

GEORGIA STATE UNIVERSITY
THE W.J. USERY, JR., CENTER FOR THE WORKPLACE

USERY LECTURE IN LABOR POLICY
“The Great Doubling:
labor in the new global economy”

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DR. RICHARD FREEMAN: Bill Usery asked me to focus on what I thought was the most important issue facing American workers. That issue is the increased global competition among workers due to the advent of China, India, and the former Soviet bloc to the world capitalist economic system.

I want to begin the lecture with one big fact regarding China, India, and the former Soviet bloc joining the global economy. If you remember nothing else from this lecture, remember this: In the last fifteen or so years, as a result of these countries joining the global economy the number of people in the global workforce has doubled. This is a massive change.

Before the collapse of communism in the Soviet Union, China's movement toward market capitalism, and India's decision to undertake market reforms and enter the global trading system, the global economy encompassed roughly half of the world's population – the advanced OECD countries, Latin America and the Caribbean, Africa, and some other parts of Asia. It did not contain China, which suffered from the economic insanities of Mao's cultural revolution. It did not contain the Soviet bloc, which operated behind the Iron Curtain. It did not contain India, which sought self-sufficiency behind high tariffs and a state-planned and highly regulated economy. As a result, workers in the US and other advanced countries and in traditional market-oriented developing countries such as Mexico did not face competition from low wage Chinese or Indian workers nor from workers in the Soviet empire.

If China, India, and the ex-Soviet bloc had remained outside of the global economy, there would be about 1.46 billion workers in the global economy today (2000, in exhibit 1). Because those countries joined the rest of the world, there are now 2.93 billion workers in the global economy. Since twice 1.46 billion is 2.92 billion, you can see why I have titled this lecture, “The Great Doubling”.

Few analysts expected the world to come together so suddenly in a single global economy based on capitalism and markets. During the Cold War it seemed normal for the world to be divided into competing economic systems that had only loose connections one to the other. Many thought that the state planned economies could function as well or better than market economies. Many feared that communist dictatorships might defeat democracies. Instead, the Soviet System imploded, with workers leading the opposition to communism, in a process begun by Solidarnosc in Poland. After experiencing the economic and political effects of the Cultural Revolution, China’s Communist Party chose to introduce market capitalism while maintaining their dictatorship in politics. After losing ground compared to other developing countries and to the advanced countries, India moved from an autarkic state-run economy toward markets and the global trading community.

The result of these developments was the doubling of the number of workers in the global economy.

The capital-labor ratio

What impact might the doubling have on workers in the US and elsewhere? A simple thought experiment helps answer this question. Imagine what would happen tomorrow if through some bizarre cloning experiment a mad scientist doubled the Georgia workforce. Twice as many workers would be seeking employment from the same businesses. Twice as many

graduates from Georgia State would be applying for the same number of job openings. It doesn't take much economics to see that this would be good for employers but terrible for workers.

Wages would be driven down. Unemployment would rise.

But, you might think, "Wait a second. What if the mad scientist doubled the Georgia workforce in a different way: by convincing Hollywood movie stars, millionaire sports figures, and billionaire friends of Bill Gates, to move from the Riviera, Beverley Hills, Silicon Valley to Atlanta, Savannah, Augusta. These people would bring lots of capital with them. They would build huge houses, buy lots of exclusive label products, demand fine restaurants, and so on. They would create lots of new jobs." This is a correct analysis. If the countries that joined the global capitalist system brought with them lots of capital, doubling the work force would have very different effects on labor than if they brought with them very little capital. Economics says that to understand how the doubling affects workers, we have to know what it does to the ratio of capital to labor in the global economy.

There is no regular published data on the capital stock of countries. One reason is that surveys that collect data on capital stock are infrequent, particularly outside of manufacturing, and are available for only some countries. The Penn World Tables, which provides the best data on the aggregate economy in most countries, has said that it will produce capital stocks for the countries in its data system but has not done so yet. The Penn World Tables does, however, have data on yearly investments for most countries. Using these data, I applied the perpetual inventory method of cumulating investments per year into capital stocks for each country with sufficient information and summed the estimates to obtain the capital stock in the global economy for 1990 and 2000. In these calculations, I used two different depreciation rates, a 5% rate and a 10% rate. The 5% rate gives investments a longer life and thus produces a higher

amount of capital than does the 10% depreciation rate. Experts on the Soviet Union report that investments in the communist period produced less useful capital than this methodology indicates, and so I made some adjustments for that. There are other technical problems in the calculations about which you do not want to know. Finally, I divided the estimates of the global capital stock by the global work force to obtain global capital-labor ratios. When the Penn World Tables team produces its own capital stock series, their estimates will dominate mine. But their estimates will undoubtedly give similar orders of magnitudes as mine and thus tell the same story about the global capital labor ratio that I will now tell.

The story is simple (see exhibit 2). The doubling of the global work force reduced the ratio of capital to labor in the global economy by 40% to 50%. The reason is that the advanced capitalist countries had most of the capital in the world while China, India, and the ex-Soviet bloc did not have much capital to bring with them when they joined the global economy. India had little capital because it is a very poor country – one of the lowest income countries in the world. Low income means not much capital. China is also very poor and lost some of its capital stock during the Maoist period. The ex Soviet Empire brought little capital to the global economy for a different reason. It had a high investment rate and was much wealthier than China or India, but much of the Soviet capital was invested in producing military goods and in old-fashioned heavy industry instead of in modern computer-driven technologies or in the production and delivery of consumer products. Additionally, when East Germany joined West Germany, we learned that much of the civilian capital that the old Soviet Bloc has was either outmoded or so polluting as to be basically worthless.

Since India, China, and the ex-Soviet bloc brought little capital to the global economy, the doubling of the global work force came close to halving the global capital labor ratio. My

estimates show that the capital per worker in the world economy after the great doubling was 56 percent of the capital per worker in the global economy in 1990 and 61 percent of the capital labor ratio in 2000 that the world would have had before China, India, and the ex-Soviet bloc joined the world economy. That is a massive drop in the capital-labor ratio. If Georgia lost 44 percent of the plant and equipment and buildings in some cataclysm, it would be much poorer than even Mississippi. Of course, doubling the global work force did not destroy capital. Roads, buildings, electrical power plants, schools, and much equipment are largely immobile. It is on the margin of new investments that the doubling alters incentives for capital. Responding to huge supplies of low wage labor, capital should flow to China, India, and to the ex-Soviet bloc.

Indeed, this is what we see today. German manufacturers set up plants in Eastern Europe, where wages are far below those in Germany, and look longingly at the Ukraine, where wages are even lower than in Eastern Europe. American firms off shore jobs to India, fund joint ventures in China, shift production to Mexico, set up research facilities in India and China; and subcontract production to low wage countries. It will take a long time, perhaps thirty years, before the capital-labor ratio in the world returns to the level it had before China, India, and the ex-Soviet bloc joined the global economy. It may take even longer for the global economy to fully adjust to the doubling of the work force.

How this adjustment process works itself out will have immense consequences for workers throughout the world. Workers in the new entrants to the global economy should do better since capital will flow to them, raising wages and increasing employment. Workers in developing countries where wages exceed those in China and India risk doing worse than when they were the global economy's low wage producers. These countries have to find new growth strategies. Workers in the US and other advanced countries will benefit from the low prices of

goods from China and India but will suffer from the enhanced labor market competition. The advanced countries have to maintain their comparative advantage in high tech sectors despite the increasing technological competence of India and China. The economic and labor market policies that countries, the international community, unions, and firms choose to guide the transition will go a long way to determining whether it proceeds smoothly, or bumpily, or aborts.

Impacts on the new entrants

Joining the global capitalist system has already greatly improved the economic position of workers in China and India. In the 1960s China and India lost ground relative to the other developing countries as well as to the advanced countries. In the past two decades, as they adopted market capitalism, the two countries have been catching up, though they still have lower national income per capita than most other developing countries (exhibit 3). Neither China nor India is, for instance, as wealthy as Mexico. Wages in both countries are below those in Peru or South Africa. But China and India are making rapid progress. Chinese factories are zooming with people producing all sorts of products for the world. India has a thriving business in call centers and in software development. With the end of the multi-fiber agreement in apparel that allocated shares of US imports to particular countries, an increasing proportion of apparel and eventually textiles will shift to China and possibly India and Bangladesh.

The rate of poverty in China has fallen since it embraced market economics and the world trading system. The fall in poverty is remarkable because it occurred despite China having one of the greatest rises of inequality in the history of the world. Under communism, the state set wages for the entire work force and China had an extremely egalitarian distribution of income: virtually everyone was poor. As China freed up its labor market and allowed firms to decide what to produce and how much to pay in response to market forces, inequality in China

increased by region, level of skill of workers, industry, and so on. But economic growth was so fast that even though the wealthier got ahead of the poor by a lot, poverty fell, making China the best case I have seen for trickle down economics (exhibit 4). Still, the high inequality and lack of democratic accountability leaves China vulnerable to social disorders. If the Chinese growth rate tails off, the country could experience mass protests that bring down the regime, something of which the Chinese government is fully conscious.

Removing barriers to business and entrepreneurship and placing greater reliance on markets than on state planning in India had a similar impact in spurring economic growth. Some analysts claim that India's greater openness to trade also contributed to its improved performance. Others downplay that factor. But no one gainsays the substantial improvement in economic performance. India has long had a highly unequal distribution of income and the upswing in growth did little to help the poorest. It has some insurance against disorders since it is a democracy in which groups who fail to advance as the economy grows can and do use the ballot box to press for changes in policy.

The ex-Soviet economies have had a difficult transition to becoming market economies. Almost all suffered a big drop in income and rises in inequality and poverty when they abandoned state planning in favor of market economics. The East European countries, particularly Poland, have done better than Russia and the less Western-oriented states. Accession to the European Union should help the workers in the East European countries, as it should induce greater capital flows to the East and create opportunities to immigrate to higher wage locales.

Impacts on developing countries

Workers in the developing countries in Latin America, Africa, and Asia have not done well in the period covered by great doubling. Following the advice of the IMF and World Bank and the success of the four “tiger economies” of East Asia (Korea, Singapore, Hong Kong, Taiwan), most of these countries adopted an export-led strategy of producing goods and services made by low wage labor for the global economy. This strategy might have succeeded in spurring development before the doubling of the global work force. But it cannot do so in the face of competition from China and India. In fact, in the 1990s and 2000s, employment in the older developing countries shifted from the formal sectors historically associated with economic advancement to informal sectors, where work is precarious, wages and productivity low, and occupational risks and hazards great. No advanced country obtained high income by shifting labor from industry to the informal sector.

Research has not determined the causes of the growing informalization, but I suspect that China and India’s entry to the world economy has contributed to this. It has transformed many developing countries from low wage competitors with advanced countries to high wage competitors with China and India. Wages in relatively poor Latin American countries like Peru or El Salvador are three times those in China or India. Mexico is a much more expensive site for production of blue jeans than China. Labor costs in South Africa are also far above those in China and India, while the country’s strong trade unions and labor regulations reduce its appeal to the footloose firms in the global chain of production. Despite devaluations of the currency, South Africa has not been able to improve its share of export markets.

The end of the multi-fiber agreement in apparel in 2005 brought home the need to find new development strategies to many countries. Under the agreement the US allocated the rights to sell apparel to various developing countries. The system distorted world trade but gave many

poor countries an opportunity to produce apparel, which has historically been the first leg up in industrial development. China's low wage are gaining it an increasing share of the apparel market, aborting the path of development that these countries expected to follow. To compete with China, employers in Central America have asked workers for more hours at lower pay. "We are poor as it is, but they threaten to move the jobs," one union leader said at a spring 2004 Harvard conference on the end of the quota system. "What can we do?"

Neither the International Monetary Fund nor the World Bank, who are the principal advisors to developing countries on economic matters, have grappled with this question. Neither has come to grips with the fact that in the post-doubling world, their old policy suggestions will not work for most developing countries. Producing generic low wage goods and services for the global market place will not do in the face of competition from China and India. Some countries may expand through sale of natural resources to China, though mining and other resource industries employ few people and the multinationals who run the industries often repatriate capital to their home country rather than invest in the developing country. Some may be able to expand their domestic markets. I suspect that there is no simple answer about what to do in the face of the doubling of the global workforce and that each country will have to craft a strategy dependent on its own unique circumstances.

Global inequality and poverty

The growth success of China and India, who make up one third of the world's population, the economic problems of many other developing countries, and the weak performance of the transition economies, together with the economic performance of advanced countries, has altered the distribution of incomes around the world. Has it raised or reduced global inequality and poverty?

Estimates of the income of individuals in the entire world, including China, India, and the ex-Soviet bloc, show that global inequality has lessened from 1980 to 2000, the period encompassing the doubling. Inequality did not fall because income distributions became more equal within countries. The opposite is true. Incomes became more unequal in most countries. Global inequality fell because China and India gained relative to other developing countries and to the advanced countries. For all the concern about poverty in Africa, whose economies have done extremely poorly, incomes in China and India were below those in Africa. More of the lowest income people in the world lived in those two countries than from anywhere else. Rising incomes in China and India moved the incomes of workers at the bottom of an income distribution closer to the average, reducing inequality. The global rate of poverty fell for the same reason. The World Bank's estimate of global poverty (based on a poverty line of \$1 a day) shows that much of the poverty reduction in the world occurred in China. Still, the decline in poverty was not universal. Poverty rose in Africa, in Argentina, and in much of the ex-Soviet bloc, as well as in selected other countries.

The US and other advanced countries

During the North American Free Trade Agreement debate and in ensuing discussions of free trade, proponents of globalization told Americans that we were in a "win-win" situation. The US would get good jobs while the workers in developing countries would get the low-level jobs that we didn't want, but which gave them higher incomes than traditional agriculture. Proponents recognized that less skilled Americans might suffer from competition with lower paid workers overseas, but assumed that there was an easy cure: more education.

The logic for this claim was that the US and other advanced countries had a comparative advantage in skilled labor-intensive sectors compared to developing countries. This comparative

advantage resulted from the advanced countries having relatively many highly educated workers whereas developing countries had relatively many less educated workers. Trade would increase output and employment in the skilled labor-intensive sectors in the US and other advanced countries and would increase output and employment in the unskilled labor-intensive sectors in the developing world. The “North-South” model of trade between advanced countries and developing countries formalizes the notion that the advanced countries monopolize the cutting edge innovative sectors while developing countries end up producing more traditional products. There is some validity to this model. The US and other advanced countries export relatively high tech products and import products made with less skilled labor. But as any computer programmer or software engineer who has seen their job off-shored to India or any researcher who has seen multinationals develop new R&D facilities in China and India knows from personal experience, something is missing in this analysis.

What is missing is that while China and India have large peasant workforces with many less educated workers, they also have large and growing numbers of persons receiving university education. And the ex-Soviet bloc has long invested in education. Throughout the world, the number of students enrolled in college has increased greatly, diminishing the US’s comparative advantage from having a highly educated work force (exhibit 5). In the 1960s, on the order of 50 percent of college enrollments were in the U.S. Europe hadn’t yet expanded their college system to US levels. Chinese higher education was a mess. India had relatively few university graduates. This changed greatly in the final two decades of the 20th century. More and more countries invested in higher education and more and more students chose to go to college. By 2000 UNESCO data show that roughly 100 million students enrolled in college around the

world, with about 38 percent in China, India, and the former Soviet bloc. The US share of global college enrollments fell to about 15 percent.

Comparative advantage in technologically intensive industries depends on scientists and engineers more than on graduates in other disciplines. Here, the US advantage has fallen more. The proportion of students studying science and engineering is larger in most other countries than in the US. This is particularly true of China, India, and the ex-Soviet bloc. Reflecting this, the Institute of Electrical and Electronics Engineers raised alarm bells in 2004 with the claim that China was graduating some 700,000 engineers compared to 65,000 engineers in the US. What was going to happen to the US advantage in high tech if China graduated over ten times the number of engineers as the US? The 700,000 engineering graduates number was excessive, perhaps due to inclusion of large numbers of technicians with less than bachelor's level education. Recent estimates indicate that in 2003, China graduated approximately 325,000 engineers – “only” five times as many as the US. The huge number of engineers reflects an astounding expansion of Chinese higher education since the mid-1980s, when China graduated far fewer engineers than did the US.

The newly graduated Chinese engineers are unlikely to be as skilled as U.S. graduates. You can't double or triple enrollments in any university setting and maintain quality. To find out how well graduates in developing countries can compete with those from advanced countries in the global labor market, the McKinsey Global Institute asked recruiters for multinational firms the proportion of graduates from various developing and transition countries that they viewed as good candidates for jobs. The recruiters came up with numbers ranging from 10 percent to 20 percent, depending on the occupation and country. But even ten to twenty percent of the

increasing number of graduates from developing countries adds immensely to the supply pool from whom multinationals “globally source” to fill vacancies.

Consider next the global supply of the doctorate scientist and engineers. From the end of World War II and through the 1970s and 1980s the US was the dominant scientific and intellectual power in the world. The US produced about one-half of the PhDs in the world in science and engineering. Many Ph.D.s in the rival superpower, the Soviet Union, worked on military things, not on civilian technology relevant to the global economy.

Data on the number of PhD graduates in the 2000s shows that the number of science and engineering PhDs graduating in other countries is rising rapidly and has or will surpass the number graduating in the US. Advanced Europe has been producing more PhDs in science and engineering than the US for a decade already and it will expand on its lead throughout the rest of the current decade. Other countries are increasing their doctorates in science and engineering fields. The biggest and most startling increase in doctorates is for China. I was at an OECD conference in Paris when I first saw statistics that indicated that China would soon graduate more PhDs in science and engineering than the US. I thought the data had to be wrong – an overestimate comparable to that for bachelor’s engineering graduates. I asked two students to confirm or challenge these statistics. I said to each, “Find what’s wrong with these statistics.” They searched Chinese educational statistic sources and contacted agencies and researchers in China and reported that the numbers were right.

In 2001 China graduated about a third as many science and engineering PhDs as did the US. Enrollments in PhD programs have risen by enough, however, that by 2010 China will graduate more PhDs in science and engineering than the US. This is remarkable for a country that is still one of the poorer countries in the world. It must be the first time in history that a poor country

would be graduating more persons with the highest educational qualifications than the wealthiest and most advanced country in the world. These data, moreover, exclude Chinese students earning degrees in other countries. Add in degrees to Chinese students outside of China and the ratio of PhDs to Chinese citizens relative to all graduates from US universities rises to about 0.72 in 2001. But here the comparisons get tricky. Many Chinese doctorates stay and work in the US for many years, and many become permanent residents or citizens.

The bottom line is that the US will have no monopoly on either good jobs or smart people creating new ideas and products in the future. With 3 billion more people in the global economy, the great doubling will increase the supply of people getting university degrees. There will be a lot of smart people from around the world competing for jobs in the US or for jobs with multinationals elsewhere in the world or working for firms in their own country that compete with US firms. Globalization means competition for the most highly educated as well as the less educated.

Indicators of change

How important is the increasing share of university students and science and engineering graduates in China, India, and other countries to US technological leadership and comparative advantage in high tech educated labor-intensive industries that provide the best jobs? I examine next a set of indicators that shows that the changes in supplies described above are affecting the US position as scientific and technological leader in many ways, and thus the country's comparative advantage in global markets.

... high tech production and trade

Consider first the share of the US and other countries in global production of high tech goods. Exhibit 6 shows that judged by this measure, the US has done relatively well, maintaining

its share of high tech production despite a huge jump in the shares going to China and South Korea. The share of high tech production in Japan fell sharply, while Germany was surpassed by China. In part the US did better than other advanced countries because the US population was growing more rapidly than the populations of Europe and Japan. Data on the archetypical product of the modern economy, the computer, tells a similar story about the rise of China in technology. In 2003 China surpassed Japan to become the world's No 2 market for personal computers after the US and bought IBM's personal computer division to increase its productive capability.

The performance is much worse in the balance of trade in high technology goods. In 1980 the US had 30% of the world's market of high tech exports and 13% of the global high imports, so that it ran a huge trade surplus in high tech. In 2001, by contrast, the US share of high tech exports had dropped nearly in half to 17% while the US share of high tech imports had risen by enough that the trade surplus in high tech had disappeared. In 2004 the US was running a 37 billion dollar deficit in the balance of trade in high tech industries. That's the sector where the country's comparative advantage was supposed to create good jobs for Americans.

... employment of foreign born specialists

Another indicator of how the growing number of highly educated workers in China, India, and other countries is affecting the US can be seen in exhibit 7, which displays the share of the foreign-born among employed scientists and engineers with different degrees. The data shows that in 2000 17% of bachelor's degree scientists and engineers were foreign-born, while 29% of masters' degree scientists and engineers were foreign born and 38% of PhD scientists and engineers were foreign-born.

The most striking statistics in the exhibit are for PhDs less than 45 years old and for the overlapping group of post-doctorate workers, who make up a large share of younger scientists, especially in the life sciences. Over half of the people doing science and engineering at the doctorate level in the US below 45 years of age are foreign born, many from India, China and other developing countries. For better or worse, the United States has come to rely on immigrants to maintain the scientific and technological prowess that is critical to the country's economic success and national security. With large numbers of science and engineering graduates coming from China and India, many earning their Ph.D.'s in the US, and with Europe graduating one and a half to two times as many Ph.D.'s as the US, this is arguably the only way for the US to maintain its position as the leading technology power, absent a huge national effort to make science and engineering more attractive to US citizens.

... Off shoring

In fall 2004 the Harvard Labor and Worklife Program ran a day and a half long conference on off shoring. Before the conference, all I knew about off shoring was that it was in the news and that one of my colleagues, who was serving as head of the Council of Economic Advisors, had gotten into trouble pointing out that off shoring was another form of trade. Participants at the conference noted the absence of national statistics on off shoring, but even absent national statistics, no one gainsaid that the phenomenon was growing rapidly. Web sites devoted to off shoring attest to its significance. Consultants advise firms on how they can save money by off shoring. A 2005 McKinsey Global Institute study on off shoring estimated that upwards of 10% to 15% of jobs could be off shored in the next decade or two. Most of these jobs are, moreover, likely to be high skilled jobs. Anything that can be digitalized has the potential for being done overseas. Some CEOs have expressed concern that sending high level

work overseas is not in the US's national interest, but business is about making money, and if more can be made by off shoring work overseas, that is what firms will do. Given the rising numbers of highly educated workers in low wage countries like China and India, I expect the off shoring of good jobs to continue unabated.

... Scientific papers

If other countries are closing the gap in science and technology with the US, the shares of scientific papers from those countries should be rising, while the US share of papers should fall. In fact, that is what is happening (exhibit 8). The share of papers from Asia has risen substantially. The EU share of papers has also risen, presumably because the EU is graduating more science and engineering PhDs than the US. The statistics also show the disaster to the scientific enterprise in the ex-Soviet Union, whose shares of scientific papers goes way down. The US share of papers covered by Chemical Abstracts has fallen even more sharply (exhibit 9). The papers in Chemical Abstracts are more closely related to scientific and technological developments that affect the economy than papers in some other scientific fields, for instance, String theory. In 1980, 73% of the papers were written by US citizens or residents. In 2000 the percentage of articles written by Americans had gone down to 40 percent.

The decline in the US share of scientific publications is a natural outcome from the spread of higher education and scientific competence around the world. This has to be a good for humanity in general. It is good for Americans as consumers of the products that scientific and technological advance make possible, but at the same time, it reduces the US advantage in science and technology that has helped make US workers highly productive and thus well paid.

... an index of technical prowess

My next indicator of the change in the technological competence around the world comes from a study by researchers at the Technology and Policy Assessment Center at Georgia Tech (exhibit 10). This Center produces a set of indicators of the technical capability of countries that the National Science Foundation uses in its biennial Science and Engineering Indicators report on the status of the US scientific and engineering endeavor. In 1993 the US and Japan were far ahead of China in the Ga. Tech index. In 2003, while Japan was falling behind the US, China more than doubled its score to over 50% of the US score. The Georgia Tech group made the rise of China the headline in their report on the 2003 data: poor country moving up rapidly in the technology world. This is the first time, I think, in the history of the world that a really poor country is reaching the science and technology frontier.

... location of multinational research facilities

As a final indicator of the spread of technology and education, consider where major multinationals located their research facilities in the 1990s-early 2000s. If China and India are truly increasing their ability to conduct leading edge research, we would expect to see firms invest in R&D facilities in those countries. In fact, Microsoft has a major research facility in Beijing which is developing new products that they may try out on the Chinese market first. Production would naturally start off in China. Then they might bring production to the US or, more likely, export to the US. IBM has major research facilities in China and India. In 2003, Cisco CEO John Chambers declared that Cisco was a Chinese firm, as it developed a major new facility there. The Chinese government counts the number of multinational research facilities in the country. In 2005 Chinese President Hu Jintao proudly told the World Economic Forum that as of the latest count, there were over 700 such facilities. In 1990, there were no more than a handful.

The challenge: human resource leapfrogging

My analysis diverges from the “North-South trade” model that trade economists use to explain how technological change affects trade between advanced and developing countries (exhibit 11). That model posits that the North (the advanced countries) has a monopoly in developing new products and processes and trades those products for older standard products made by unskilled workers in the South (developing countries). Firms like Microsoft, IBM, Intel, and Cisco are supposed to produce cutting edge goods in the US or other advanced countries while firms in China, Mexico, India, Indonesia, and Brazil would make t-shirts, sneakers, and little plastic toys that use older technologies.

The North-South model roots the advanced country monopoly of high technology in the greater number of scientists and engineers and other highly educated workers per capita in those countries than in developing countries like China and India. If success in high technology depends on the relative number of highly educated workers to the work force countrywide, the model would be correct in locating technological superiority with the advanced countries.

By contrast, I posit that success in high tech industries depends on the absolute number of scientists and engineers working in those sectors. Even though highly educated workers are a small proportion of the work forces of China and India, these countries are sufficiently populous to have a big footprint in science and engineering and thus in high tech sectors. Put differently, there is an economy of scale in country size that allows a low income populous country to reach the scientific and technological frontier even though it has proportionately fewer highly educated workers than advanced countries. I call the process by which a low wage populous developing country educates enough scientists, engineers, and other university graduates to challenge the

comparative advantage of high income countries in high tech activities “human resource leapfrogging”.

Can this challenge harm the US and other Advanced Countries?

Yes, it can. One way to see this is to think of the consequences to advanced countries of the loss of the monopoly they had in research and development and innovation of new products that lies at the heart of the North-South model. In that model, workers in the North are paid higher wages than comparable workers in the South because of the monopoly in technology. The differential in pay rises with the rate of technological innovation and falls with the rate of diffusion of those innovations. Other factors contribute to the higher pay of workers in advanced countries -- greater education and skills, higher capital-labor ratios, and the rule of law and better protection of property. Still, losing the technological edge means losing the higher productivity and wages associated with developing the newest products.

That one country's gain can be another's loss when a country's comparative advantage is made through investment and research rather than determined by exogenous factors (such as soil and sun for vineyards) follows from the Ricardian model of trade in which trade arises from technological differences between countries. The clearest analysis of this is the Gomory-Baumol model, in which two advanced countries compete for “retainable industries”, with the country that gains more of those industries obtaining higher output per capita. Per the North-South model, Gomory and Baumol assume that developing countries cannot compete for the high-technology rapid productivity-increasing sectors, so that trade between advanced countries and developing countries is invariably mutually beneficial. Human resource leapfrogging by populous low wage countries allows those countries to compete for retainable industries. In fact,

with much lower initial wages, they are a more formidable competitor for an advanced country than another advanced country.

Let me give an example. Let's say that someone in the US has invented and produced whirling Calabi-Yau gizmos, which exploit the hidden dimensions of string theory to make people feel at one with the universe. The gizmos are the greatest thing since pet rocks and a big hit in the world market. The gizmo industry requires lots of skilled workers, so more US workers get good jobs, while wages rise generally. If a firm in India comes up with competing gizmos and begins to produce them, competition will force down the price and wages in the US. But with cheaper labor, India is able to reduce the price so much that the US whirling gizmo industry disappears, and along with it the good jobs and higher wages. India's gain is the US's loss.

I said that one country's gain **can** be another's loss in this type of competition. It is also possible, however, that the loss of some leading edge sectors can benefit the advanced country. If India produces whirling gizmos at very low prices, US consumers will benefit. Something like that has happened in the production of televisions and in many computer products and services, though in these cases, the US shifted at least some labor to other new products. In general, however, losing industries that employ large numbers of highly educated and skilled workers, and that offer great opportunities for rapid technological advance is unlikely to benefit a country.

Job structure and retainable industries

Accepting that the US can suffer economic losses if another country – developing or advanced – outcompetes the US in high tech sectors where the US currently has a comparative advantage, what types of industries ought the country strive to retain or gain in the global economy?

It should strive to keep industries that have the potential for rapid technological progress and growth and that offer many “good” jobs. This probably includes sectors such as airplane manufactures, electrical machinery, motor vehicles, chemicals, high tech computer equipment, software activities, and financial services. It also includes the sector that many of us know best – higher education. American universities are the world’s leader --- in one global rating, thirty of the top forty universities in the world were American. This is why the US attracts so many international students, and is one of the great things of which the country should take pride.

Will the US remain so dominant in that sector? I doubt it. Europe is improving its universities rapidly and creating programs that allow students to move readily among them. China, India, and other developing countries are investing in higher education. The US comparative advantage will decline, but the US ought to maintain its leading position. Higher education is a large employer, with hundreds of thousands of persons working in the sector, from professors to gardeners and receptionists, and the close tie between universities and industry enhances the country’s ability to transform knowledge creation in university research into products.

By contrast, consider what would happen if the US lost the space exploration industry. I don’t want to insult any US astronauts, but if some other country landed an astronaut on Mars, the economic consequences would be minimal. President Bush’s desire for the US to develop a manned trip to Mars appeals to the science fiction fan in me but not to the economist. I can think of few worse ways to spend R&D moneys and science-engineering talent than sending an American to Mars. With a declining share of the world’s scientific resources, the country has to choose the sectors in which to invest with greater concern for their economic consequences than in the past. The Nano-technology Initiative, designed to fund research on nano-science and

nano-engineering to position the US in the forefront of what many believe will be the key technology in the future, makes a lot more sense than journeying to Mars.

Transitions to a New Globalization

The great doubling has brought the entire world (save Cuba and North Korea) into the same market-based capitalist economic system and created the potential for workers around the world to access modern technology and improve incomes rapidly. Barring disaster, the world has begun an historic transition to a truly global economy that should produce rough income parity among nations and “make poverty history”. But the transition is unlikely to be short or sweet. It will take several decades for the low income populous countries to approach the income levels of advanced countries: it would take 50 years of real wage increases of 6% per year for China to attain current US income levels. Things could go wrong along the way, as some countries and groups within countries do better or worse than others. The great doubling poses challenges to the policy-makers around the world.

The largest gains should come to China and India. But those countries still face huge challenges. They have to grow fast enough to absorb much of their peasantry into modern sector jobs and have to limit inequality to maintain social order. Other developing countries face the bigger challenge of finding new ways to advance their economies without engaging in head on competition with China and India in low wage industries. Russia and some of the other ex-Soviet countries have to get their economic acts together to turn their market economies from generators of inequality to generators of wealth for all. Africa has to reorient itself and get on a stable political and economic trajectory. The US and the advanced capitalist world have to find ways to maintain wages and living standards in the face of low wage competition and the increased technological and economic sophistication of China and India.

Transitions, Past and Future

There have been successful transitions from major economic shocks in the past. Perhaps the most successful transition was the recovery of Western Europe and Japan after World War II. The US sent capital to Europe under the Marshall Plan that helped those countries reconstruct their economies rapidly. Recovery of Europe in turn created markets for American products while rapid increases in European wages saved US workers from facing low wage competition. Similarly, the US helped Japan develop into a market democracy with the capability of challenging the US in many technically advanced sectors. The progress of Korea from being one of the poorest economies in the world, devastated by the Korean War, to an essentially advanced economy in about fifty years is even more remarkable since that country had never before been among the leading global economies.

There are examples of unsuccessful transitions as well, of which the reunification of East Germany with West Germany is the most recent. The German government acted as if low income East Germany would meld seamlessly with the wealthier capitalist West despite the legacy of nearly half a century of communism. It offered extensive welfare programs to keep workers in the East, but did not raise taxes to fund a massive Marshall plan style program to rebuild the East's economy. German unions sought wage parity between East and West rather than allowing wage differences to reflect productivity differences. The result is that what had been the healthiest economy in Europe was transformed into one of the sickest, with high unemployment and sluggish growth.

Closer to Georgia, reconstruction of the US South after the Civil War was an even greater failure. It took over a century for the South to achieve something akin to economic parity with the rest of the country. The southern whites who disenfranchised black citizens spent the better

part of the 20th century oppressing the blacks, limiting their schooling and economic opportunities rather than joining with them to try to move the southern states' economies forward. Suppressing the rights of a large proportion of the citizenry and engaging in massive government supported economic discrimination is no way to grow an economy.

Turning to the transition to the doubling of the global work force, I can envisage a bad transition scenario and a good transition scenario (figure 12).

...bad transition

In the bad transition China and India develop enclave economies, with a modern sector that competes with the advanced countries, but which does not grow enough to employ the huge number of rural workers. Low agriculture productivity and wages limits wage growth for less skilled industrial workers, which creates low wage competition for other countries. The US saves little and continues to absorb financial capital, so the capital-labor ratio in developing countries rises slowly, further dampening wage increases around the world. Wages fall in advanced countries more than wages rise in developing countries, and there is a resurgence of protectionism in the advanced countries.

The greatest danger to the transition is not, however, protectionism in the advanced countries but social instability in developing countries, particularly China, as a result of rising internal economic inequality. Without political freedom and legitimate channels of protest, China risks disorder from disgruntled citizens if its economy runs into economic problems. The Chinese government recognizes the dangers of economic discontent, which has led it to develop some policies that favor the rural poor and urban job losers, but it continues to outlaw independent unions and political parties that might threaten the communist monopoly on power.

... good transition

In the good transition, the increased number of scientists and engineers working worldwide accelerates the rate of technological advance enough to raise living standards in all countries, including the low income developing countries adjusting to competition with China and India, and the advanced countries squeezed between low wage competition and the increased technological competence of China and India. The US and other advanced countries retain comparative advantage in some leading sectors, becoming hubs in the global development of technology and exploiting the economies of scale from having many technologically innovative activities in the same localities. They increase social services and social infrastructure to citizens to substitute for the difficulty of raising wages in the face of low wage services. The world savings rate rises as the US saves more, and the global capital labor ratio rises rapidly. Finally, there is continual international pressure on developing countries to raise their labor standards and to distribute the benefits of growth to workers.

Conclusion

So which will it be? If countries adopt reasonably sensible policies, we can avoid the disaster of a bad transition and succeed in improving the well-being of the vast majority of workers. But this requires that policy-makers adjust to the fact that the doubling of the global work force has put workers in many countries in a more precarious position than before and seek policies to protect the interests of labor, when labor is economically weak due to the decline in the global capital labor ratio. The overriding policy bent should be toward workers more than toward capital, which ought to be able to take care of itself through global sourcing of work.

References and Supporting Material

Detailed documentation of the evidence is given in

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