived in the small, to affect only a handful of children. Others were being planned in the large, to scale to tens of thousands of children or adults. Some were put together by entrepreneurs hoping to make money and others by people whose only motivation was to help people less fortunate than they.

Bangalore was full of tales of young people just out of some prestigious university setting up a new business on a shoestring, and Indian couples returning after years in the United States to start their own business with their life savings as capital.

All of these people had access to capital, which in India does not depend on the government or on government-owned banks. Bombay has a well-established stock market and banking system and venture capital is available to people with ideas for new enterprises. The rule of law holds sway in India in a way that has no parallel in China and intellectual property rights, though not as well protected as they are in the United States, are much safer in India than in China.

But the most important thing about India is its people. They do not live in fear of their government. They are famously argumentative, analytical, creative, imaginative, risk-taking people. In contrast to China, we heard no complaints about Indian managers waiting around to be told what to do. That is hardly surprising, because the Indian culture is so different from that in China. Indian students do not live in fear of their government. And they are expected to take charge. It would not occur to them to stand around waiting to be told what to do. Lesley Stahl, reporting for CBS, tells us that the students in the IITs are expected to hire their own cooks for their dorms, organize student life, elect their own leaders (who actually have major responsibilities for student discipline and other important matters) and...take charge. The same is true in Indian schools. In India, potential leaders start young and management is a respected occupation. In China, the best students do not go into management schools because management is so far down the status hierarchy. In India, an increasing number of engineers graduating from the IITs are going on to get a degree in management because that is where they think the action is. In the last analysis, nothing is more important to the success of an economy than the capacity of its managers and their willingness to take risks in the pursuit of their goals.

We have described the obstacles to India's growth, and they are serious: its socialist inheritance, still largely intact, along with the civil service created to administer it; the lack of most of the physical infrastructure needed to support a modern economy; and the failure of the Indian government to take the measures required to stay ahead of the curve with respect to the need for educated and trained people to sustain the growth of the Indian economy.

These obstacles, are, we think, much more serious than the popular or even the specialist press would have one believe. But we believe that India will succeed, not in spite of the chaos, but because of it. India is like a great frothy yeast, bubbling away, often in the most unexpected places. The Chinese minister was right. Far from being centrally controlled, it is out of control, irrepressible ...chaotic. Indians have had to get around their government for so long that they have actually invented a word to describe their penchant for creating workarounds. It is as if the whole country is a workaround. As if hundreds of millions of people had developed the skills to make things work despite whatever obstacle presented itself to them.

Not only are more young, very well educated Indians choosing to stay, but those who have been in the United States or other advanced industrial nations are now returning in increasing numbers. Students who might have gone into engineering or management or medicine two or three decades ago because that is where the only opportunities were are now going into journalism, literary pursuits, music, economics or fashion design. There seems to be a sense of infinite possibility among these talented young professionals. That is India's greatest resource.

Only a fool, of course, would write off China. But, as I see it, China's challenge is greater. The Chinese government's control of the country is what has made it possible for them to march to their foreign-direct investment-led growth so rapidly. But it is their obsession with control that is forcing them to push resources toward their inefficient, uninnovative state enterprises; making them wary of the very entrepreneurs who could help them become more productive; stifling the development of managers who could take the kind of initiative required to plow new ground and build great indigenous firms; and keeping in place the corrosive system under which party secretaries rather than university presidents and provosts hire the professoriate at their universities.

If China does not find a way to embrace the true spirit of democratic capitalism, its economy will decline as its costs rise relative to those of its low cost neighbors.

If all it has to offer is low cost labor, the world will find that they can get that more cheaply elsewhere. If it succeeds in broadly educating its people, but does not create an environment in which those people can create new solutions and develop the innovations needed to bring those new ideas to scale, then China will just slog along while others, slower to start, overtake them.

It would, however, be imprudent to overstate the case. One friend told us of an international investment advisor who observed that Mao, having wiped the slate clean of age-old institutional structures and beliefs, created in their place a willingness to try anything and to accept anything that works. The Chinese, he said, have an extraordinary appetite for learning from the rest of the world, and absorbing whatever seems useful. We reported on this above when we spoke of their eagerness to benchmark the West with respect to anything that matters to them.

And we must remember the example of South Korea. That country, too, began its meteoric economic rise as a very authoritarian nation. Then, not without difficulty and over a period of years, it made the transition to democracy and even greater economic success. The agent for that change was South Korea's growing middle class, which, in the end, is China's best hope for relatively smooth transition to democracy, Western style. If China is able to trace the same path, in its own way, then there will be no stopping her.

THE IMPLICATIONS OF THE RISE OF ASIA FOR EDUCATION AND TRAINING IN THE UNITED STATES

While we are skeptical of much that has been written about the tidal wave of change from Asia, and believe that the challenge from that quarter will not overtake the United States this year or next, the challenge in the next ten to twenty years will be formidable indeed.

It is the numbers that count. China is about 1.4 billion people, India about 1 billion, for a total of about 2.4 billion. According to information released by the National Science Foundation in 2005, China is producing about 600,000 engineers a year and India about 350,000. That is just 50,000 short of one million engineers a year. But many of the “engineers” produced in China and India have degrees earned in just two or three years and they include people who in this country would be regarded as industrial technicians. The senior managers in the international firms we talked with estimated that ten percent of China’s engineers and a comparable proportion of India’s engineers are capable of doing quality engineering work as that term would be defined by an international firm. At ten percent, though, these figures add to 135,000 engineers of international quality, which is more than twice what we are producing, and approaching three times what we are producing if one takes into account the proportion of the engineers produced in the United States who are foreign born and who may return to their native country.

At present, according to the National Association of Colleges and Engineers and the American Society For Engineering Education, starting salaries for engineers in India are on the order of \$4,800 per year or one tenth of what they are in the United States. The Dean of the Engineering School at the University of California, Berkeley reports that average engineering salaries in China in 2005 were approximately double that. These salaries will continue to rise as demand rises and supply continues to be constrained. But, even if they doubled relative to our salaries, that would still be quite a bargain.

It is also true that, while most of the engineers and scientists we are producing are foreign nationals who used to stay in this country, a small but rising proportion are now returning to their native country. While the most recent figures available from American sources put that proportion at about five percent, the companies we talked with in India reported that the numbers are increasing rapidly. The brain drain that used to run in our favor may be about to run in the other direction.

And it is also true that many talented Asian engineers who used to go to the United States do not do so any more. India's National Association of Software and Service Companies (NASSCOM) reports that, whereas in 1993, 84 percent of Indian computer science graduates headed for jobs or advanced study in the United States, only 60 percent do so now. The opportunities in India are steadily improving. Lalit Malhotra, professor of physics at the New Delhi campus of the Indian Institute of Technology reports that "There was a time when the whole of the computer class would disappear from India after their studies. Now it is more like 50-50."

This is great news for the Indians, but it is a serious problem for the United States. According to the American Electronics Association, one out of five US scientists and engineers are foreign-born. Yet the number of skilled workers immigrating to the United States has declined by 27 percent between 2001 and 2003. These workers are indispensable to American science and engineering.

What is most important about these numbers is their direction. The National Academy of Science reports that, over the past three years alone, both China and India doubled their production of three and four year degree holders in the fields of engineering, computer science and information technology, while the production of people in those fields in the United States has remained stagnant.

Engineers are not, of course, the only professionals required to run a modern economy. But they are an important signpost. To avoid a steady, and possibly accelerating, decline in our standard of living, we will have to be at the forefront of technological development in field after field. That will take scientists, engineers, and technical managers of a high order. They will be a small, but exceedingly important, component of our total workforce. But they are also a proxy for the rest. The successful knowledge-based economy of the future will require a much higher proportion of highly educated, technically adept professionals than ever before. Both China and India know this and are determined to make the effort required to produce them. As we have seen, the near term challenges in that regard are formidable, but time and the numbers are

in their favor. Small proportions of their populations turn out to be very large numbers of people relative to the population of the United States.

We conclude that the United States has some time, but not very much, to recast its education system to meet the challenge just described. The price of not doing that will be a gradual and general lowering of wages — and therefore the standard of living — in the United States until it matches that of our lower wage, equally high skill competitors. Recall that we are not competing with all of the Chinese and Indians. We are only competing with the 300 million best educated Chinese and Indians. That is fewer than the top 15 percent.

To compete effectively against their top 15 percent, it will not be enough to be equally well educated. That is because, if we are only as well educated as their top 15 percent, we will be able to earn no more than their top 15 percent, because that is all the world will be willing to pay us for our efforts. That means that, *on average, and at the peaks*, we will have to be better educated than their top 15 percent.

Consider what that really means. The majority of our students leave high school with an eighth grade level of literacy or less. We will have to do much, much better than that to beat India and China's top 15 percent. And the top 10 percent of our students was far down from the world's top ten percent in the best-constructed international comparisons of student achievement. So we will have to do much better at our peaks.

To stand a decent chance of simply maintaining our standard of living in the face of determined competitors who will be able to field world class work forces the size of our entire population within ten to fifteen years and who will be willing to work for considerably less, we will have to work very, very hard to improve our schools, higher education and job training systems. There is not a moment to lose.

A moment ago, I mentioned the need to have an education system that is first class on average and also at its peaks. China has strategies for accomplishing both. It has one strategy for radically improving the performance of its rural schools, which is what is needed to bring its averages up, and another — its key schools and its 100 world class universities strategies — for pushing up its peaks. These strategies are clear and powerful and the Chinese have a very good record of delivering on their priority policy goals in education.

The Indians' have plans for improving rural education, and for creating a new (very small) set of world class universities, but their record of reaching their goals in this arena falls far short of the Chinese and they show no signs of being able to muster the public commitment or the governmental determination to accomplish their modest goals.

In the United States, we have, in No Child Left Behind, for the first time since the Elementary and Secondary Education Act of 1965, a clear national strategy to raise average performance by raising the performance of the students in the bottom quarter of the distribution. Not only do we lack a clear, determined strategy for raising the peaks, but it appears that No Child Left Behind may actually be operating in such a way as to lower the performance of students in the upper two thirds of the distribution.

But there is more to this story, at least concerning China and India, that is relevant here. Both China and India use strategies in their rural areas that involve the use of boarding schools to raise the performance of students near the bottom of the distribution. We are not suggesting the widespread use of boarding schools in the United States, but what is important here is the fact that both countries have chosen strategies for dealing with poor children that emphasize the noncognitive dimensions of their growth and development, which might be just as important as the cognitive dimensions. India's policy, different from China's, calls for identifying exceptionally promising poor rural youth and giving them extra resources in these boarding schools. The urban educators among us were struck by this, knowing as they do that some of the brightest kids

they have ever met are the gang leaders who find little support in school and get their challenges elsewhere. India's idea of identifying some of the poorest kids with the greatest potential and then giving them as much extra help as possible could have enormous payoffs in the United States.

It is also true that both China and India have found ways to harness the competitive, entrepreneurial instinct in their schools that ought to be of interest in the United States. We have already pointed out that, in China, the key public secondary schools are allowed to "sell" a certain number of slots to parents from all over the country who are willing to pay substantial sums to place their (relatively) low performing sons and daughters in these schools. The result is schools that have a highly entrepreneurial spirits, though, in all other respects, they are public schools operating within the ambit of the rules that apply to every other public school.

In India, the top private schools are busy franchising themselves, creating new schools to serve more students, with the same boards but different headmasters than the original schools.

These ideas and developments, and others that we have described, are very much worth paying attention to, but what is most important here are not the national policies of China and India but the enormous eagerness of their people for education and the drive of their people for superior educational achievement, far greater than what we have seen in our own schools. If they have a secret weapon, that is it.

The hunger for education in these countries is palpable. While our parents in this country complain of the demands that school makes on the time of their children and the vast majority of our children loaf through school, millions upon millions of their counterparts in China and India, parents and children hand in hand, are working as hard as they possibly can to achieve as much as they possibly can in school, whatever it takes, because they see school and educational achievement as their only ticket to a much better life. When we asked a young

Chinese student why he was working so hard in school, he said, “for me, for my family and for my country.” He spoke for millions.

The inescapable conclusion is that we have in some sense gone soft, that we either do not understand what is at stake, both personally and as a country, or we do not care enough to do what will be required. We have always valued the credential, as a way up, but we have not, until now, placed a high value on education. If that continues, it will only be a matter of time before we are overtaken.