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The End of Cheap Chinese Labor

Hongbin Li, Lei Li, Binzhen Wu, and Yanyan Xiong

In recent decades, cheap labor has played a central role in the Chinese model, which has relied on expanded participation in world trade as a main driver of growth (Lin, Cai, and Li 2003; Bernstein 2004). At the beginning of China's economic reforms in 1978, the annual wage of a Chinese urban worker was only $1,004 in U.S. dollars: that is, 615 renminbi yuan divided by China's official exchange rate of 1.68 yuan/dollar in that year, and then deflated to the 2010 level by the U.S. GDP deflator. (The official exchange rate was overvalued at the time, but it is useful in measuring the price that U.S. consumers pay for Chinese labor embodied in Chinese goods.) Back in 1978, China's wage was only 3 percent of the average U.S. wage at that time, and it was also significantly lower than the wages in neighboring Asian countries such as the Philippines and Thailand. The Chinese wage was also low relative to productivity. According to Ceglowski and Golub (2007), China's "unit labor cost"—wage as a percentage of labor productivity—relative to the same ratio in the United States declined from over 70 percent in the 1980s to about 30 percent in the mid-1990s.

However, wages are now rising in China. In 2010, the annual wage of a Chinese urban worker reached $5,487 in U.S. dollars—that is, 37,147 yuan divided by the

■ *Hongbin Li is C.V. Starr Professor of Economics, Lei Li is a Ph.D. student, and Binzhen Wu is Assistant Professor of the School of Economics and Management, all at Tsinghua University, Beijing, China. Yanyan Xiong is Associate Professor, School of Economics and Management, Southeast University, Nanjing, China. All four authors are also affiliated with the China Data Center, Tsinghua University. Their email addresses are lihongbin@sem.tsinghua.edu.cn, lil6.11@sem.tsinghua.edu.cn, wubzh@sem.tsinghua.edu.cn, and xiongyanyan@seu.edu.cn, respectively. Yanyan Xiong is the corresponding author.*

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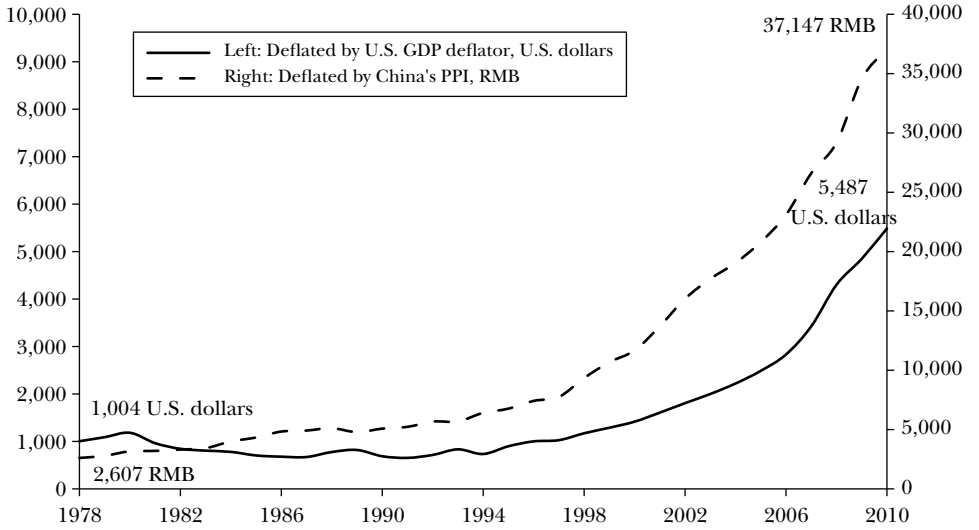
exchange rate of 6.77 yuan/dollar—which is similar to wages earned by workers in the Philippines and Thailand and significantly higher than those earned by workers in India and Indonesia. China's wages also increased faster than productivity since the late 1990s, suggesting that Chinese labor is becoming more expensive in this sense as well.

The opening section of this paper discusses China's rising wages in more detail. For example, the increase in China's wages is not confined to any sector, as wages have increased for both skilled and unskilled workers, for both coastal and inland areas, and for both exporting and nonexporting firms. We then benchmark wage growth to productivity growth using both national- and industry-level data, showing that Chinese labor was kept cheap until the late 1990s but the relative cost of labor has increased since then. Finally, we discuss the main forces that are pushing wages up. For example, the reforms in the late 1990s re-established a flexible labor market in China, enabling firms to pay workers according to productivity. China's labor force may have already reached its peak in 2011; and China's rural-to-urban migration will also slow down because the rural young are highly mobile; almost all rural youth in the 16–20 age bracket are already working off the farm (Rozelle, Huang, Zhang, and Li 2008). Therefore, future increases in migrant labor must come from those who are older or those who have established families, who will require the prospect of larger wage gains than migrants of the past if they are to find migration worthwhile.

Rising Wages in China

China's urban areas have a dual labor market: one for urban workers and the other for low-skilled migrant workers. Urban workers (both skilled and unskilled) have urban *hukou* (household registration), which means that they are registered with the government as living permanently in cities. Migrant workers have rural *hukou*, and they are very mobile in two aspects. First, they live temporarily in the places where they work during the year and return to their rural homes during the Chinese New Year holidays and the peak agricultural seasons (Wang and Zuo 1999). Although more migrant workers have chosen to stay in cities permanently in recent years, an average migrant worker spent 2.2 months in their rural homes and 9.8 months in off-farm work away from home in 2011 (2011 Survey of Off-farm Laborers by China's National Bureau of Statistics). Second, these workers often change their migration destinations and jobs. After the Chinese New Year holidays, which is a period of one to two months, they return to the cities to work, but they are highly likely to change jobs or migrate to a new city. They also change jobs and locations within a year, which makes tracking them in regular household surveys very difficult. With the difficulty of surveying this particular group, no large-scale survey data that cover all Chinese workers are available. However, China's National Bureau of Statistics does have good data for urban workers.

Figure 1
Real Annual Wages of Chinese Urban Workers
(deflated to 2010 prices)



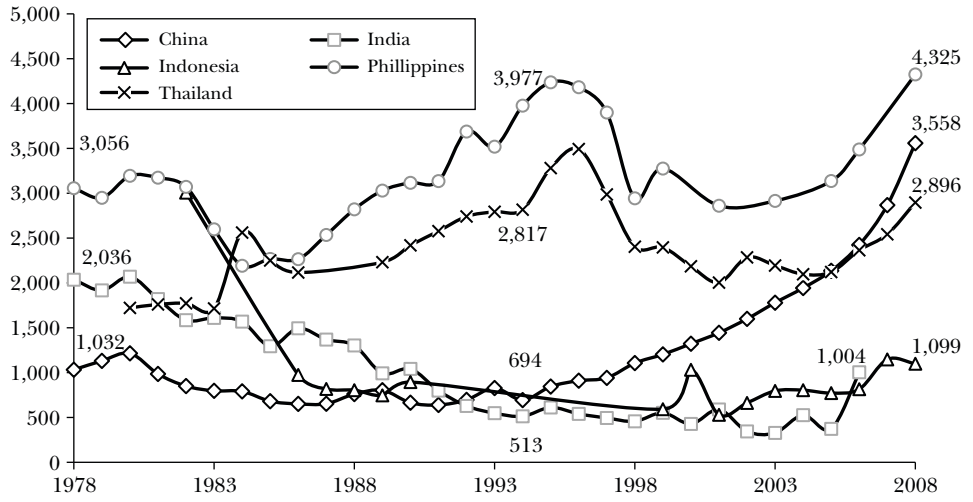
Source: China Statistical Yearbooks.
Note: PPI is producer price index.

In the first two decades of the reform period from 1978 up to the later part of the 1990s, the growth of workers' wages in Chinese urban areas was relatively low, as shown in Figure 1. According to the *Statistical Yearbooks* published by China's National Bureau of Statistics, the annual real wage of a Chinese urban worker increased only slightly from $1,004 in 1978 to $1,026 in 1997, at an average annual growth rate of only 0.1 percent (before tax, including pensions, and again converted from yuan to U.S. dollars using the current exchange rate, and to the 2010 level using the U.S. GDP deflator). This growth rate of China's urban wages is significantly lower than China's annual real growth rate of 4.0 percent (in real U.S. dollars) in these two decades.[1]

However, China's wage growth started to pick up steam in the late 1990s. In 1998, the real wage as measured in U.S. dollars grew by over 14.1 percent, marking the start of a new era of fast wage growth. In the period from 1998 to 2010, the average annual growth rate of real wages was 13.8 percent, exceeding the real GDP

[1] This seemingly low growth rate for China's economy might be surprising, but remember that, because we are interested in China's wage levels in the context of the world market, we are converting at the official yuan/dollar exchange rate—and that exchange rate was overvalued before the foreign exchange reform in 1994. However, the same qualitative pattern of GDP growing faster than wages holds true if the comparison is done in yuan. The growth rate of China's GDP as measured in real renminbi yuan over these years was 5.9 percent for wages and 9.9 percent for GDP.

Figure 2
Annual Manufacturing Wages of Asian Emerging Economies
(real U.S. dollars in 2010, deflated by the U.S. GDP deflator)



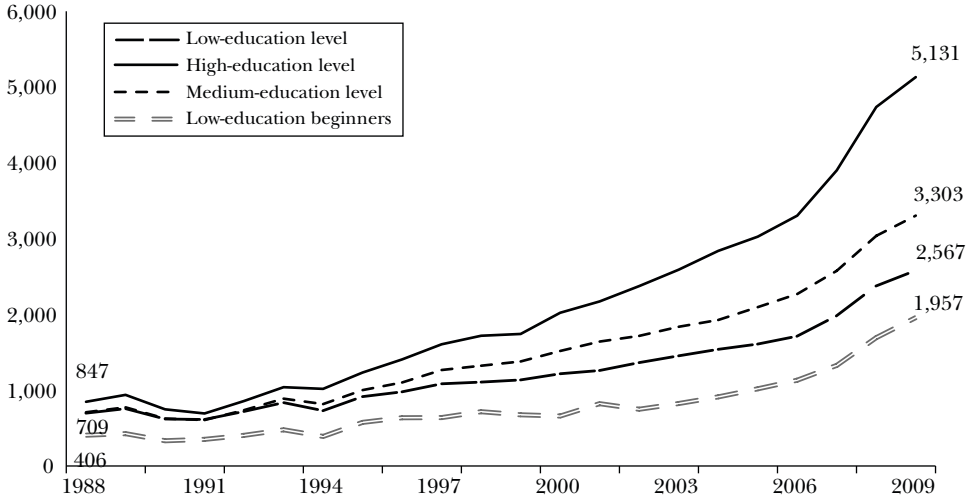
Source: International Labor Organization LABORSTA Database.

growth rate of 12.7 percent. The fast rise of China's urban wages since the late 1990s is due in part to institutional factors such as the privatization of state-owned enterprises in the mid-1990s, the re-establishment of the labor market, and the slowdown of labor force growth and migration, which we will discuss in detail below. As Figure 1 shows, the real wage in yuan grew faster than the real wage converted to dollars at the then-current yuan/dollar exchange rate because China's official exchange rate was overvalued before 1994.

China's wages have also increased compared with the wages of other developing economies. In Figure 2, we compare the manufacturing wages of a group of Asian developing countries. Note that China's manufacturing wage is lower than the overall wage in Figure 1. Among these countries, China had one of the lowest manufacturing wage rates in 1994 at $694 in U.S. dollars, or about 17 percent of the manufacturing wage in the Philippines. By 2008, the last year in which we have data for most of these countries, China's wages are second only to those of the Philippines, marking a wage gap of only 18 percent. The wages of two other populous Asian countries, India and Indonesia, are much lower at only about 41 and 34 percent of China's wages, respectively, in 2006, the last year in which data for India are available.

To explore whether the rise of China's wages is confined to certain sectors, we use micro-level data from the Urban Household Survey, which covers all urban areas in China and uses probabilistic sampling and a stratified, multistage method

Figure 3
Annual Wages of Urban Workers by Education Level
(real U.S. dollars in 2010, deflated by the U.S.GDP deflator)



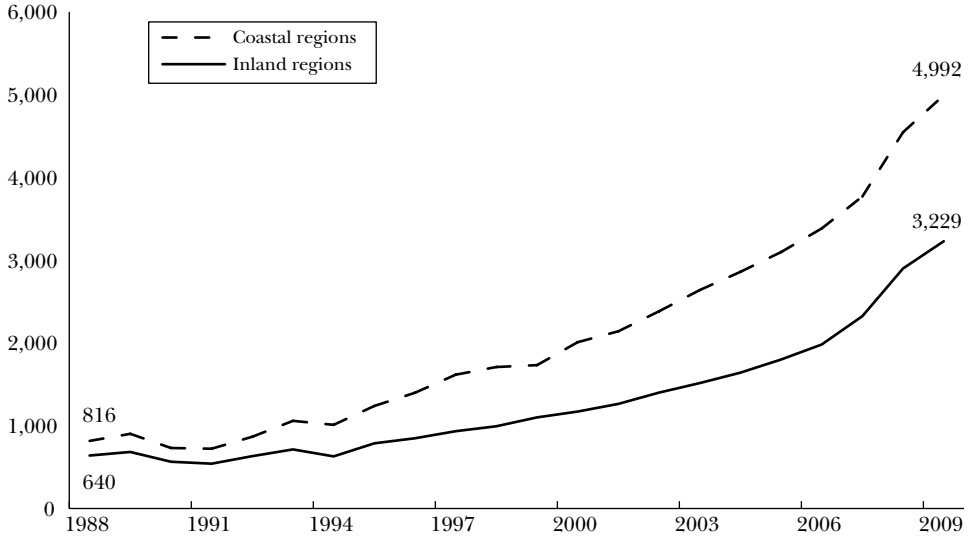
Source: The Urban Household Survey data in 9 provinces, 1988–2009.
Notes: Education levels: "low" refers to junior high school and below, "medium" refers to academic/technical high school, and "high" refers to college and above. "Low-education beginners" are low-education workers with working experience less than 5 years.

to select households. To be included in the sample, a household must reside in a specific city for at least six months. Therefore, this sample does not include migrant workers who live in a city for less than six months or those who work off the farm in rural areas. The sampled households are asked to keep a detailed record of their incomes and expenditures every day. In the subsequent discussion, we will examine China's wages by exploring this dataset.[2] The wages reported in this study are lower than the aggregate statistics reported in Figures 1 and 2 because firms report aggregate wages, including pensions and taxes.

Wages are increasing for China's workers at all skill levels. Figure 3 shows that growth rates of real wages for those with low education level (junior high school and below), medium education level (academic and technical high school), and high education level (college and above) are all increasing at high speeds—at 6.5, 7.6, and 9.0 percent per year, respectively. Fast wage growth rates even for unskilled workers

[2] Our access to the Urban Household Survey covers the period from 1988 to 2009 for the nine provinces of Beijing, Liaoning, Zhejiang, Anhui, Hubei, Guangdong, Sichuan, Shaanxi, and Gansu. These provinces represent different regions and economic conditions. After excluding the unemployed individuals and individuals younger than 16 or older than 60, we are left with 321,311 individuals in the sample, with an average annual sample size of 14,605. The mean values and trends of most variables in our sample are comparable with those of the national sample.

Figure 4
Annual Wages of Urban Workers by Region
(real U.S. dollars in 2010, deflated by the U.S. GDP deflator)



Source: Wages by regions are from the Urban Household Survey data in nine provinces, 1988–2009.

suggest an overall rise in wages. To explore this phenomenon further, we examine the wages for low-education beginners, or low-education workers with less than five years of experience in the job market. Their wage growth was 7.8 percent per year in the 1988–2009 sample period and was actually higher at 9.8 percent annually from 1997 to 2009, which is a faster increase than for urban workers as a whole.

Wages are also rising in both the more-developed coastal regions and the less-developed inland regions despite the wage gap that exists between the two, as illustrated in Figure 4. The growth rate of wages in the inland regions was 7.7 percent per year from 1988 to 2009, which was one percentage point lower than the growth rate in the coastal regions. As a result, this regional wage gap increased to 54.6 percent in 2009. However, the inland regions have been catching up since 1997, with their annual wage growth rate being one percentage point higher than in coastal regions (10.9 versus 9.9 percent annually). Wages are also rising for both exporting and nonexporting firms. Interestingly, nonexporting firms have higher wages than exporting firms, similar to the findings of Lu (2010). However, the wage gap between these two types of firms is also declining over time.

The Urban Household Survey does not include the most mobile migrant workers, who may be the lowest-paid workers in China. To examine this issue, we use some aggregate statistics of migrant wages released by the National Bureau of Statistics. The annual real wages of migrant workers, who tend to have a junior high school degree

or lower education level, averaged $2,541 (in U.S. dollars) in 2009, is almost the same as the real wages of low-education workers in the Urban Household Survey sample in the same year ($2,567). The wages of the two samples corroborate each other, and their similarity suggests that the wages of low-skilled urban workers may track those of migrant workers. In terms of wage growth, the wages of migrant workers in the sample from the Rural Household Survey also increased at a high annual rate of 9.6 percent from 2003 to 2009. Furthermore, the wages of migrant workers increased even faster in the last two years, reaching $3,535 (in U.S. dollars) in 2011.

Wages versus Productivity

Although China's wages have been rising fast, if their growth rate is lower than that of labor productivity, then labor is effectively becoming cheaper per unit of product. So, to answer whether China's fast wage growth since 1997 implies that Chinese labor is becoming more expensive, we need to compare wage growth to labor productivity growth. In doing so, we find that Chinese labor becomes cheaper before the late 1990s, but not since then.

We calculate the growth of gross labor productivity by deducting the growth rate of the labor force from the growth rate of real GDP, drawing on data published in China's *Statistical Yearbooks*. In the period of 1982 (the first year in which we have data on labor force) to 1997, China's GDP (converted at the official exchange rate and deflated to real 2010 U.S. dollars) increased by 5.5 percent, and the labor force grew by 1.9 percent, implying labor productivity growth of 3.6 percent per year. This figure almost triples the real wage growth of 1.3 percent per year during that period, suggesting that Chinese labor was becoming cheaper relative to productivity during this period. Of course, this is a simple calculation that it does not adjust for changes in the quality and quantity of other inputs such as capital and the human capital of the labor force, but it is nonetheless revealing.

Chinese labor also became cheaper relative to other countries over this time period. Ceglowski and Golub (2007) find that manufacturing "unit labor costs"—the ratio of wages to labor productivity—fell for China relative to that of the United States from over 70 percent in the early 1980s to about 30 percent in the mid-1990s. Moreover, the relative cost of Chinese labor at this time was not only lower than that of developed countries but was also lower than that of developing countries such as India, Malaysia, and Mexico. It appears that wage growth fell far behind productivity growth in China during this period.

However, China's wages have increased at a much faster rate than productivity since 1997. Using our aggregate data, we find that China's GDP in real U.S. dollars increased by 12.7 percent annually in the period from 1997 to 2010, whereas labor force growth decreased to only 1.4 percent, implying an annual growth rate of 11.3 percent for gross labor productivity. Although this rate is much faster than that of the productivity growth before 1997, it is lower than the astonishing annual

Table 1
Characteristics of Selected Manufacturing Sectors in China

Industry	*Employment (million) 2010* (1)	*Export/ Sales ratio 2010* (2)	*Capital/Labor ratio (1,000 US$) 2010* (3)	*Value added per worker (1,000 US$) 2010* (4)	*Wage/(value-added output per worker) 2007* (5)	*Wage/(value-added output per worker) 2010* (6)
Leather, fur, and other textiles	2.76	0.30	20.88	11.60	0.28	0.39
Wearing apparel	4.47	0.28	23.22	11.04	0.31	0.41
Instruments	1.25	0.33	61.14	18.63	0.35	0.25
Electronics	7.73	0.63	72.10	19.32	0.12	0.24
Electrical machinery	6.04	0.19	77.53	23.01	0.22	0.20
Transport equipment	5.74	0.11	123.53	30.51	0.24	0.15
Basic iron and steel	3.46	0.03	196.51	55.13	0.20	0.08

Source: China Statistical Yearbook (various years).
Notes: All values are in 2010 real U.S. dollars. Industry classification follows the GB/T4754 standard released by China's National Statistics Bureau. The 1997 data include all enterprises in the specific industry, while the 2010 data only include enterprises above a designated size in an industry. "Instruments" refers to precision and optical instruments; "Electronics" refers to radio, television, and communication equipment and apparatus; "Electrical machinery" refers to electrical machinery and apparatus.

real wage growth of 13.8 percent in the same period. Therefore, Chinese labor is indeed becoming more expensive.[3] According to Ceglowski and Golub (2007), China's relative unit labor cost was 63 percent that of Malaysia and 70 percent that of Korea by 2002. If the gap between wages and productivity in China continues to close by 2.5 percent per year, China's advantage of lower labor cost relative to Korea will be completely eliminated by the year 2018, and that relative to Malaysia will be gone by 2022.

We draw on recent industry-level data to examine the unit labor cost: in this case, our measurement is the average wage as a proportion of value added per worker. In particular, we select several two-digit industries as cases from China's *Statistical Yearbooks*. As shown in column 1 of Table 1, these industries are large in employment size: they employ more than 1 million workers each and 31 million workers in total in 2010. Most of them are also major exporters, with 29 percent of their sales as exports on average (column 2). To facilitate analysis, we sort these firms by the capital/labor ratio (column 3), which can be viewed as a measure of labor (or capital) intensity or as revealing the level of technology.

[3] Ceglowski and Golub (2007) find that relative unit labor cost stabilized or increased slightly from 1995 until 2002, the last year covered by their study.

These variables suggest several interesting associations. First, labor-intensive industries are major exporters with very high export/sales ratios, consistent with the fact that China uses its abundant labor for export industries. Among the seven industries, basic iron and steel has the lowest labor intensity, and its sales are mainly domestic. Second, there is a clear negative association between the capital/labor ratio (column 3) and unit wage cost (column 6), which is defined as the ratio of wage to value added per worker, suggesting that labor-intensive industries have higher unit labor costs.

Finally, the last two columns suggest that labor-intensive industries experienced a sharp rise in unit labor costs. As an example, for the apparel industry, the unit labor cost increased from 0.31 in 1997 (column 5) to 0.41 in 2010 (column 6). The unit labor cost also increased in two other relatively low-tech industries: leather, fur, and other textiles; and electronics (which is mostly assembly). However, industries with higher capital/labor ratios like transport equipment and basic iron and steel experienced a decline in unit labor costs in the same period, suggesting that the labor cost advantage remains for the relatively high-tech industries.

Potential Reasons for Rising Wages

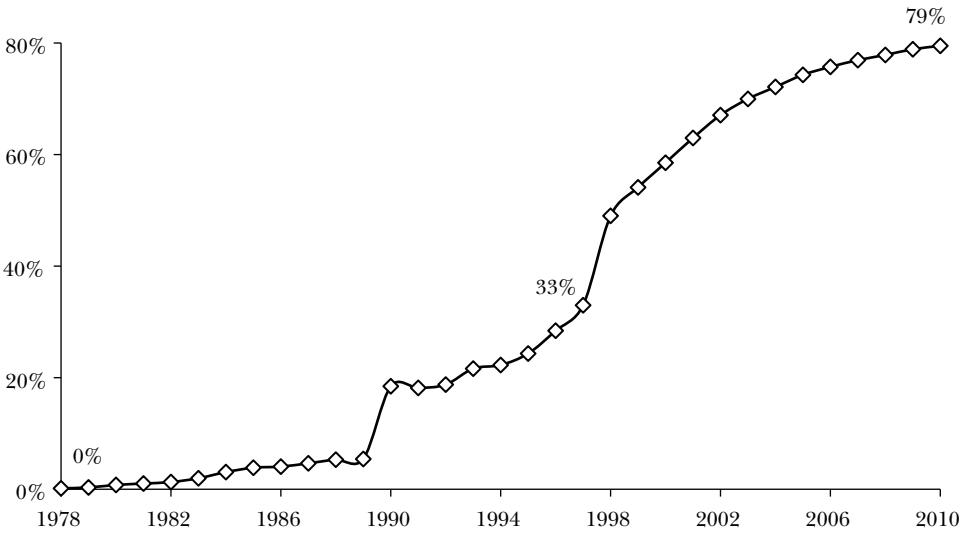
The discussion to this point has argued that China's real wage was more or less stagnant or stable in the 1980s and early 1990s, and grew substantially beginning in the late 1990s. In this section, we discuss three potential reasons for this change: institutional reforms, the disappearing "demographic dividend," and the slowing of rural–urban migration.

Institutional Reforms

China has transformed its economy from a planned labor allocation system to a more market-oriented labor market. In the planned system, workers were allocated by the central planner to the state-owned enterprises, and jobs were permanent with little mobility (Fleisher and Wang 2004). The central planner set the wages of all workers in the country using a simple system of grades, with the grade mainly depending on seniority. Wages were set low, and so was the wage gap between grades. In this system, wages did not reflect productivity, and because of this and the misallocation of workers, productivity was low.

The first major step in China's urban labor market reforms was to establish an internal pay incentive system within state-owned enterprises. Starting in the late 1980s, the financial insolvency of many state-owned enterprises prompted the Chinese government to undertake a series of reforms. The reforms started by allowing profitable firms to pay higher wages and even bonuses to the more productive workers, which increased the pay difference among workers (Park, Song, Zhang, and Zhao 2008). However, because private firms were still not allowed in these areas and job mobility was low, there was essentially no external labor market.

Figure 5
Private Employment as a Proportion of Total Urban Employment

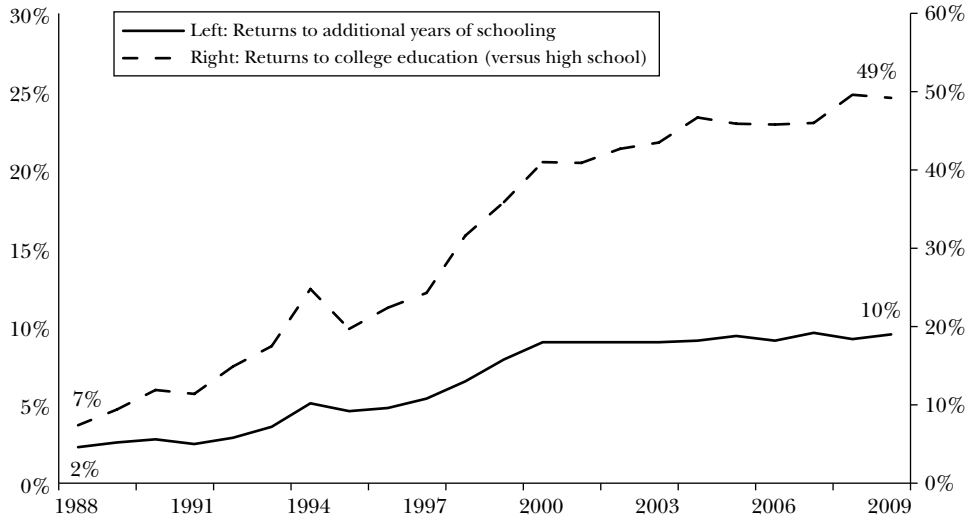


Source: China Statistical Yearbooks.

The second step in urban labor market reforms was to establish an external labor market. The most aggressive enterprise reforms took place in the mid-to-late 1990s, when China started to privatize state-owned enterprises and when the status of private firms was legalized (Cao, Qian, and Weingast 1999; Li 2003). These reforms were dramatic, with millions of state-owned workers being laid off and moving to jobs in the private sector. At the same time, the government started to allow large-scale migration of rural workers to cities (Cai and Wang 2010). Taken as a whole, these reforms established an external labor market that not only helped reallocate workers but also linked wages more closely to productivity (Zhang, Zhao, Park, and Song 2005). With these reforms, the private sector has become a prominent player in the labor market, with private sector employment as a proportion of total urban employment rising from literally nothing in the early 1980s to about 80 percent at present, as shown in Figure 5.

One consequence of the labor market reforms is the increase in the return to education, suggesting that the link between wage and productivity is becoming stronger. We replicate Zhang et al. (2005) in calculating a Mincer-style rate of return to education—that is, using wages as a dependent variable, and level of education and work experience as the key explanatory variables—but use the Urban Household Survey sample, which covers more provinces and a longer time series. The results of this calculation, reported in Figure 6, show that the return to an additional year of schooling is only 2.3 percent in 1988, but it increased to about 9 percent in 2000 and has been stable in the past decade. The return to an additional year of

Figure 6
Returns to Education in Urban China



Source: Authors' estimations using data from the Urban Household Survey data in 9 provinces, 1988–2009.

education in the latest year of 2009 was 9.5 percent, similar to the world average rate of 9.7 percent, as reported by Psacharopoulos and Patrinos (2004). The return to college education in China increased the fastest, from only about 7.4 percent in the largely planned labor allocation system in 1988 to 49.2 percent in the much more flexible labor market system of 2009, exceeding the average 40 percent return in developed economies.

Demographic Transition and Labor Shortage

China has experienced a demographic transition from high to low birthrates since the 1970s. China had a baby boom from 1950 to 1978, with the total fertility rate averaging 5.2 births per woman, although a break occurred during the so-called "Great Leap Forward" from 1958 to 1961, during which around 30 million people died (Ashton, Hill, Piazza, and Zeitz 1984). China's total population increased from 552 million in 1950 to 963 million by 1978. In 1979, China started the "one-child policy," the largest and strictest population control policy in human history (Banister 1987). According to this policy, still largely in effect today, each woman is allowed to have only one child, and above-quota births are heavily fined. The one-child policy, together with other social and economic changes, has a significant impact on the fertility rate (Li and Zhang 2007; Li, Zhang, and Zhu 2011). China's total fertility rate fell sharply from 6 births per woman in 1970 to only 1.4 in 2010 (*The Economist* 2011).

Many countries have experienced lower birthrates as their economies develop, but the speed and magnitude of China's demographic transition are unprecedented in world history. The natural growth rate of China's population has decreased to an annual rate of 0.56 percent since 2001, similar to the population growth rate in Japan from 1980 to 1985. The United Kingdom took about 200 years (1750 to 1955) to complete its demographic transition to having low birthrates, and the United States took 140 years (1800 to 1940) to do the same (Livi-Bacci 1997; Greenwood and Seshadri 2002), while China's transition took only about 30 to 40 years.

This rapid shift to lower birthrates creates the "demographic dividend," that is, a situation in which a disproportionate share of the population is in its prime working years, with relatively few children or elderly. As Chinese baby boomers entered the labor market in the past three decades, China's labor force increased from 583 million in 1980 to about one billion in 2011. The sharply declining fertility of the baby boomers then leads to a low "young dependency ratio" or a large proportion of working-age people. Indeed, the working-age population aged 15–64 increased from 59.3 percent of China's population in 1980 to 74.4 percent in 2011. A large proportion in the work force and a low dependency ratio all tend to be accompanied by a high savings rate, abundant labor, and abundant working time for labor, which are beneficial for economic growth (Li and Zhang 2007).

However, the same demographic transition also means that China has entered a period when its labor force will increase much more slowly. Because of the low fertility of the baby boomers, China's labor force growth has been slowing down. As shown in the last section, coinciding with the faster wage growth after 1997, the growth rate of China's labor force dropped from 1.9 percent before 1997 to 1.4 percent since 1997, suggesting that the declining labor force growth could be one of the reasons behind the fast wage growth in the last decade.

Based on the "low variant" estimates by the United Nations (2011), China's population is expected to begin declining by 2015, and the labor force may have already peaked in 2011. According to these projections, which assume no upward shift of the birth rate, China's population will decrease from its current level of 1.34 billion to 1.13 billion by 2050, and the working population will decrease from one billion to 696 million. By then, China's labor force as a proportion of the population will drop to 62 percent, whereas the proportion of the elderly (aged 65 and over) will reach 29 percent. The dropping labor force proportion will cause labor shortages and help push wages up further.[4]

[4] The labor force as a proportion of the population is even lower for the medium and high variant estimates because of the assumed higher birth rates. The "medium variant" estimate of the population is 1.30 billion by 2050, with the labor force as a proportion of the population dropping to 61 percent and the proportion of the elderly reaching 26 percent. The "high variant" estimate of the population is 1.48 billion by 2050, with the labor force as a proportion of the population dropping to 60 percent and the proportion elderly reaching 22 percent.

China is already experiencing labor shortages. China's Ministry of Human Resources and Social Security carries out quarterly surveys that cover official job centers in 117 cities. These surveys show that the "position/seeker ratio," which is the ratio of newly created positions over the number of job seekers, has been trending upward from 0.65 at the start of 2001 to above 1.0 in the first quarter of 2010 and 1.08 in the first quarter of 2012. When the position/seeker ratio exceeded one for the first time in China, the number of newly created jobs exceeded the number of job seekers.

The labor shortage phenomenon is especially evident in China's coastal areas, such as the Pearl River Delta and the Yangtze River Delta areas. In the first quarter of 2008, the position/seeker ratio in the Pearl River Delta area reached a historical high of 1.89. Although the ratio dropped during the global financial crisis, it has rebounded with the recovering economy. In the first quarter of 2010, the ratios for the areas of the Pearl River Delta, Southeast Fujian, Yangtze River Delta, and Bohai increased to levels above 1, indicating a labor shortage in most of the coastal regions.

Can population growth increase again if China relaxes the one-child policy? This outcome seems unlikely. China is already relaxing the policy by allowing couples who are both an only child to have a second child. The first cohorts of the "one-child policy" children (born in the 1980s) are already in their childbearing age, but the birth rate has shown no sign of recovery so far. The one-child policy, together with many other social and economic reforms, may have caused a lasting change in preferences about fertility in China. There have also been calls for a total removal of all birth control policies, but the government seems hesitant to do so because of political resistance from both the multitude of birth control agencies and the people who were penalized by the one-child policy.

Slowing Down of Structural Changes

The migration of rural workers to urban areas in recent decades has helped keep the wages low in urban areas, but this pattern seems ripe for change as well. According to various *Statistical Yearbooks* of China, the number of migrant workers increased from 25 million in 1985 to 159 million in 2011. However, the growth rate of migrant workers is slowing down. Using 1997 as the breaking point, the growth rate declined from 10.8 percent per year before 1997 to only about 4.6 percent annually since then.

The major barriers to increasing migration from rural areas are a combination of the remaining institutions, such as the *hukou* system, and the fact that many of those who can migrate at the lowest cost are already doing so. Chinese households are managed by the *hukou* (household registration) system, which was established in the early 1950s to consolidate socialist governance, control domestic migration, and administer the planned economy. Every person is required to be registered at his/her place of birth and then acquire a *hukou* certificate that specifies rural/urban status and location from there. All administrative activities, such as land distribution,

Table 2
Proportion of Chinese Rural Residents Working Off-Farm

Age cohorts	*1995*	*2004*	*2007*
16–20	23.7	74.3	97.7
21–25	33.6	80.7	86.5
26–30	28.8	70.5	77.1
31–35	26.9	62.0	65.6
36–40	20.5	53.7	73.5
41–50	20.8	41.5	54.3

Sources: De Brauw, Huang, Rozelle, Zhang, and Zhang (2002), Rozelle, Huang, Zhang, and Li (2008).

issuance of identity cards, registration of a child in school, and medical insurance, are based on *hukou* status. Until the early 1990s, the *hukou* was also used to distribute food, cooking oil, and clothing coupons, thus restricting internal mobility in both urban and rural areas. Although the *hukou* system has been gradually relaxed since the mid-1990s, it still restricts migration in many ways. Farmers have been allowed to migrate to cities to work since the mid-1990s, but they cannot change their *hukou* status and thus cannot enjoy public services in the cities such as education, medical insurance, housing, and pensions. Unfortunately, most of these public services are of much lower quality or do not even exist in rural areas because most of the government spending is in urban areas. The huge gap in public welfare provision prevents the government from removing the *hukou* policy, as entrenched urban residents do not want to share their welfare benefits with the migrants, even though they need migrant workers to provide services. A recent proposal to allow migrant children to take the college entrance exams in cities has received heavy resistance from the local residents in Beijing and Shanghai.[5]

Various pieces of evidence suggest that the marginal cost of migration is rising, and the distance and need for migration are being shaped by the *hukou* system. According to de Brauw, Huang, Rozelle, Zhang, and Zhang (2002) and Rozelle, Huang, Zhang, and Li (2008), who conducted three rounds of surveys in China in 1995, 2004, and 2007, most young rural residents no longer worked in agriculture by 2007. The probability of doing off-farm work for all rural laborers increased from 31 percent in 1995 to 60 percent in 2007. The sharpest increase was observed among the youngest age group of 16–20, for which the probability of working off farm increased from 24 percent in 1995 to 98 percent in 2007, as shown in Table 2. Now, the youngest cohorts of laborers have almost no farmers. Even for older cohorts, the

[5] NetEase, a popular website, reported on September 6, 2012, that 95 percent of the local residents oppose the proposal. The Chinese link is at http://edu.163.com/12/0906/11/8ANETDNL00294JD0.html, and a translation by Google is at http://translate.google.com.hk/translate?hl=zh-CN&sl=auto&tl=en&u=http%3A%2F%2Fedu.163.com%2F12%2F0906%2F11%2F8ANETDNL00294JD0.html.

probability of working off farm was very high by 2007: the probability was 87 percent for cohorts aged 21–25 and 77 percent for cohorts aged 26 to 30. As fewer young rural laborers are available, the marginal migrant worker will become older and have a higher marginal cost of migration. Indeed, the average age of migrants is increasing. According to a survey by China's National Bureau of Statistics, the average age of off-farm laborers increased from 34 years in 2008 to 36 years in 2011. The proportion of older off-farm laborers (aged 41 or above) increased from 30 to 38 percent in the same period. Thus, the potential supply is largely tapped out.

Migrants are staying closer to home, which helps reduce their migration costs. Again, according to the National Bureau of Statistics, the proportion of migrants working out of the province decreased from 53 percent in 2008 to 47 percent in 2011. The proportion of migrant workers working away from their home provinces decreased most significantly in China's poorest western areas, from 63 to 57 percent in the three-year period.

One reason why migrants can remain closer to home is that some factories and laborers are also moving from the coastal to the inland areas because of rising production costs such as labor and land costs, a phenomenon termed "flying geese" by Akamatsu (1962). For instance, Foxconn Technology Group is the largest contract supplier (assembling electronic products by Sony, Apple, Hewlett-Packard, Nokia, and other brand names) in China, employing over a million workers. This company moved its major plants away from Shenzhen to inland provinces such as Hebei and Henan (Luk 2010), mainly because of the hefty wage increases in Shenzhen.

However, the migration of firms and workers back to the inland areas is likely to be limited. In fact, Chinese manufacturing industries have been highly concentrated in the coastal areas since the central government established five special economic zones in the coastal areas in the 1980s (Wen 2004), and they have become even more geographically agglomerated in the last decade (Long and Zhang 2012). The agglomeration of industries in the coastal or border areas has occurred in other East Asian countries as well as in the rest of the world (Hanson 1996). One explanation for this phenomenon is the Krugman (1991) lock-in hypothesis, which argues that once industries are concentrated in the coastal regions for whatever reason, and then increasing returns to scale in production occur, more firms are encouraged to locate in these regions to benefit from the backward and forward linkages and from the external economies created. The reduction in China's trade barriers can also facilitate agglomeration in the coastal and border areas (Hanson 2001).

Conclusion

In the 1980s and through the late 1990s, Chinese workers were cheap in the sense that their labor cost relative to productivity was much lower than that of most other countries. Therefore, firms earned rents by sourcing in China, which triggered fast employment growth and rural–urban migration. But because of changes

since the late 1990s, including institutional reforms in China's labor markets and demographic transition that have reduced what used to be a huge amount of slack in labor supply, the "underpricing" of Chinese labor appears to be coming to an end. Wages are rising faster than labor productivity, particularly in labor-intensive exporting industries such as apparel and electronics, which will likely move out of China and probably go to countries like India and Vietnam.

China is becoming a middle-wage country. If the annual rate of wage growth of 13.8 percent over the past decade is maintained, the average real wage in urban China would reach $20,000 in U.S. dollars by 2020. As benchmarks for comparison, U.S. compensation for manufacturing workers reached $20,000 in 1980, Japanese compensation for manufacturing workers reached this level in 1986, and the annual wage in Korea reached $20,000 in 1995, according to the U.S. Bureau of Labor Statistics. Even if China's wage only grows at par with productivity at 11.3 percent per year, the Chinese average real wage will reach $20,000 by 2022. Similarly to other middle-wage countries, China needs to make a transition toward higher value-added industries, whether export or domestic.

Is China ready to move up the technological ladder? We believe the answer is "yes," for several reasons. First, China's aggregate labor productivity has been increasing at 11.3 percent per year for over a decade, partly because of manufacturing firms' heavy investment in research and development (with expenditures on research and development per worker increasing at an annual rate of 16.9 percent in the past 20 years) and capital deepening (total assets per worker in China increased to $94,240 in 2010). Second, human capital, at least measured in quantity, has risen dramatically. In 1999, the Chinese government started an aggressive "College Expansion" movement that increased the college entry class enrollment from 1.1 million in 1998 to 6.6 million in 2011. By 2050, Ma (2010) predicts that 40 percent of China's labor force can be expected to hold a college degree, similar to the level of Japan's labor force today.

In short, the end of cheap labor in China does not mean the end of Chinese economic growth. Rising productivity and education mean that China's comparative advantage is shifting. If China can improve the quality of education and develop institutions that help to foster innovation and entrepreneurship, then going forward, China may join a place alongside Korea and Japan (with a lag of two decades) as a formidable force in high value-added manufacturing and innovation.

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