

McKinsey Global Institute



June 2012

The world at work: Jobs, pay, and skills for 3.5 billion people



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The world at work: Jobs, pay, and skills for 3.5 billion people

Richard Dobbs
Anu Madgavkar
Dominic Barton
Eric Labaye
James Manyika
Charles Roxburgh
Susan Lund
Siddarth Madhav

Preface

Over the past 30 years, economies and markets have become more integrated and inter-dependent, as trade volumes have grown and developing economies have industrialized. Labor markets have evolved along with the global economy, bringing nearly one billion people in the developing world into the global labor pool and helping both advanced and developing economies raise productivity and GDP. Recently, however, strains caused by the rise of a global labor force have also become more apparent. These strains—heightened by the “Great Recession”—include rising joblessness and income inequality, and distressingly high rates of youth unemployment.

How demand and supply of labor develop over the coming decades will have even greater impact on the global economy. The research in this report was conducted to provide a picture of the evolving global labor market. We find that, based on current trends, there are potentially serious gaps in the supply of workers with the skills that will be needed to drive 21st-century economies, and a growing surplus of workers with more limited skills. Avoiding these imbalances (in both advanced and developing economies) and their consequences will require an unprecedented commitment to education and training.

The research was led by Anu Madgavkar, an MGI senior fellow, MGI Director Richard Dobbs, and Susan Lund, director of research at MGI. We thank McKinsey Managing Director Dominic Barton and MGI Chairman Eric Labaye for their thoughtful guidance. MGI Directors James Manyika and Charles Roxburgh provided support and insight. Siddarth Madhav managed the project team, which included Abhishek Agrawal, Arun Devadas, Y. Arvind Eashwar, Shishir Gupta, Jonathan Humphrey, Kuntala Karkun, Akhil Kulkarni, Resham Mansharamani, Ujjayini Mitra, Aishwarya Singh, and Paayal Vora. McKinsey engagement managers Sudipto Paul and Neha Sureka provided project management support. MGI Senior Editor Geoffrey Lewis provided editorial support. We thank the MGI communications and operations organization—Tim Beacom, John Cheetham, Deadra Henderson, Julie Philpot, and Rebeca Robboy—for their contributions. Marisa Carder provided graphic design support.

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Our distinguished China experts included Chong-en Bai, deputy dean, School of Economics and Management, Tsinghua University; Kam Wing Chan, professor, Department of Geography, University of Washington, Seattle; Hongbin Li, C.V. Starr Chair and Professor of Economics, School of Economics and Management, Tsinghua University; Xiaowen Lu, former deputy director, China Institute of Sociology, Shanghai Academy of Social Sciences; Rong Mo, deputy director general, Institute of Labor Research, China Ministry of Human Resources and Social Security; and Juwei Zhang, deputy director, Institute of Population and Labor Economics, Chinese Academy of Social Sciences.

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Finally, we offer thanks to the 20 human resources executives we interviewed on the understanding that we would not identify them or their companies. All references to specific companies in this report are from public sources.

This is the fourth MGI report on labor markets published since 2010. Previous works were: *French employment 2020: Five priorities for action*; *Help wanted: The future of work in the advanced economies*; and *An economy that works: Job creation and America's future*.

Richard Dobbs

Director, McKinsey Global Institute
Seoul

James Manyika

Director, McKinsey Global Institute
San Francisco

Charles Roxburgh

Director, McKinsey Global Institute
London

Susan Lund

Director of Research, McKinsey Global Institute
Washington, DC

June 2012



1.1 billion

non-farm jobs created—
84% in developing economies

245 million

increase of college graduates
in the labor force

40%

share that foreign-born workers
contributed to labor force growth
in advanced economies

1 in 5

new non-farm jobs in
developing economies
associated with exports
(2000–10)

75 million

unemployed young workers
(15 to 24 years old) in 2010

***A global labor market
emerges (1980–2010)***



3.5 billion

projected 2030 global labor force,
up from 2.9 billion today

38 million–40 million

potential shortage of college-educated workers in 2020

60%

share of India, other South
Asian nations, and Africa in
global labor force growth

45 million

potential shortage of workers with secondary
education qualified to work in labor-intensive
manufacturing and services in developing economies

360 million

additional older people who are not
part of the global labor force by 2030

***... and market challenges
intensify (2010–30)***

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Executive summary

In the past three decades, technology and globalization have reshaped economies around the world, unleashing sweeping changes in markets and sectors. In the process, a global labor market began to take shape, bringing tremendous benefits—as well as dislocations and challenges. The most striking benefit has been the creation of 900 million non-farm jobs in developing countries, helping lift hundreds of millions of people out of poverty. During this time, advanced economies were able to raise productivity by investing in technology and tapping new sources of low-cost labor, while creating new high-wage jobs for high-skill workers.

Strains in this global labor market are becoming increasingly apparent—especially in the aftermath of the “Great Recession.” Joblessness remains high, and there are expanding pools of the long-term unemployed and other workers with very poor employment prospects; youth unemployment is approaching crisis proportions. And, even as less-skilled workers struggle with unemployment and stagnating wages, employers face growing shortages of the types of high-skill workers who are needed to raise productivity and drive GDP growth. Jobs and income inequality have become grave political and economic concerns.

In this report by the McKinsey Global Institute, we identify forces of demand and supply that are shaping a global labor force that will grow to 3.5 billion by 2030. We document these shifts and analyze the implications for workers, national economies, and businesses. We conclude that the forces that have caused imbalances in advanced economies in recent years will grow stronger and that similar mismatches between the skills that workers can offer and what employers need will appear in developing economies, too.

If these trends persist—and absent a massive global effort to improve worker skills, they are likely to do so—there will be far too few workers with the advanced skills needed to drive a high-productivity economy and far too few job opportunities for low-skill workers. Developing economies could have too few medium-skill workers to fuel further growth of labor-intensive sectors and far too many workers who lack the education and training to escape low-productivity, low-income work.

These potential imbalances are based on our “momentum” case, which uses current patterns in demographics and in the demand and supply of labor to project likely outcomes in the next two decades. In this analysis, we use educational attainment as a proxy for skills because education data are available across most nations, but we acknowledge that this is a rough measure—the quality of formal education varies across countries, and training through apprenticeship can be more important than formal education in many occupations.¹ We also note that the market can at least partially correct

1 The Organisation for Economic Co-operation and Development (OECD) is developing a survey method to determine skill levels of populations more precisely. See *Better skills, better jobs, better lives: A strategic approach to skills policies*, OECD Publishing, May 2012.

imbalances through changes in supply, demand, and wages, which would reduce potential gaps.

However, analyzing these nominal gaps indicates where potential problems may arise (e.g., where it may be extremely difficult to hire graduate engineers to staff an R&D facility) and provides a framework that policy makers, business leaders, and workers can use to guide their decisions. Moreover, the magnitude of the gaps suggests that “business as usual” market responses will be insufficient to prevent adverse outcomes for millions of workers in advanced and developing economies. A concerted public and private effort will be required on multiple fronts.

The most significant imbalances that would arise in the momentum case include:

- **A potential shortage of about 38 million to 40 million high-skill workers, or 13 percent of demand for such workers.** Based on current patterns of educational attainment and demand growth, employers in advanced economies could face a shortage of 16 million to 18 million college-educated workers in 2020, despite rising college-completion rates. The remaining gap—around 23 million college-educated workers—would appear in China, despite a dramatic rise in educational attainment by 2020 (Exhibit E1).
- **A potential surplus of 90 million to 95 million low-skill workers around the world, or around 10 percent of the supply of such workers.** Labor forces of advanced economies could have as many as 32 to 35 million more workers without college education than employers will need. In India and younger developing countries, there could be as many as 58 million surplus low-skill workers in 2020.
- **A potential shortage of nearly 45 million medium-skill workers in developing economies, or about 15 percent of the demand for such workers.** Industrialization will raise demand for workers with secondary education and vocational training in India and the developing economies of South Asia and Africa. But because of low rates of high school enrollment and completion, India could have 13 million too few such workers; younger developing economies could have 31 million too few.

For advanced economies, such imbalances would likely lead to more long-term and permanent joblessness. More young people without post-secondary training would fail to get a start in the job market and older workers would drop out because they don’t qualify for jobs that are being created. The polarization of incomes between high- and low-skill workers could become even more pronounced, slowing the advance in national living standards, and increasing public-sector burdens and social tensions. In some advanced economies, less-skilled workers could very well grow up poorer than their parents, in real terms.

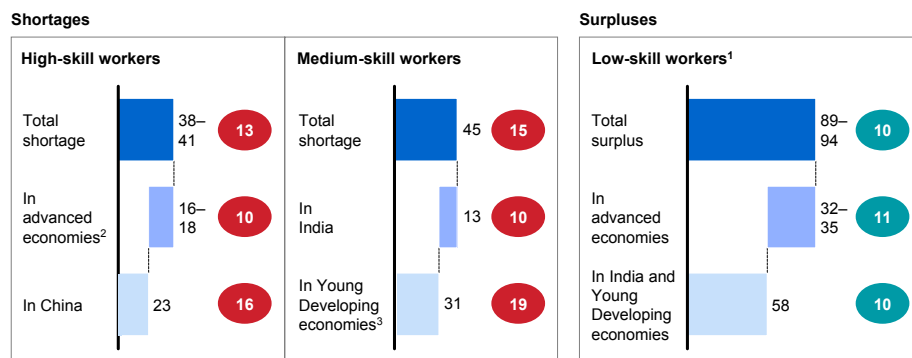
In China, India, and other developing economies, the impact of potential imbalances would be felt in different ways. An inadequate supply of highly educated workers could slow China’s climb into higher value-added industries and hinder the productivity gains that are increasingly important to its growth. India’s problems will be different—the projected surplus of low-skill workers would imply millions trapped in subsistence agriculture or in urban poverty. This picture could be mirrored in other South Asian economies and in sub-Saharan Africa.

Exhibit E1

In the “momentum” case, the world is likely to have too few high-skill workers and not enough jobs for low-skill workers

Gap between demand and supply of workers by educational attainment, 2020E
Million workers

● % of supply of skill cohort
● % of demand for skill cohort



- 1 Low-skill defined in advanced economies as no post-secondary education; in developing, low skill is primary education or less.
- 2 25 countries from the analyzed set of 70 countries, that have GDP per capita greater than US\$ 20,000 at 2005 purchasing power parity (PPP) levels in 2010.
- 3 11 countries from the analyzed set of 70 countries, from South Asia and sub-Saharan Africa, with GDP per capita less than \$3,000 at 2005 PPP levels in 2010.

SOURCE: McKinsey Global Institute analysis

For the global labor market to continue to deliver benefits to all workers, employers, and national economies over the next 30 years, these imbalances must be avoided—and “business as usual” market solutions alone are not likely to be sufficient. Decisive action by policy makers and businesses will be required on multiple fronts.

We estimate that advanced economies could avoid a shortage of high-skill workers by doubling the growth rate in tertiary education attainment (while also raising the share of graduates in science, engineering, and other technical fields), retraining mid-career workers, and allowing more high-skill workers to immigrate. In addition, many nations can narrow the skill gap by raising the labor force participation rate of college-educated women and keeping older high-skill workers in the labor force. Even these measures, however, could leave 20 to 23 million workers in advanced economies without the skills that employers will need in 2020. To employ them, the rate of job creation for low-skill workers in advanced economies would need to be at least five times higher than in the past.

The challenge in developing nations could be even more daunting. If current trends persist, in 2020 there could be one billion workers in the global labor pool who lack secondary education. Hundreds of millions of working adults without job-relevant skills would need training; India alone has 340 million such workers, half of them with virtually no schooling. Capacity of high schools and vocational schools would have to grow at two to three times the current rates. Developing economies would also need to double or triple labor-intensive exports and investment in infrastructure and housing construction to employ low-skill workers.

A GLOBAL LABOR MARKET EMERGES

From 1980 to 2010, the number of workers in the world rose by 1.2 billion, to approximately 2.9 billion. Most of this growth was in developing economies, where a massive “farm-to-factory” shift also took place that raised non-farm jobs from 54 percent of global employment in 1980 to nearly 70 percent in 2010

(Exhibit E2). This shift not only drove the growth of national economies in China, India, and other developing countries, but also contributed to the exit from poverty of an estimated 620 million people worldwide in the past 20 years.²

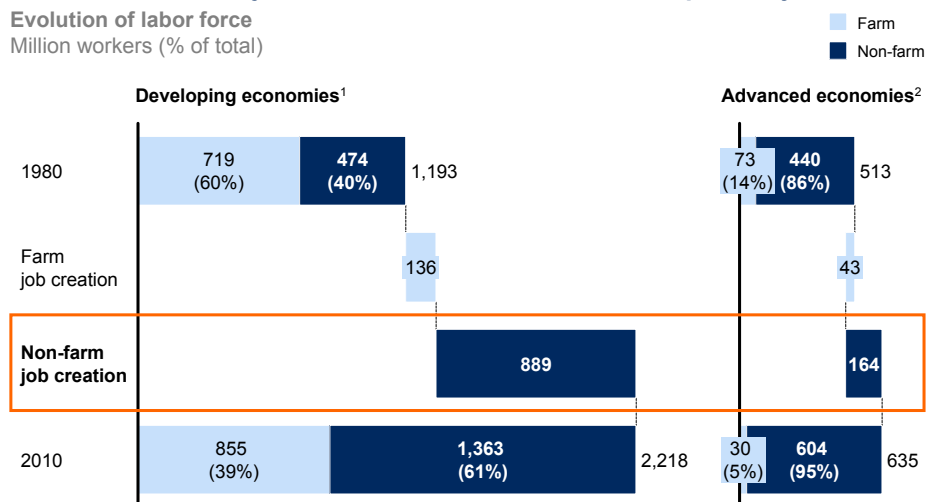
We estimate that at least one-fifth of non-farm jobs created in developing countries in the past decade were associated with rising exports, in effect bringing 85 million workers directly into the global economy. Also adding to this pool are immigrants from developing economies, who contributed an estimated 40 percent of labor force growth in advanced economies in the past three decades. In recent years, more of these workers have arrived with advanced skills: by 2008, foreign-born workers accounted for 17 percent of all employment in STEM (science, technology, engineering, and math) occupations in the United States.

To understand how economies are positioned in the emerging global labor market and how their labor forces are likely to evolve, we analyze 70 countries that generate 96 percent of global GDP and are home to 87 percent of the world's population. We plot median age, average educational attainment, and GDP per capita—parameters that indicate the quality and productivity of labor supply as well as its potential to expand. The 70 nations fall into eight clusters with common attributes: four in the developing economies (including China and India, which are their own clusters); three in advanced economies; and the Eastern European nations of the former Soviet bloc (Exhibit E3). Examining clusters, we can see, for example, that “Aging advanced” economies score highly in GDP per capita and educational attainment. But they have the oldest populations, which will make it difficult for them to increase the supply of high-skill talent from domestic sources. In this report we discuss potential gaps on a cluster basis; additional research is required to estimate country-level imbalances (e.g., how aging would affect supplies of high-skill workers in Germany, a member of the “Aging advanced” cluster).

Exhibit E2

1.1 billion non-farm jobs were created worldwide in the past 30 years

Evolution of labor force
Million workers (% of total)



¹ Includes 45 countries with GDP per capita less than \$20,000 at 2005 PPP levels in 2010.

² Includes 25 countries GDP per capita greater than \$20,000 at 2005 PPP levels in 2010.

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations Population Division (2010 revision); ILO Key Indicator of Labor Market index; local statistics for China and India; McKinsey Global Institute analysis

² Based on the World Bank's definition: less than \$1.25 per day at 2005 purchasing power parity (PPP) levels.

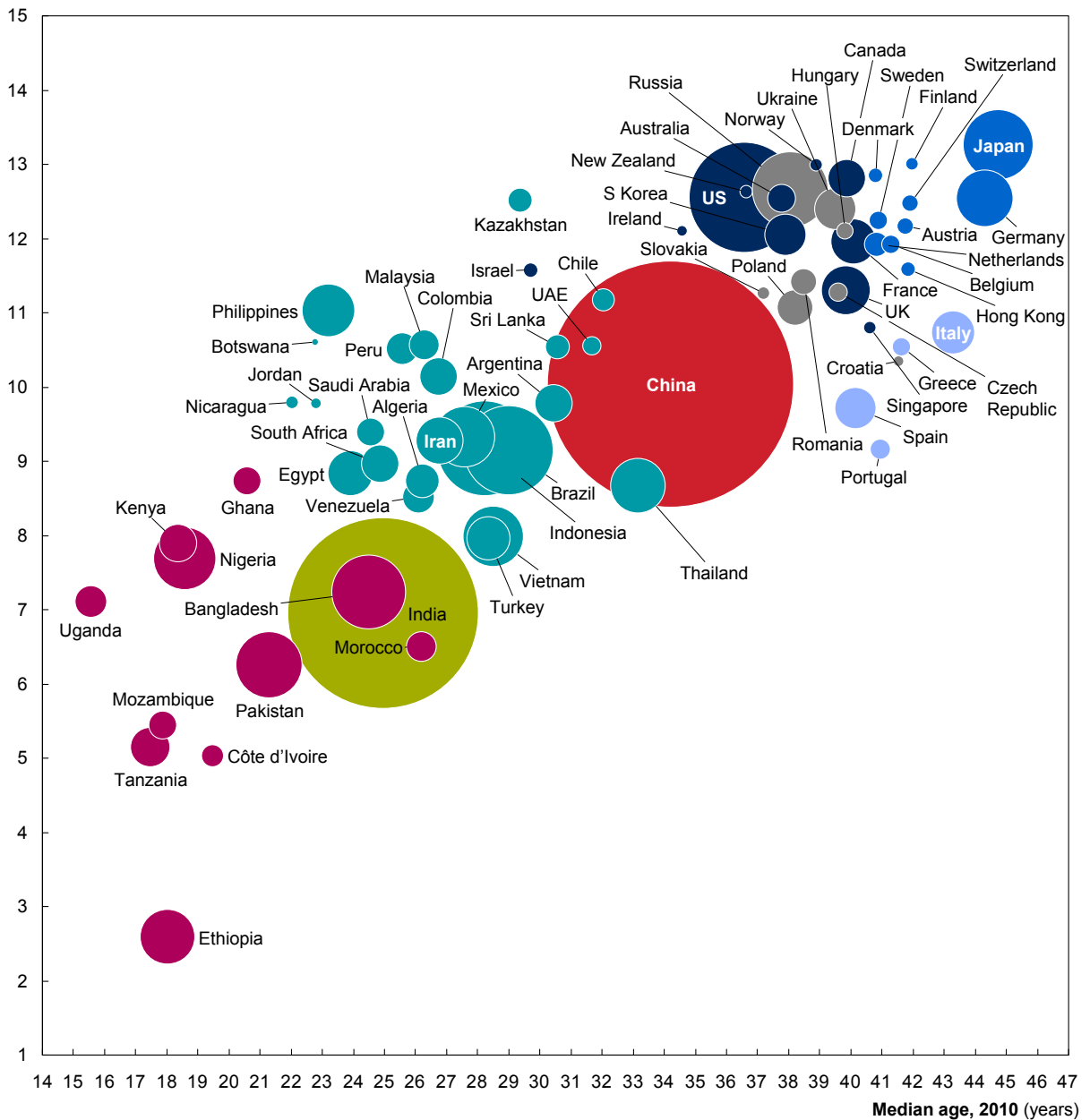
Exhibit E3

Global labor markets fall into eight clusters, each distinctly positioned in terms of age profile and educational attainment

○ Size of circle represents total size of the labor force of the country in 2010

Cluster	● Young Developing	● Young Middle-Income	● India	● China	● Young Advanced	● Russia & CEE	● Southern Europe	● Aging Advanced
Workers Million	322	640	469	783	290	141	60	145
GDP per capita \$	<3,000 ²	3,000–20,000 ³	3,000	7,000	25,000–50,000 ⁴	10,000–20,000 ⁵	20,000–30,000	30,000–45,000

Education Index, 2010¹



1 Calculated based on attainment levels of working-age population, and relative weights for each attainment level—4 for no education, 6 for primary, 12 for secondary, and 16 tertiary.
 2 With the exception of Morocco (GDP per capita of \$7,100).
 3 With the exception of UAE (GDP per capita of \$28,500).
 4 With the exception of South Korea (GDP per capita of \$23,500).
 5 With the exception of Czech Republic (GDP per capita of \$22,300) and Ukraine (GDP per capita of \$6,000).
 NOTE: All money data in this report is expressed in US dollars (\$) and at 2005 purchasing power parity (PPP) levels; for more detail on methodology for clusters, please see the appendix.
 SOURCE: United Nations Population Division (2010 revision); ILO; IIASA; McKinsey Global Institute analysis

Developing economies: riding a rising demographic tide

With large and rapidly growing populations and increasing access to global markets, developing economies became the world's largest suppliers of low-skill labor. These workers filled rising domestic needs as their countries industrialized and helped meet demand from the global economy, too.

China added 121 million non-farm jobs in its expanding manufacturing and service sectors in the past decade; more than 80 million of these were filled by workers shifting out of low-productivity agriculture, helping accelerate productivity gains. About 33 million jobs were created in manufacturing, and about a third of all new non-farm jobs were associated with exporting industries. China's focus, since the 1950s and 1960s, on educating both rural and urban workers across the nation, was reflected in the secondary education attainment rate of 60 percent in 2010. The result has been a dramatic increase in per capita GDP, which rose to 20 percent of advanced economy levels in 2010, from 3 percent in 1980.

India followed a similar path, but at a slower pace. In the 2000–10 decade, for example, India created just 67 million non-farm jobs, which was enough to keep pace with labor force growth, but not sufficient for more workers to move out of agriculture into more productive jobs. Indeed, while the share of farm jobs fell from 62 percent in 2000 to 53 percent in 2010, the number of farm workers remained steady at about 240 million. Also, India lags behind China in creation of higher value-added manufacturing and export-oriented jobs: 41 percent of India's job creation in the past decade was in low-skill construction, compared with 16 percent in China. And, while India rivals China in tertiary education attainment, the share of people with secondary school education is only about one-third the ratio in China, which could lead to a shortage of medium-skill workers for expanding labor-intensive industries.

The farm-to-factory transition also has played out in places such as Vietnam, a member of the "Young middle-income" cluster, which created 12 million non-farm jobs and reduced agricultural employment from two-thirds of all jobs in 2000 to half in 2010. The Philippines, another member of the cluster, created 3.5 million service sector jobs between 2000 and 2010, many of them in IT and IT-enabled services, thanks to its relatively high level of educational attainment. Countries in the Middle East and North Africa region (MENA), on the other hand, also rapidly increased tertiary attainment rates, but did not create enough high-quality service jobs. In Egypt, for example, five million students graduated from colleges between 1995 and 2006, but the economy created only 1.8 million jobs in skill-intensive service sectors.

The "Young developing" countries of South Asia and sub-Saharan Africa continue to benefit from a demographic dividend: their labor forces expanded by 2.9 percent annually from 1990 to 2010, reaching 322 million in 2010, and they have raised educational attainment. Countries like Bangladesh and Nigeria could be well positioned to take on more of the world's labor-intensive work as costs rise in China and India.

Advanced economies: High skills and high productivity to sustain growth

In response to slowing labor force growth and rising global competition, advanced economies have focused on raising productivity, often by adopting labor-saving technologies. From 1977 to 2007, manufacturing employment in advanced economies declined by 20 million, with the greatest losses in labor-intensive sectors such as textiles, leather, footwear, and wood products. Even economies like Germany that have remained major exporters of manufactured goods, saw total manufacturing employment shrink by more than 25 percent, despite their growing strength in knowledge-intensive manufacturing, which includes sectors such as chemicals, transport equipment, and advanced manufacturing (requiring a relatively small number of high-skill workers to program and run factory machines).

Across advanced economies, hiring has been strongest in services, particularly knowledge-intensive sectors such as finance and business services. Jobs also grew in labor-intensive sectors such as construction, retail trade and hospitality, and public services. Hiring rose rapidly in so-called interaction work, which requires face-to-face contact and includes the professions and business management. About half of interaction jobs require college degrees. Hiring was weakest in low-skill production and transaction occupations (assembly workers or customer service representatives), where tasks could be automated or transferred to low-cost locations.

Growing strains

In the wake of the “Great Recession,” the deteriorating position of low- and medium-skill workers has raised concerns about income inequality across advanced economies. However, the growing polarization of income that is so apparent today reflects a long decline in the role of low- and medium-skill labor (workers with just high school education or some post-secondary schooling at most). Such workers were once essential to the growth of advanced economies. But since the late 1970s, companies have come to rely increasingly on investments in labor-saving machinery and information technology to raise productivity. They have also invested in R&D and knowledge workers to help drive innovation. As a result, demand for the kinds of workers who make up three-quarters of the labor force has fallen—and, along with it, the share of national income that goes to workers. After rising steadily from 1950 to 1975, labor’s share of income in advanced economies fell from the 1980s onward, and now stands below the 1950 level.

High-skill workers (those with college degrees) remained in high demand and saw their wages rise—by about 1.1 percent a year in real terms in the United States, while wages declined slightly in real terms for workers who did not complete high school. Over 30 years, this has led to a widening gap between incomes of college-educated workers and workers with lower skills: the average college graduate earned 2.8 times the wage of an average high school dropout in 2008, up from a premium of 1.7 times in 1980. Even within college graduates, higher demand for certain specializations has driven wage concentration. For example, in the United States, the average STEM major earns \$500,000 more (in discounted lifetime earnings) than the average non-STEM major.

The weakened position of low-skill labor is reflected in employment figures: in most advanced economies, unemployment rates for the least-skilled are two to four times those of the most highly skilled workers, whether the economy is in recession or recovery. The effects of falling demand for low-skill labor have been especially harsh for younger workers. Today, 75 million young people (aged 15 to 24) who are not in school or college are unemployed, accounting for 38 percent of the world's unemployed.³ Youth unemployment has been high in developing economies as well. Across the MENA nations, youth unemployment consistently averaged 25 percent from the early 1990s through 2010. Left unaddressed, the youth unemployment problem could leave many advanced economies with a “lost generation” of workers.

POTENTIAL GAPS: TOO FEW HIGH-SKILL WORKERS AND NOT ENOUGH JOBS FOR MEDIUM- AND LOW-SKILL WORKERS

The most important trend shaping the global labor supply in the next two decades will be slower growth. New workers will enter at a slower rate, and older workers will leave in higher numbers. The overall effect will be to reduce the annual growth rate of the global labor force from about 1.4 percent annually between 1990 and 2010 to about 1 percent to 2030. China's labor force growth will likely drop by almost half, to just 0.5 percent annually—in “Aging advanced” economies, labor forces will shrink and will likely be flat in Southern Europe. Among the advanced economy clusters, only the “Young advanced” will grow its labor force, but only at about 0.6 percent annually to 2030.

Over the next two decades, China will be replaced by India and the “Young developing” economies of South Asia and Africa as the leading source of new workers in the global market. These nations will supply 60 percent of the more than 600 million net new workers that we project will be added to the global labor supply, bringing the total global labor force to 3.5 billion in 2030 (Exhibit E4). While China will be eclipsed as the world's major source of low-cost labor, it will assume a new and potentially more important role as the largest supplier of college-educated workers to the global labor force. Between them, China and India will contribute 57 percent of the world's new workers with some college education through 2030.

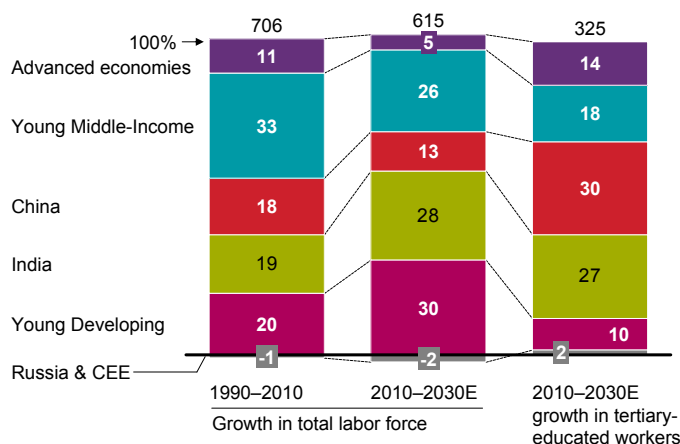
Over the same period we project that the total population of people over 55 who are not in the labor force (including a surge of retirees) could reach 360 million. Some 40 percent of the expected retirees would be in the advanced economies and China, complicating the challenge of filling skill gaps in those nations. Of these retirees, approximately 38 million would be college-educated workers, who will take with them valuable skills. Raising the labor participation rate of workers over 55 and finding ways to keep retirement-age workers employed are obvious ways to narrow potential skill gaps.

3 *Unemployment Statistics*, Eurostat.

Exhibit E4

India, South Asia, and sub-Saharan Africa will add the most workers through 2030; China and India will lead in workers with tertiary education

Net additions to labor force and tertiary-educated workers
%; million workers



1 Includes Young Advanced, Aging Advanced and Southern Europe clusters.

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations Population Division (2010 revision); International Labor Organization (ILO); Global Insight; Oxford Economics; Economist Intelligence Unit; local statistics for China and India; McKinsey Global Institute analysis

With slow-growing or even shrinking labor forces—and lower labor participation rates, also due to aging—economies will need to accelerate productivity growth. To maintain historical rates of GDP growth, we estimate that the “Aging advanced” economies would need to increase productivity growth by about 60 percent of historical levels, to about 1.9 percent annually. The Southern Europe cluster will face an even steeper challenge: these economies would need to double their 0.7 percent rate of productivity growth of the past 20 years to sustain growth in GDP per capita. To bring the productivity target down to a more easily achievable range and still sustain GDP growth, countries can also raise labor force participation rates, particularly those of prime working-age women and older workers.

In any case, advanced economies would still need to push hard for higher productivity improvements, which will require rapid expansion in highly knowledge-intensive sectors of the economy, such as advanced manufacturing, health care, and business services. This, in turn, would depend on access to high-skill workers—which, at current growth rates of supply, may lag behind demand. We project that by 2020, advanced economies could have about 16 million to 18 million too few workers with tertiary degrees, or about 10 percent of their demand.

Even China, despite its “skill dividend,” will likely struggle to keep up, as its supply of tertiary-educated workers will be constrained by slow growth in the supply of secondary school graduates who will qualify for university training. Meanwhile, rapid job growth in services sectors and knowledge-intensive manufacturing will increase demand for high-skill workers. China could end up with 23 million fewer workers with a tertiary education than it will likely require in 2020, or about 16 percent of demand.

At the same time, advanced economies would also experience rising surpluses of workers with less education and increasingly limited employment opportunities. At current rates of educational attainment and labor force growth, we project that there could be 32 million to 35 million more workers with only secondary education than employers will demand in 2020, equivalent to an 11 percent oversupply.

In developing countries, if patterns of educational attainment and job creation do not change, the demographic advantages (young and rapidly growing populations) that have helped many of these nations prosper could become an economic and political burden. Based on current population and education trends, India could have 27 million too many low-skill workers, who would likely be trapped in low-productivity, low-income work. “Young developing” economies could have 31 million similarly positioned low-skill workers. Meanwhile, India and “Young developing” economies could have 45 million too few workers with secondary school education.

A GLOBAL AGENDA FOR JOBS AND SKILLS

The imbalances we project in our momentum case would have undesirable implications for the global economy. Unemployment of low-skill workers would continue to rise and global growth rates would fall if high-skill jobs were to go unfilled. Wages could respond to imbalances in demand and supply by polarizing further, leading to greater income inequality. Patterns of migration and trade flows could adjust to address labor shortages and surpluses across regions. But given the volumes of low- and medium-skill workers that would need to be employed, and rising resistance to immigration in some nations, these adjustments could have limited impact.

To create better outcomes for workers and economies, policy makers and business leaders across the globe will need to find ways to vastly improve the capacity to provide job-relevant education and training. And, in both developing and advanced economies, new approaches to job creation for low- and middle-skill workers will be required.

We estimate that advanced economies will need to raise the number of young people completing tertiary education 2.5 times as quickly as they are currently doing. They will also need to guide more students to job-relevant training (in the United States, for example, only 14 percent of college degrees awarded are in STEM fields). India and the “Young developing” economies will need to catch up in secondary and vocational education and find ways to retrain hundreds of millions of adults who have little or no formal education and job skills. To meet government targets of secondary school graduation rates, India would need to add 34 million secondary school seats, to reach 82 million school seats by 2016, and hire twice the number of secondary school teachers every year.

Such goals cannot be met by conventional methods alone. Recasting the global labor force to align with future demand will require deep and wide innovations to improve the capacity, reach, and delivery of educational and company training systems. This will require new ways of teaching, collaboration with industry to craft curricula to employer needs, and new ways of building schools and training teachers.

From rural schools in India to the top universities in advanced countries, technology can be used to extend the capacity of schools and teachers. Even now, teachers in parts of India are reaching low-income students through DVD-based lessons, and top US professors are giving classes to hundreds of thousands of students per semester, rather than hundreds, through online systems. The need for innovation is high and will require more resources than governments alone can provide: private industry, private investors, and the social sector also will need to help.

Even with these steps, the shortages we project would not disappear entirely. Both advanced and developing economies will also need to consider steps to raise demand for less-skilled workers. In advanced economies there are opportunities to create new jobs for low- and middle-skill workers in service sectors, including in the fast-growing health care industry and through “marketization” of home services such as child care and elder care (turning a segment of the informal economy into an industry, with full-time employment, training, benefits, even career advancement). In some places, regulatory reform may help enable job creation for less-skilled workers, for example, by relaxing restrictions on retail trade. Additional responses to long- and short-term unemployment may also be required, including measures like Germany’s job-sharing program, which provides a subsidy that allows employers to avoid mass layoffs by keeping workers on at reduced hours.

Developing economies can create demand for less educated workers by encouraging the expansion of labor-intensive sectors. By moving up the value chain—from supplying raw food or raw materials and intermediates to processed food and finished goods—economies create more jobs. By scaling up its garment manufacturing sector, Bangladesh, for example, created employment opportunities for millions of low-skill women, many of whom had never worked in the formal economy before. Government can also help create jobs in the manufacturing and construction sectors by reducing the regulatory barriers that inhibit new enterprises and infrastructure development.

For businesses operating in a global knowledge economy, an immediate priority is to develop a deeper understanding of how labor markets and skill pools are evolving in different countries to inform global recruiting and supply chain strategies. Businesses should also consider how to play an active role in public education and training. For example, IT companies in India actively shape college curricula and delivery, to ensure better access to skills. Some businesses could choose to participate directly in the booming education sector, as providers of vocational training for example. Longer term, businesses in a skill-scarce world would need to optimize demand for skilled workers, by investing in skill-saving technologies such as knowledge codification systems and smart devices that raise productivity even of low-skill workers. Finally, given the urgency of resolving unemployment and inequality problems, businesses should consider aligning their corporate social responsibility efforts to labor priorities in their communities.



Throughout the 20th century, industrialization, innovation, and advances in technology resulted in record wealth creation and improving living standards—a rising tide that globalization shared with the developing world. Work itself evolved: it took less human effort to raise food and build things. But it now takes greater knowledge to innovate and continue to raise productivity. As the 21st century unfolds, the supply of high-skill workers is not keeping up with growing demand, while too many workers are left with inadequate or outdated skills. Slower growth, rising income polarization, growing pools of unemployed or under-employed workers, and soaring social costs are real possibilities. To keep those possibilities from becoming realities, policy makers, business leaders, and workers themselves must find ways to bring education, training, and job creation into the 21st century.

1. A global labor market emerges

Over the past three decades, the industrialization of developing economies, rising trade, and immigration, have all helped to bring about a more integrated global labor market. More than one billion non-farm jobs were created worldwide. Around 900 million of these were created in developing economies and played a role in lifting 620 million people out of poverty between 1990 and 2008.⁴ In advanced economies, as growth shifted to services and companies adopted technology to improve productivity, millions of new high-paying jobs were created for high-skill workers.⁵

But recently, strains have become apparent, particularly during the slow recovery from the “Great Recession” of 2008–09. In advanced economies, the fortunes of high- and low-skill workers have diverged sharply. While demand for high-skill workers remains strong—and shortages of such workers are becoming more common—there are large and growing pools of low-skill workers for whom job opportunities are shrinking. Long-term unemployment is becoming more common, and across advanced economies youth unemployment has risen to 18 percent, or more than twice the overall rate.

While part of the problem is cyclical—a natural result of the global financial crisis and a severe recession—it is increasingly clear that long-term structural changes in global demand and supply of labor play a major role. As a result, in advanced economies, polarization of incomes is growing. And, with slow wage growth for low- and middle-skill workers, labor’s share of national incomes (the sum of all employee compensation) has fallen to its lowest level in 60 years.

Today, the effects of changes in labor demand and supply are most apparent in advanced economies, but they are also beginning to be felt in developing ones. Across the global labor market there are growing mismatches between worker skills and employer needs (in France there are too few college graduates; in India, there aren’t enough workers with secondary education). In this chapter we examine the evolution of the global labor market and the roots of potential imbalances.

4 This is based on the World Bank’s definition of poverty: income of less than \$1.25 per day based on 2005 purchasing power parity (PPP) levels. It compares the number of people who lived in poverty in 2008 with those in 1990. This estimate includes children and others who are not in the labor force.

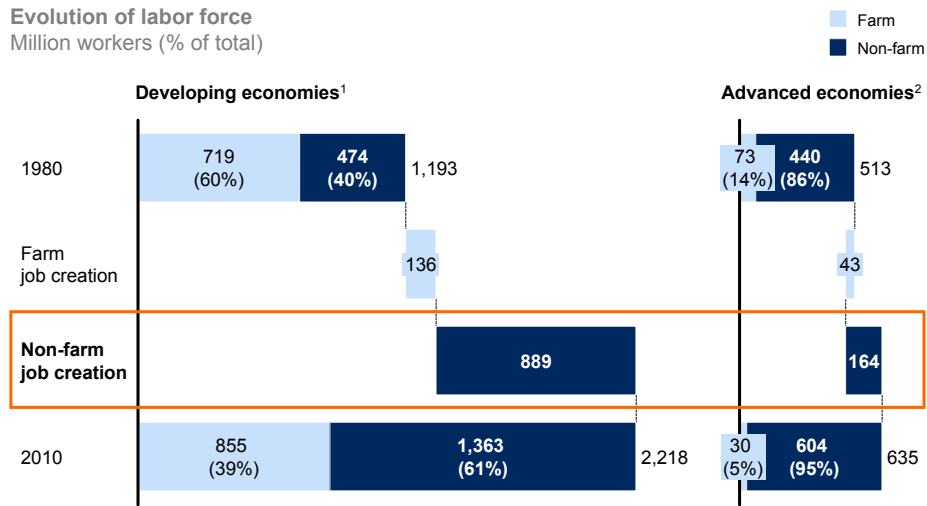
5 We use educational attainment as a rough proxy for skill level. High-skill refers to workers with a tertiary education or more, medium-skill refers to workers with only a secondary education, and low-skill refers to workers with no more than a primary education.

GROWTH OF A GLOBAL LABOR MARKET

From 1980 to 2010, the world’s labor force grew by 1.2 billion, to approximately 2.9 billion. Almost 90 percent of the growth occurred in developing economies, including 500 million new workers in China and India. This growth, driven by demographics (i.e., fast-growing populations) and rising labor market participation, also reflects a critically important “farm-to-factory” shift in developing economies. Approximately 1.1 billion⁶ non-farm jobs were created worldwide, raising global non-farm employment from 54 percent of all jobs in 1980 to nearly 70 percent in 2010. Of the 900 million non-farm jobs created in developing nations, 44 percent were in China and India, reflecting the shift in these economies from rural agriculture to urban industry (Exhibit 1).

Exhibit 1

1.1 billion non-farm jobs were created worldwide in the past 30 years



1 Includes 45 countries with GDP per capita less than \$20,000 at 2005 PPP levels in 2010.
 2 Includes 25 countries GDP per capita greater than \$20,000 at 2005 PPP levels in 2010.
 NOTE: Numbers may not sum due to rounding.
 SOURCE: United Nations Population Division (2010 revision); ILO Key Indicator of Labor Market index; local statistics for China and India; McKinsey Global Institute analysis

The advanced economies created about 165 million non-farm jobs from 1980 to 2010. A large contributor to this growth was rising participation by women.⁷ Over this period, the number of women in the labor force rose by 77 million, accounting for 61 percent of the 122 million net additions to the labor forces of advanced economies.

Average skill levels also rose rapidly. From 1980 to 2010, the number of college graduates in the world labor force rose by 245 million. The proportion of college graduates in the labor force doubled in advanced economies and grew by more than 2.5 times in developing economies (Exhibit 2). Around the world, about 700 million high school graduates joined the labor force, raising the global proportion of workers with secondary education to 48 percent in 2010, up from

6 This is calculated by applying non-farm shares of employment for a subset of countries from the International Labor Organization’s Key Indicator of Labor Market index (equivalent to about 62 percent of world labor force) and applying these to World Bank estimates of the world labor force.

7 We use the ILO definition of labor force participation rate: the proportion of a country’s working-age population that engages actively in the labor market, either by working or looking for work.

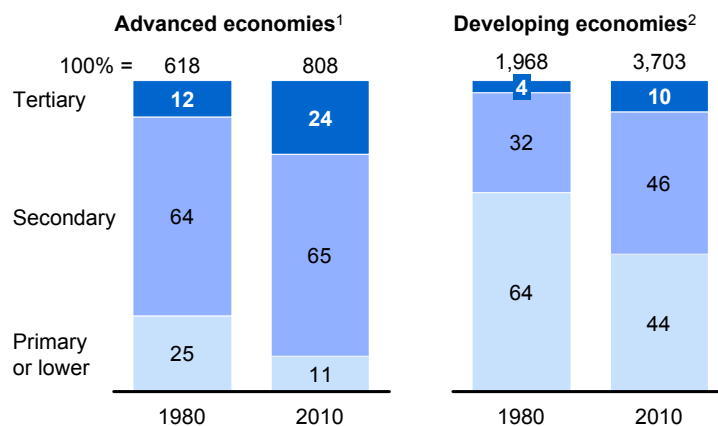
39 percent in 1980. One of the biggest contributors to this surge in secondary education was China, which undertook an extensive program of universal secondary education, raising the total number of workers with secondary school education in the global supply by an estimated 270 million.

Exhibit 2

Rates of tertiary education attainment have doubled in advanced economies and risen by 2.5 times in developing ones since 1980

Educational attainment

% of total working age population; million people



¹ Includes 25 countries from the Young Advanced, Aging Advanced and Southern Europe clusters.

² Includes 45 countries from the Young Middle-Income, China, India, Young Developing, and Russia & CEE clusters.

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations Population Division (2010 revision); International Institute for Applied Systems Analysis (IIASA)

During this period, trade, offshoring and migration served to integrate national labor markets into a more global market. In the past decade, we estimate that 85 million jobs that were created in developing economies were associated with rising exports,⁸ or about 20 percent of net new employment (Exhibit 3). Aside from a small number of jobs in exported services—about four million jobs in IT-enabled services, mostly in India and the Philippines, for example—most of these jobs were in manufactured goods. In advanced economies, trade in services is growing quickly: our work on the impact of trade⁹ shows that many advanced economies have built surpluses in knowledge-intensive services—and in knowledge-intensive manufacturing—and have created export-related jobs in these sectors.¹⁰

Immigration has also played a role in creating a more global labor market. The number of immigrants¹¹ in the world rose faster than the population—from 142 million in 1990 to 207 million in 2010. More than half of this increase was the result of people leaving developing economies for advanced ones, where foreign-born workers contributed an estimated 40 percent of labor force growth from 1980 to 2010. In recent years, the proportion of high-skill migrants has

⁸ We estimate jobs associated with exports using the export share of GDP at a sector level in 2000 and 2010, assuming constant productivity across export and domestic output.

⁹ For a detailed discussion of the impact of global trade on jobs in advanced economies, see *Trading myths: Addressing misconceptions about trade, jobs and competitiveness*, McKinsey Global Institute, May 2012 (www.mckinsey.com/mgi).

¹⁰ Ibid.

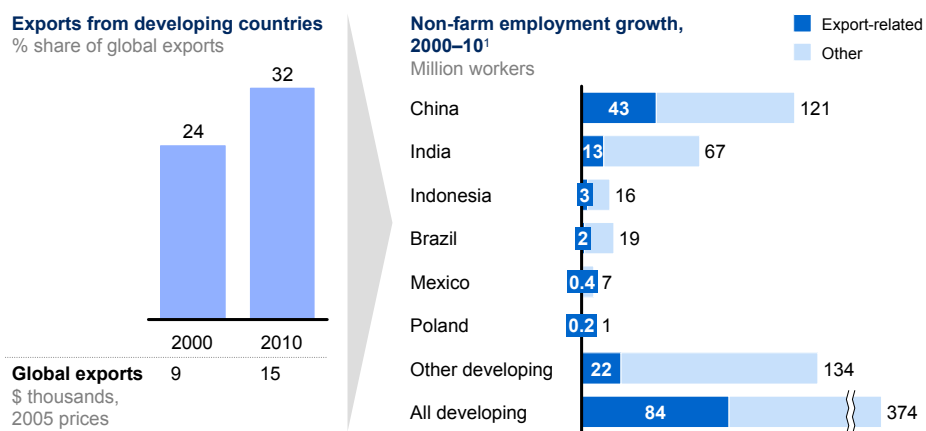
¹¹ Immigrants are defined by the United Nations as the stock of foreign-born people or foreign citizens resident in a country.

been rising—from 19 percent in 1980 in the United States, to 26 percent in 2010, for example—as immigrants filled demand that domestic supply alone could not meet.

To understand where nations around the world now stand in the emerging global labor market and how they are positioned to accommodate likely changes in labor demand, we examined 70 countries that account for 96 percent of global GDP and are home to 87 percent of global population. By segmenting them based on the median age, their educational profiles, and GDP per capita, we identify eight clusters of countries¹² that share common attributes (see Box 1, “Segmentation of countries based on labor supply characteristics”). By looking at how clusters are positioned, we can see, for example, how well prepared they are for a global contest for high-skill workers. In the Southern Europe cluster, for instance, we see that educational attainment is quite low relative to other advanced economies¹³ and age is on the higher side. China has an older population than other developing economies, and its educational attainment is approaching that of advanced economies. India has similar average educational attainment levels, though higher per capita GDP, than “Young developing” economies such as Nigeria and Kenya.

Exhibit 3

A fifth of non-farm jobs created in developing economies in the past decade were associated with exports



1 Export contribution to non-farm employment growth is calculated as the difference between export-related non-farm employment in 2010 and 2000. Export-related employment is estimated at the sector level (i.e., agriculture, manufacturing, mining, and other services) assuming constant labor productivity across exports and domestic output.

2 Countries selected based on their growth in exports in \$ terms from 2000 to 2010: selected countries include China, India, Indonesia, Brazil, Mexico, Poland; Russia and the oil-exporting countries of the Middle East excluded from this analysis.

SOURCE: Economist Intelligence Unit; Global Insight; OECD Input-Output Table (2005); ILO; local statistics for China and India; McKinsey Global Institute analysis

12 For a detailed list of countries by cluster, see Exhibit E3 and Box 1; for a description of our clustering methodology, see the appendix.

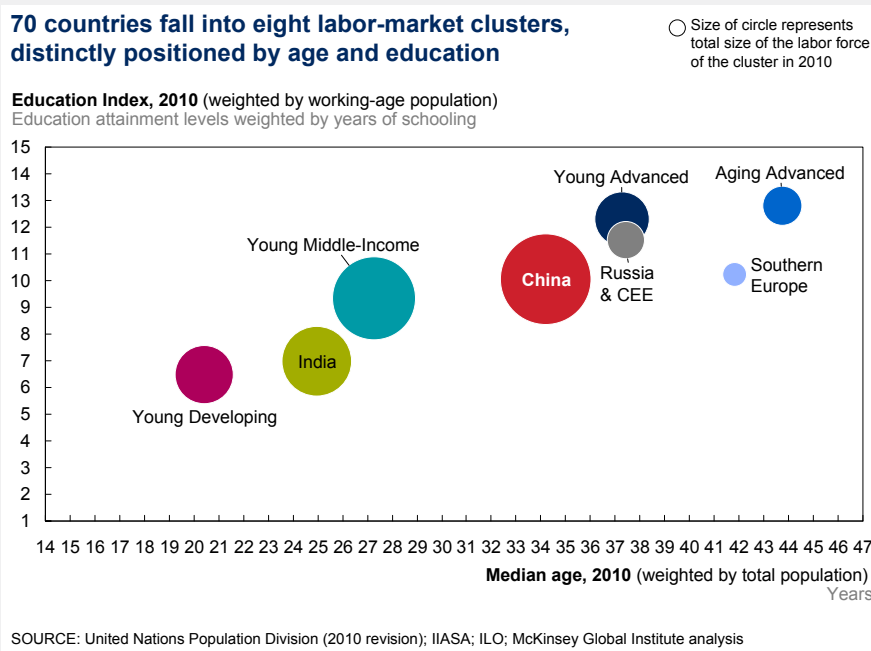
13 For example, just 10 percent of the working-age population in Italy had a college degree in 2010—not only lower than the level in other advanced economies but also lower than that in developing countries such as Malaysia, Thailand, and the Philippines.

Box 1. Segmentation of countries based on labor supply characteristics

We segment economies according to three labor market characteristics: median age, average educational attainment of the working-age population, and GDP per capita in 2010. These parameters are proxies for a country’s potential to grow labor supply, quality of supply, and productivity of supply. This segmentation yields six groups of nations, plus India and China, which have unique characteristics. Three clusters with relatively high median age and educational attainment are the “advanced economies” (their per capita GDP is greater than \$20,000¹) while countries in the Russia and Central & Eastern Europe cluster have similarities on educational attainment and median age, but lower levels of GDP per capita and are not included in the “advanced economies.” The remaining four clusters are developing economies with lower median age and educational attainment, and per capita GDP of less than \$20,000. In some cases, the cluster name is geographic—as in the case of Southern Europe—but geographic classifications were not used to define the segmentation. The cluster-level gaps we quantify are broad, directional estimates (e.g., we estimate skill gaps at the country cluster level, rather than at the individual country level). More detailed, work would be required to estimate potential imbalances at a country level (e.g., identifying skill gaps would require projecting which industries will develop fastest, the pace of technology change, even the pattern of a country’s trade balance).

Exhibit 4 shows the clusters as circles, whose sizes and positions on the grid are scaled based on the labor forces of countries within each cluster. Exhibit E3 plots each country on two of the dimensions used.

Exhibit 4



1 We use the term “Advanced economies” to refer to the 25 countries in our three clusters of Aging advanced, Young Advanced, and Southern Europe, all of which had 2010 GDP per capita greater than \$20,000, at 2005 purchasing power parity (PPP) levels. Nations from these three clusters are all Organisation for Economic Co-operation and Development (OECD) members, except Singapore and Hong Kong. Some of our Russia and Central & Eastern Europe cluster (e.g., the Czech Republic, Hungary, Poland, and Slovakia) are also OECD members, as are Chile, Mexico, and Turkey (classified as part of the “Young middle-income” cluster), but we do not refer to them as “advanced economies.”

DEVELOPING ECONOMIES: RIDING A RISING DEMOGRAPHIC TIDE

Developing economies have benefited from favorable demographic forces: large, and rapidly growing populations that can fill global demand for labor. This supply of workers helped meet domestic needs, as nations industrialized and job creation shifted from low-productivity agricultural to manufacturing, construction, and services in growing urban centers. These expanding labor forces also helped fill a global need for low-cost labor.

China. The rapid rise of China in the past three decades was made possible by the development of a modern industrial workforce. From 1980 to 2010, China's non-farm labor force grew by 315 million to around 475 million, and now accounts for 60 percent of the total labor force. The result of labor force expansion and the shift to non-farm work was a rapid rise in productivity and per capita GDP. From 1990 to 2010, China's productivity growth averaged 9.8 percent per year, about one-fifth of which was driven by workers moving into non-farm employment—a powerful driver of productivity because non-farm workers were seven times as productive as farm workers.¹⁴ In 1980, China's GDP per capita was less than 3 percent of the average for advanced economies; by 2010, it had risen to 20 percent.

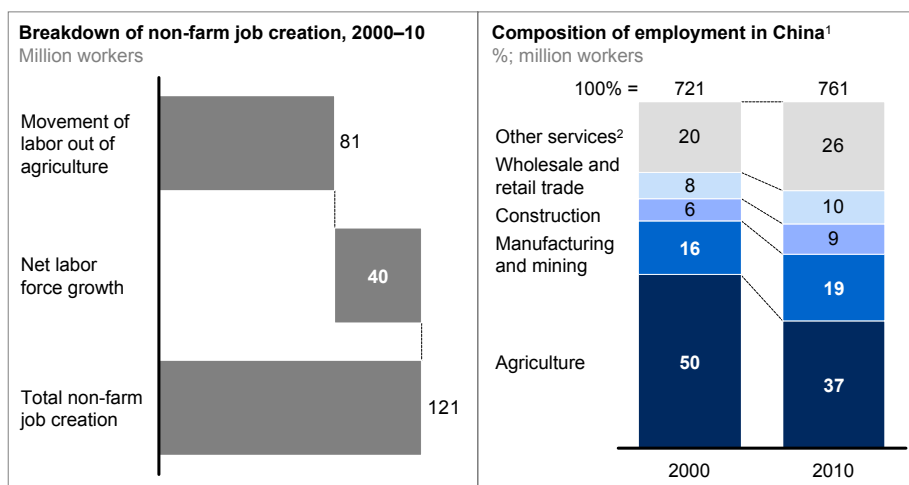
In the 2000–10 decade, China accelerated the shift from agriculture, creating approximately 121 million new non-farm jobs, including 33 million in manufacturing, bringing about 81 million workers from agriculture to non-farm employment (Exhibit 5). A third of China's new non-farm jobs were associated with exporting industries.

Rapid improvements in skill levels of Chinese workers during those decades also helped drive productivity improvements and enable the farm-to-factory shift. The proportion of Chinese workers with a secondary school diploma rose from approximately 50 percent in 1990 to around 60 percent in 2010; the proportion of those with tertiary degrees rose from about 2 percent to about 8 percent.

¹⁴ This productivity differential is estimated based on productivity levels in 2010. Average labor productivity of agricultural workers tends to be low and marginal productivity can be negligible (i.e., a large proportion of these workers can take non-farm jobs without losing agricultural output). Thus a nation's productivity jumps when workers are moved from farm to non-farm sectors.

Exhibit 5

The addition of 121 million non-farm jobs in the past decade significantly altered the structure of China's labor force



¹ 2010 sector distribution estimated using data till 2009 and data on three strata of employment for 2010.
² Includes employment of utilities; transport; post and telecom; banking and finance; health and social services; education, government and "other."
 NOTE: Numbers may not sum due to rounding.
 SOURCE: China National Bureau of Statistics; McKinsey Global Institute analysis

India. The Indian labor force grew from approximately 260 million in 1980 to 470 million in 2010, and India created millions of non-farm jobs—but not on the scale that China achieved. From 2000 to 2010, India added 67 million non-farm jobs, just enough to keep pace with the growth of its labor force. Relatively few of these jobs (about 19 percent) were associated with exports: 41 percent were in the construction sector, compared with 16 percent in China. Just 12 percent of India's non-farm job growth came from manufacturing, compared with 29 percent in China. India also has lagged behind China in raising the skills of its workforce. While it has comparable numbers of workers with a tertiary education, the share of people with secondary education in India is less than half the ratio in China and many other developing economies (Exhibit 6).

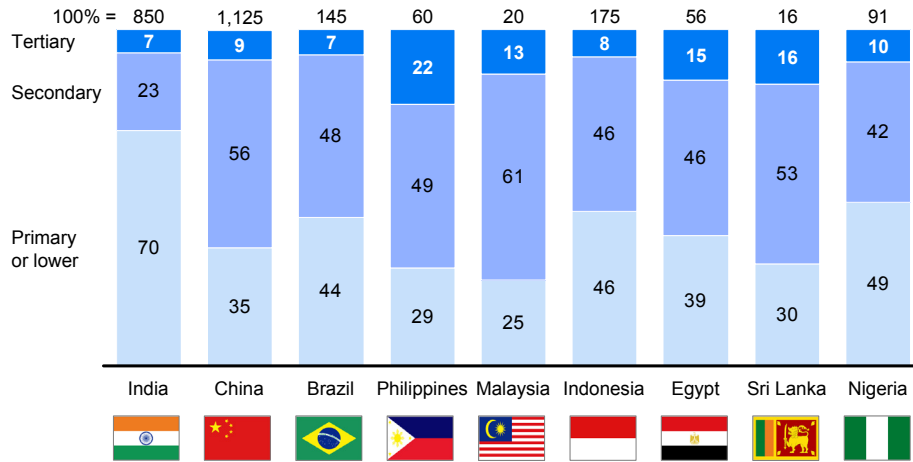
The results of the slower evolution in India's labor force are reflected in its growth and productivity record (Exhibit 7). India's productivity growth rate was about half of China's during the 1990–2010 period. This was partly due to the slower transition out of agriculture, which accounted for only about a tenth of India's productivity improvement and about a fourth of the impact China got from that shift. By 2010, Indian per capita GDP had more than tripled from the 1980 level, rising from 4.3 percent of advanced economy levels to 9 percent. However, the gap between India's per capita GDP and that of advanced economies is now greater than China's.

Exhibit 6

India has significantly more workers with only primary schooling or less and far fewer with secondary education than other developing economies

Educational attainment, 2010

% of working age population; million people



NOTE: Numbers may not sum due to rounding.

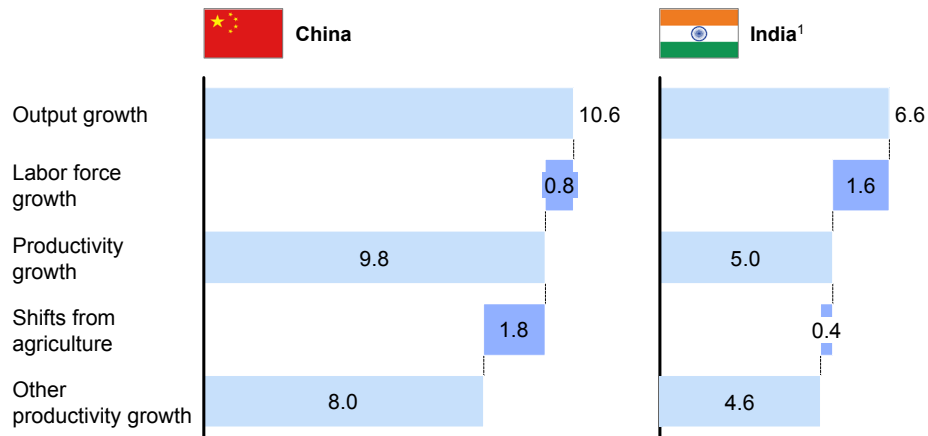
SOURCE: United Nations Population Division (2010 revision); IIASA; ILO; local statistics for India and China; McKinsey Global Institute analysis

Exhibit 7

The shift of labor in China from farm to non-farm employment has been a significant driver of economic growth; less so for India

Decomposition of output growth, 1990–2010

Compound annual growth rate, %



1 Data from 1991 to 2010.

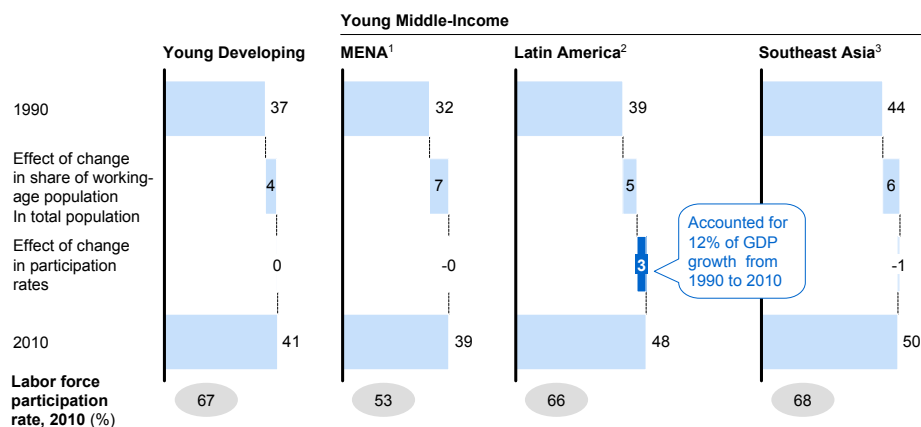
NOTE: Numbers may not sum due to rounding.

SOURCE: China National Bureau of Statistics and CEIC data (China); National Sample Survey Organisation and National Accounts Statistics (India); McKinsey Global Institute analysis

Countries in our “Young middle-income” cluster, which includes nations from Latin America, MENA, and Southeast Asia, participated in the rise of a global labor market in different ways. By 1980, Latin American countries were already highly urbanized¹⁵ and therefore derived little productivity gains from moving to non-farm employment in the past 30 years. Latin America did, however, benefit from a demographic wave: in the past two decades, the labor force, as a share of total population, jumped faster in Latin American nations than in any other developing cluster (Exhibit 8). Labor force participation among prime working-age women (aged 25 to 54) jumped from 47 percent to 65 percent between 1990 and 2010, as the number of women in the labor force rose by 46 million. As a result, GDP per capita across Latin American nations grew faster than productivity (1.7 percent per year versus 0.8 percent).

Exhibit 8 Latin American countries increased labor force participation rates more than other developing economies

Labor force as % of total population



1 Includes Algeria, Egypt, Jordan, Iran, Saudi Arabia, United Arab Emirates from MENA and select other economies from the cluster (e.g., Turkey, Kazakhstan, South Africa, Botswana).

2 Includes Brazil, Mexico, Argentina, Colombia, Venezuela, Peru, Chile, and Nicaragua.

3 Includes Indonesia, Malaysia, Thailand, Vietnam from Southeast Asia, and select other economies from the cluster (e.g., Sri Lanka).

NOTE: Numbers may not sum due to rounding.

SOURCE: UN Population Division (2010 revision); ILO; McKinsey Global Institute analysis

Like China, Southeast Asian nations have benefited from the farm-to-factory shift, which drove rapid productivity growth across the region. Productivity growth averaged 2.9 percent annually from 1990 to 2010 across the region, and Vietnam achieved annual productivity growth of 5.1 percent per year from 2000 to 2010. About 12 million non-farm jobs were created in Vietnam from 2000 to 2010, and its share of farm jobs fell from two-thirds of total employment to half. About 28 percent of the new non-farm jobs were in manufacturing, and 30 percent were in construction and trade.

As these economies built up non-farm employment, educational attainment rose, too. The share of workers with secondary education in Vietnam grew from 24 percent in 1990 to 32 percent in 2010.¹⁶ In Malaysia, the share of workers

15 In 2007, just 18 percent of Brazil's labor force was employed in agriculture, compared to 41 percent in China and 58 percent in India. For more on Latin America's urban growth, see *Building globally competitive cities: The key to Latin American growth*, McKinsey Global Institute, August 2011 (www.mckinsey.com/mgi).

16 For a further description of Vietnam, see *Sustaining Vietnam's growth: The productivity challenge*, McKinsey Global Institute, February 2012 (www.mckinsey.com/mgi).

with a college degree rose from 2 percent in 1980 to 13 percent in 2010. In the Philippines, tertiary educational attainment rose from 9 percent in 1980 to 22 percent in 2010. This helped the Philippines create 3.5 million service sector jobs from 2000 to 2010, many of them in IT-enabled services.

In the MENA nations—also part of the “Young middle-income” cluster—educational attainment is rising faster than employment opportunities. For example, in Egypt, five million students graduated from college between 1995 and 2006, but the economy created just 1.8 million jobs in skill-intensive service sectors (excluding construction and wholesale and retail trade). Youth unemployment has been persistently high—25 percent from the early 1990s through 2010—despite low participation rates (just 38 percent of young people in the MENA region are in the labor force, compared with about 50 percent in advanced economies). In surveys, only a third of young people say that they believe their education prepares them adequately for the job market.¹⁷

In the South Asian and African economies of the “Young developing” cluster, the demographic wave that is beginning to recede in China is still going strong. Their combined labor forces expanded by 2.9 percent annually from 1990 to 2010, reaching 322 million in 2010. These nations are also experiencing a rapid rise in educational attainment, creating attractive labor pools that are well positioned to benefit as wages rise in coastal China’s booming cities and in India’s outsourcing services centers and companies look for alternative sources of labor. Bangladesh and parts of sub-Saharan Africa (as well as Vietnam and Indonesia) are among the nations that have an opportunity to take their turns providing low-cost labor to the global economy in the coming decades.

ADVANCED ECONOMIES: MOVING TO HIGH-SKILL/ HIGH-PRODUCTIVITY WORK

In the past 20 years, the drive for global competitiveness has shaped job creation across advanced economies. Companies based in wealthy nations adopted technology, streamlined business processes, and took advantage of new sources of low-cost labor—often as they expanded their global footprints. As a result, productivity growth in advanced economies averaged 1 to 2 percent annually. During this time, employment in services (both low- and high-skill) grew rapidly, while employment in manufacturing, mining, and agriculture sectors fell (even in countries that are strong exporters of manufactured goods).

Increasing use of technology and the drive for productivity have all raised demand for high-skill workers, while depressing job growth for workers with lower skills.¹⁸ Production and simple transaction jobs (e.g., assembly line work or answering a customer service call) have been automated or, in some cases, shipped to lower-cost locations. At the same time, jobs have grown quickly in “interaction” work, which requires face-to-face contact. These jobs include many low-skill jobs (e.g., home health aides), as well as professions, such as law and medicine. In the United States, the number of interaction jobs grew by 8.9 million from 2002 to 2010; about half of those jobs required tertiary education. In the same period, the

17 The International Finance Corporation (IFC)-Islamic Development Bank Group, *Education for employment: Realizing Arab youth potential*, 2011.

18 See E. Brynjolfsson and A. McAfee, A., *Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy*, 2011 for a detailed discussion of the impact of technology on demand for skilled workers.

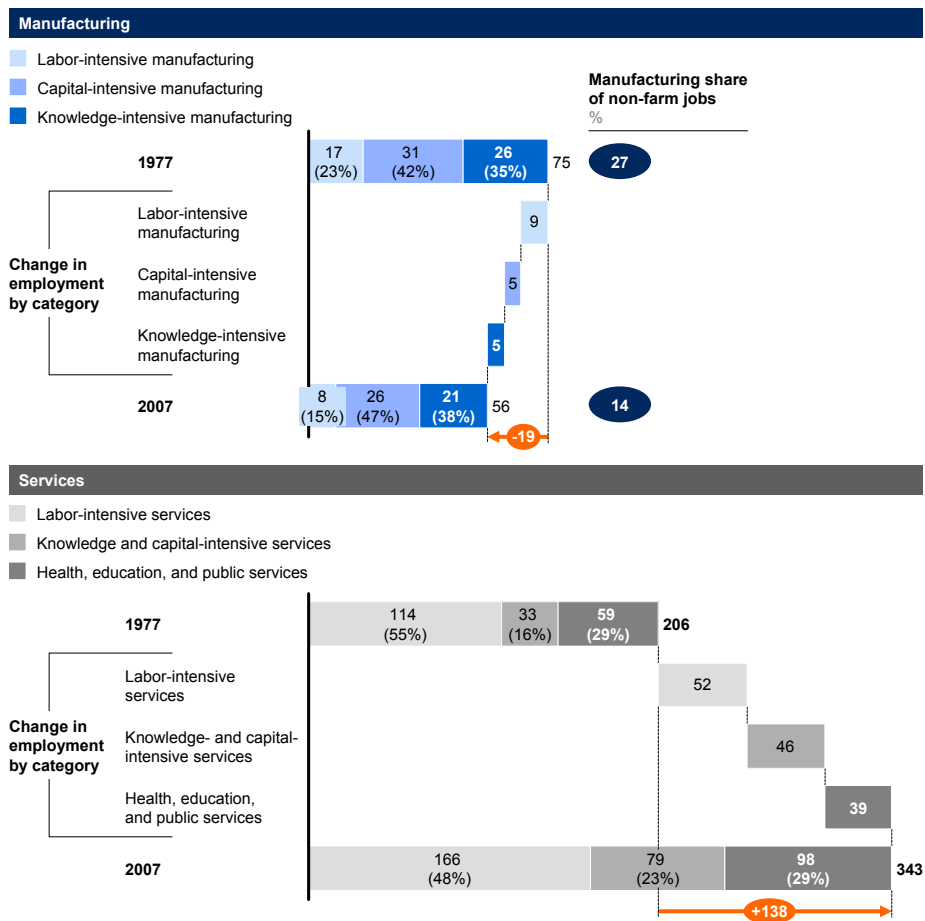
number of production jobs declined by 2.2 million and the number of transaction jobs fell by 3.5 million.¹⁹

From the 1970s to 2007, employment in agriculture, manufacturing and mining in advanced economies shrank from 33 percent of total employment to 17 percent. This included the loss of approximately 20 million jobs in manufacturing (Exhibit 9). Even economies such as Germany and Japan, which retain strong manufacturing exports, have experienced falling employment in manufacturing. They remain globally competitive by focusing on advanced manufacturing and by investing in technology. So, even though Germany lost the same share of manufacturing jobs as the United States, its knowledge-intensive manufacturing jobs did not fall as steeply—including workers who design and run advanced manufacturing machinery (Exhibit 10).

Exhibit 9

In advanced economies, labor-intensive manufacturing lost the most jobs; hiring was fastest in knowledge-intensive services, and in public services

Employment in advanced economies¹
Million workers (% of total)



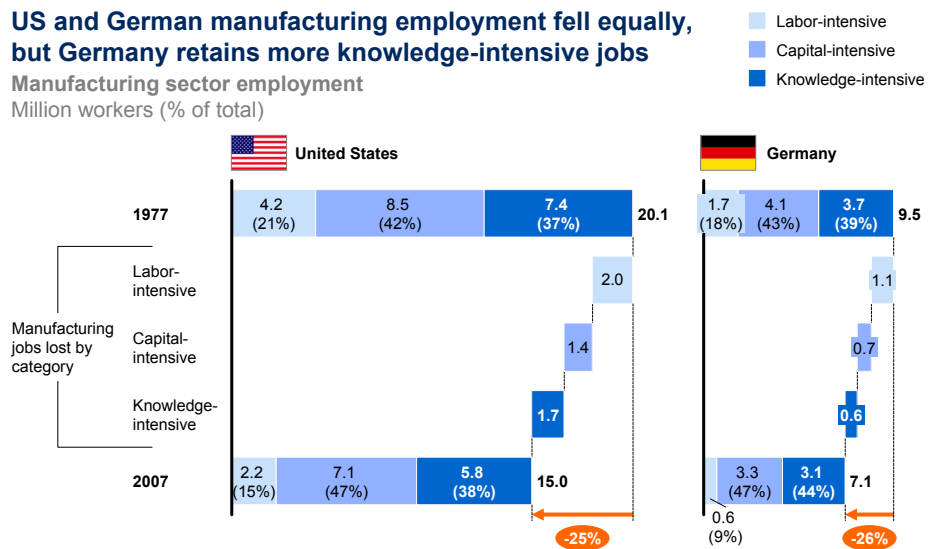
1 Does not include agriculture and mining sectors. Advanced economies are the United States, France, the United Kingdom, Canada, Ireland, Portugal, Italy, Spain, Greece, Germany, Japan, Austria, Belgium, Denmark, Finland, the Netherlands, and Sweden.
NOTE: Not to scale.
SOURCE: EU KLEMS (2009 release); McKinsey Global Institute analysis

19 *An economy that works: Job creation and America's future*, McKinsey Global Institute, June 2011 (www.mckinsey.com/mgi) describes the impact of the recession on jobs in these categories.

Exhibit 10

US and German manufacturing employment fell equally, but Germany retains more knowledge-intensive jobs

Manufacturing sector employment
Million workers (% of total)



1 Includes textiles, leather footwear, wood, wood products, cork, and recycling.
2 Includes food, beverages, tobacco, pulp, paper, printing, publishing, coke, refined petroleum, nuclear fuel, rubber, plastics, other non-metallic minerals, basic metals, and fabricated metals.
3 Includes chemicals, chemical products, machinery, electrical, optical equipment, and transport equipment.
NOTE: Numbers may not sum due to rounding.

SOURCE: EU KLEMS (2009 release); McKinsey Global Institute analysis

Job creation in advanced economies has been strongest in services such as food preparation, health care, and government, as well as in the professions and business management—roles that cannot be automated or easily moved. Within service sectors, however, the share of labor-intensive jobs has fallen significantly, while that of knowledge-intensive services has grown.

Technology, the quest for productivity, and the pressure of global competition all raised demand for skilled knowledge workers and reduced demand for low-skill workers, such as assemblers or machine operators. As a consequence, despite doubling tertiary educational attainment in the past 20 years, the supply of high-skill workers in advanced economies has not kept up with demand. Business leaders surveyed in Europe and the United States in the past two years have said they have been unable to fill open positions due to a lack of qualified candidates, and cite skill shortages among their main concerns.²⁰ While demand for workers without post-secondary training was essentially flat in the United States during the 2000–10 decade (a period of very weak job growth), demand for college graduates, continued to grow by about 1 percent annually. Today, unemployment rates for workers with only secondary school education are nearly twice those of college graduates, and hiring in skill-intensive sectors has recovered faster since the recession than in other sectors.

RISING INEQUALITY

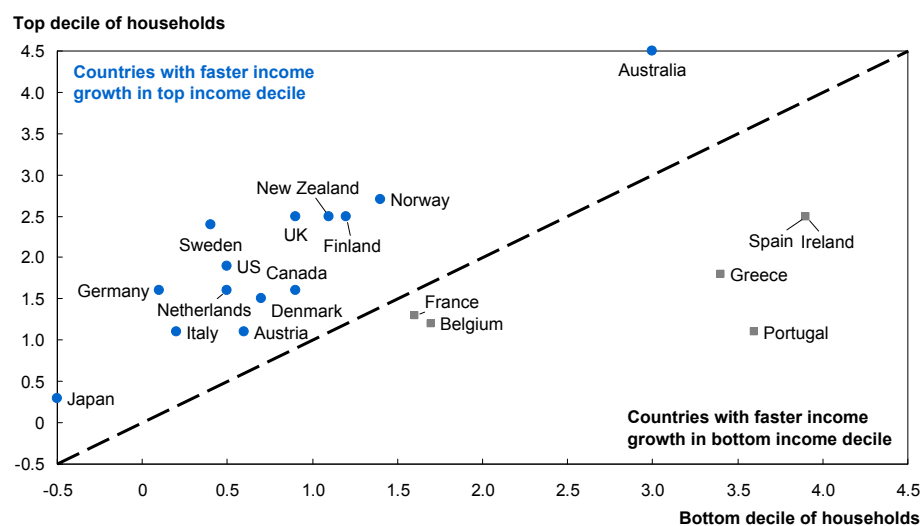
Not surprisingly, shifting demand has had an effect on compensation. Wages among less-skilled workers have stagnated or fallen in real terms. In all but a handful of advanced economies, the incomes of households in the top income decile have risen faster than incomes in bottom-decile households for 25 years (Exhibit 11). The growing polarization of household income is driven by many factors, including patterns in household formation; the rise of single-headed households, for example, is more concentrated in middle- and low-income earners. Not only are marriage rates higher among more highly educated, higher-income cohorts, but these people now marry more often within their income groups.²¹ Nonetheless, changing patterns in demand and supply in the labor market that determine long-term wage trajectories are the most powerful drivers of income polarization.

Exhibit 11

Incomes increased faster for rich households than for poor ones in many advanced economies over the past 25 years

Average annual change in real household income, mid-1980s to late 2000s

%



SOURCE: Organisation for Economic Co-Operation and Development (OECD); McKinsey Global Institute analysis

Declining position of labor and rising role of capital and knowledge

Today's concerns over income inequality need to be viewed in the context of a lengthy decline in labor's share of income (measured as the share of national income that goes to wages and compensation)²² across advanced economies. Labor's share of income had risen steadily through the 1950s and 1960s and peaked in 1975; since then labor's share of income in advanced economies has fallen below the 1950 level, declining 7 points from its peak of 65 percent in 1975

²¹ For a more detailed discussion of these phenomena, see *Growing income inequality in OECD countries: What drives it and how can policy tackle it?* Organisation for Economic Co-operation and Development, May 2011.

²² We calculate labor's share using real 2000 US dollars and excluding government transfers and capital receipts. Other transfers—contributions to social security and employer-paid benefits—are also not counted. These payments rose from 11.6 percent of US worker pay in 1980 to 22.5 percent in 2010. For more, see Alan B. Krueger, *Measuring labor's share*, NBER Working Paper No. 7006, 1999 and Paul Gomme and Peter Rupert, *Measuring labor's share of income*, Policy Research Papers, Federal Reserve Bank of Cleveland, 2004 for a detailed discussion on methodological issues and implications in calculating labor's share of income.

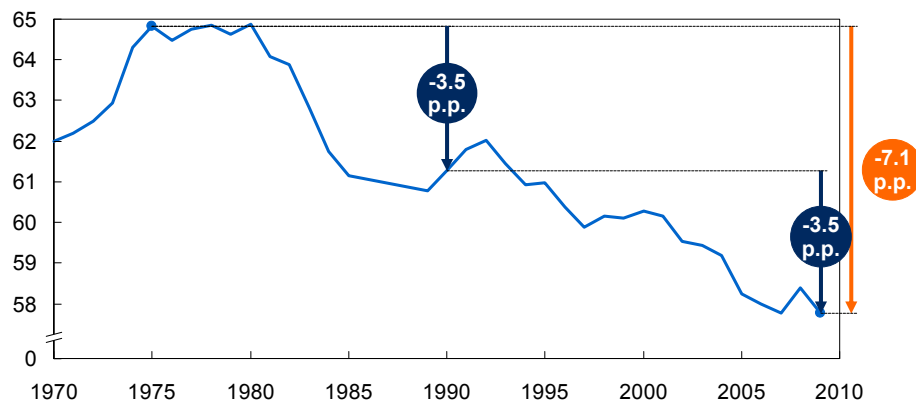
(Exhibit 12). In “Young advanced” economies, including the United States, the United Kingdom, and France, labor’s share of income fell to about 50 percent while in “Aging advanced” economies, where labor once received more than 70 percent of national income, labor’s share fell to around 60 percent. In the Southern Europe cluster, labor’s share of income declined from nearly 80 percent to about 65 percent.

Exhibit 12

Labor’s share of income across advanced economies has fallen steadily since its peak in 1975

Labor share of income in advanced economies¹

% of total



¹ Employee compensation as a share of gross national income calculated using real 2000 US dollars and excluding government transfers and capital receipts; advanced economies include the United States, the United Kingdom, France, Australia, the Netherlands, Japan, Sweden, Germany, Portugal, Italy, Greece, and Spain.

SOURCE: OECD; World Bank Development Indicators; EU KLEMS; Haver Analytics; McKinsey Global Institute analysis

This long decline reflects the shift from the days when low- and medium-skill labor were the critical drivers of economic growth in advanced economies to the more recent period in which capital goods and knowledge have taken on a much more important role. As companies adopted more automation and technology, production became more dependent on capital, and labor’s share of income fell.²³ The stock of capital relative to GDP rose from 2.1 times GDP in 1980 to 2.7 times in 2010 in the United States, the United Kingdom, Italy, Japan, and Germany. Corporate gross savings²⁴ of advanced economies rose from 10 percent of GDP in 1980 to 13.3 percent in 2008, and property’s share of national income (a proxy for earnings from capital) also rose.²⁵

²³ See Florence Jaumotte and Irina Tytell, *How has the globalization of labor affected the labor income share in advanced countries?* International Monetary Fund Working Paper, WP/07/298, 2007 for an assessment of how globalization and technological progress have influenced labor’s share of income in 18 advanced economies.

²⁴ Defined as retained earnings (or undistributed profits) and the depreciation. See *Farewell to cheap capital? The implications of long-term shifts in global investment and saving*, McKinsey Global Institute, December 2010 (www.mckinsey.com/mgi) for a detailed discussion on savings and investments by firms in advanced economies.

²⁵ Income received on financial or tangible assets, including interest, profits, and rent. Property income’s share of national income rose from 23 percent in 1975 to 38 percent in 2008 in the United States, Canada, and France.

Countries in the “Aging advanced” and “Young advanced” economies raised productivity by 1.2 to 1.6 percent annually from 1990 to 2010, by inventing new products, adopting more efficient business processes, and investing in machinery and technology. We estimate that tangible capital (as measured by levels of investment) made up 70 percent of productivity gains, and intellectual capital (as measured by higher education and spending on research and development) accounted for the remainder.²⁶ In the Southern Europe cluster, 80 percent of productivity improvement was attributable to investment in tangible capital. In the United States, investment in intangible assets, such as R&D and training, are estimated to account for more than 90 percent of labor productivity growth.²⁷

Stagnating wages and higher unemployment for low-skill labor

The corollary of rising dependence on knowledge and capital to drive growth in advanced economies has been the declining importance—and power—of low-skill labor. As a result, low-skill workers have seen a reversal of fortune in advanced economies over the past three decades. Rather than riding the tide of a growing global economy, they have suffered stagnating wages, job losses, and long periods of unemployment—while more highly educated citizens have seen rising incomes.

The role of capital grew the most—and productivity gains were the greatest—in labor-intensive manufacturing. As demand for production workers has fallen, their wage growth has trailed that of workers in both transaction and interaction jobs, despite lower productivity gains in these sectors. For example, in the United States, wage growth in production jobs, at 2.1 percent per year from 2000 to 2010, was slower than productivity growth in these jobs, which was 3.2 percent. In interaction occupations, which include public services such as education and government, measurable productivity gains have been much slower, yet wage growth has been the fastest. Interaction jobs grew 3.2 percent annually from 2000 to 2010, despite a decline in productivity at 0.1 percent per year for these jobs. From the 1960s to 2008, in the United States, real incomes rose at about 1.1 percent every year for workers with a college degree, while they declined marginally for workers who had not completed high school, and the multiple of wages of a worker with a college degree to wages of a worker without a high school degree rose from about 1.7 to 2.8.²⁸ (Exhibit 13). In most advanced economies, unemployment rates for the least-skilled workers are consistently two to four times those of the most highly skilled workers, whether the economy is in recession or recovery (Exhibit 14).

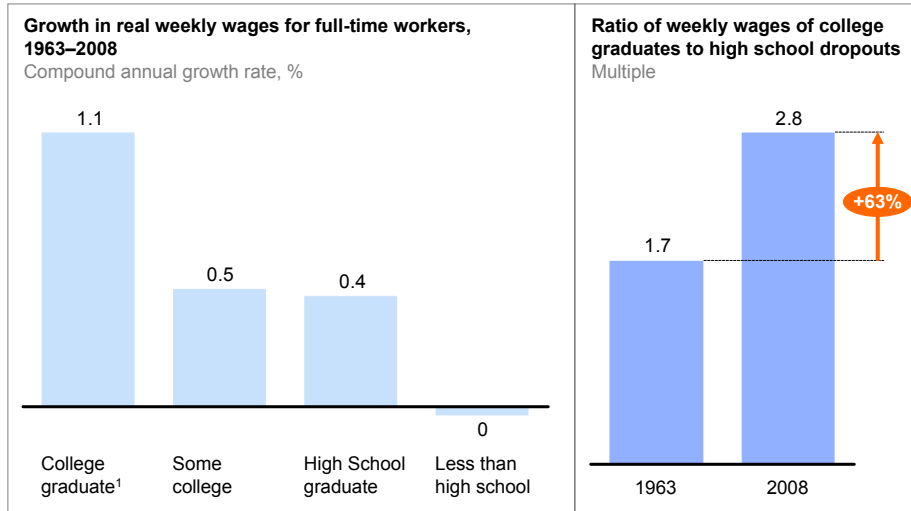
26 We estimate this using OLS regression of output per worker against growth in capital formation per worker, research and development expenditure per worker and tertiary educational attainment, for a sample of advanced economies from 1990 to 2010. We exclude product and process innovation from this analysis, which are important drivers of productivity, but are difficult to quantify at an aggregate level.

27 See Carol Corrado, Charles Hulten, and Daniel Sichel, “*Intangible capital and US economic growth*,” Review of Income and Wealth, series 55, No. 3, September 2009 for an estimate of the impact of intangible capital on growth.

28 See D. Acemoglu and D. Autor, *Skills, tasks and technologies: Implications for employment and earnings*, National Bureau of Economic Research (NBER) Working Paper No. 16082, June 2010. For additional discussion of how rising demand for high-skill workers has affected wage growth, see *Changing the fortunes of America’s workforce: A human-capital challenge*, McKinsey Global Institute and McKinsey Social Sector Office, June 2009 (www.mckinsey.com/mgi).

Exhibit 13

Wages for US workers with tertiary education have grown more than twice as fast as for others, creating a widening gap



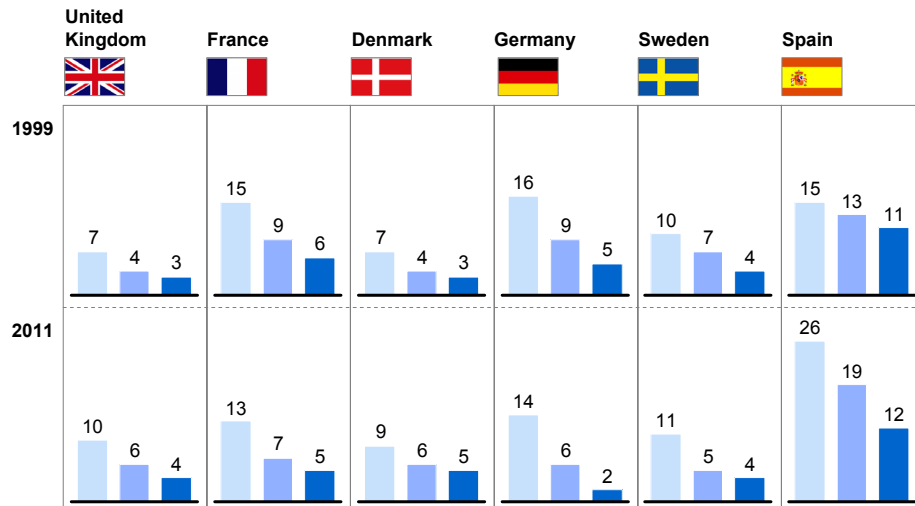
¹ Includes workers who have completed college or graduate school.
 SOURCE: CPS 2008; Daron Acemoglu and David Autor, *Skills, Tasks and Technologies: Implications for Employment and Earnings*, 2010; McKinsey Global Institute analysis

Exhibit 14

In advanced economies, unemployment for low-skill workers is 2-3 times higher than for high-skill workers

■ Less than upper secondary
 ■ Secondary
 ■ Tertiary

Unemployment rate, 25-64 years, by educational attainment
 % of labor force



SOURCE: Eurostat; OECD Education at a Glance 2011; McKinsey Global Institute analysis

Unskilled youth affected the most

As the demand of low-skill labor fell, historical rigidities (e.g., regulations barring layoffs or making them prohibitively expensive) also began to fall in some countries. Employers also achieved greater flexibility by hiring part-time and temporary workers. In “Aging advanced” economies, the share of workers in part-time jobs rose from 13 percent of the labor force in 1985 to 21 percent in 2010. In Southern Europe, the share of temporary and contract workers rose from 11 percent of total employment to 18 percent.

For many young workers, the only route to employment in the formal economy is through temporary work. This has made young workers much more likely to be laid off since in many countries, particularly in Europe, older, permanent workers are protected from layoffs.

Persistently high dropout rates have driven youth unemployment in advanced economies, too. In Spain, where youth unemployment has reached 50 percent during its financial crisis, early school leavers make up 28 percent of the 18- to 24-year-old population, compared with an average of 14 percent across the European Union. Young, unskilled workers have a much lower chance of securing full-time work in the formal economy and gaining valuable on-the-job training.

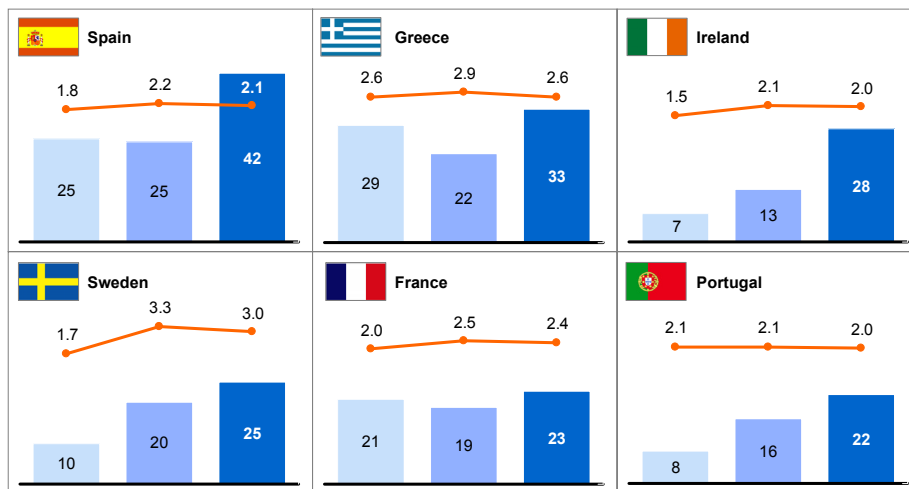
Youth unemployment has become a global issue: 75 million young people are currently unemployed globally, or 38 percent of the world’s unemployed workers.²⁹ In 2010, youth unemployment averaged 18 percent across advanced economies and around 21 percent in Europe (Exhibit 15).³⁰ Left unaddressed, the youth unemployment problem could leave many advanced economies with a “lost generation” of workers.

Exhibit 15

Unemployment for European youth is often more than twice the level of adult workers

Youth unemployment rates, select EU countries¹
Unemployed 15- to 24-year-olds as % of labor force

Ratio of youth to adult unemployment rate
Youth unemployment rate
2000 2008 2010



¹ 2010 rates in Spain, Greece, Ireland, Sweden, France and Portugal exceed the EU average rate (20.8 percent).
SOURCE: ILO Global Employment Trends for Youth, August 2010; Eurostat; McKinsey Global Institute analysis

²⁹ International Labor Organization, *Global employment trends for youth*, October 2012.

³⁰ *Unemployment Statistics*, Eurostat.

Young workers are only one cohort of the growing pools of workers facing protracted periods of unemployment. With long-term unemployment reaching new records in the recovery from the “Great Recession,” a growing number of workers are losing skills and facing diminishing odds of ever finding work. In the United States, for example, median duration of unemployment passed 21 weeks in 2010, the longest median period of joblessness in 30 years. In 2010, the share of idle workers classified as long-term unemployed (out of work for 27 weeks or more) was three and a half times as high as in the 2000–01 recession. The long-term unemployed are most likely to become discouraged and permanently exit the labor force; 20 to 25 percent of workers who are unemployed for more than 27 weeks stop looking for a job. These workers know that the longer they are out of work, the lower the probability of re-employment (Exhibit 16). The odds against a worker who has been idle for 27 weeks finding a job within a year are three times those against a worker who has been out of work for only five weeks.³¹

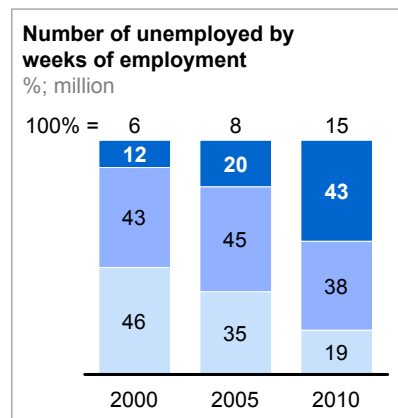
Exhibit 16

Long-term US unemployment is becoming more widespread, putting more workers at risk of not finding a new job

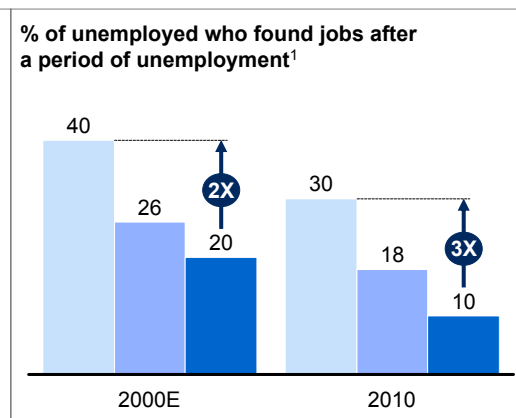


■ < 5 weeks ■ 5 to 26 weeks ■ > 27 weeks

Long-term unemployment has become more common ...



... and the chances of finding a job are growing dimmer for the long-term unemployed



¹ Based on the share of unemployed who get back into the labor force within the year.
NOTE: Numbers may not sum due to rounding.
SOURCE: US Bureau of Labor Statistics



The last 30 years were a period of remarkable growth and progress for developing economies and their workers. Advanced economies benefited from new technologies that raised productivity and from access to diverse labor pools around the world. In the next chapter, we will see how the quest for productivity is becoming global and the contest for high-skill talent will become more intense—and why even today’s developing economies will face challenges to employ low-skill workers.

2. Labor supply and demand, 2010–30

In the coming decades, the dynamics driving the global labor market will evolve. The most significant change will be slower growth of labor forces around the world. The sharpest declines are likely in the aging economies—which now will include China. As China’s labor force growth slows—by about half—India and the “Young developing” economies of South Asia and Africa will become the biggest sources of labor force growth in the coming decades. But China, along with India, will likely be the world’s largest source of college-trained workers.

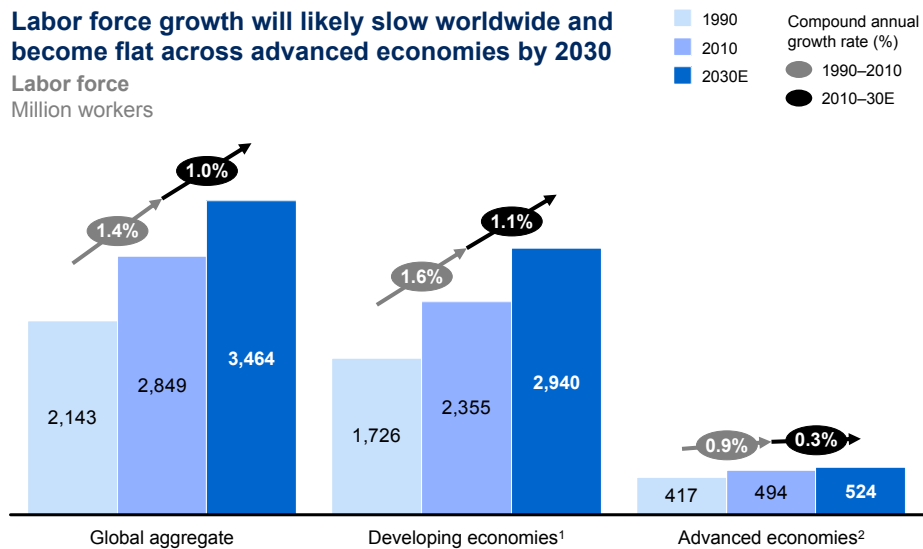
The first effect of aging and slower labor force growth will be a heightened need to raise productivity to sustain GDP growth. China, with its demographic dividend falling and incomes rising, would need to keep climbing the industrial value chain and accelerate productivity growth. As a result, its labor needs will more closely mirror those of advanced economies, with a similar emphasis on high-skill work. The demand for skilled workers will continue to grow far faster than supply, and the competition for talent will intensify and become increasingly global.

A SLOWER-GROWING GLOBAL LABOR FORCE

We project that the growth rate of the global labor force will fall by nearly a third, from 1.4 percent annually in the 1990–2010 period to 1.0 percent through 2030 (Exhibit 17). That would create 615 million net new additions to the global labor force, bringing the total number of workers to 3.5 billion in 2030, up from 2.9 billion in 2010 (see Box 2, “Overview of labor supply estimation”). Growth would decelerate during the two decades. In the 2010–20 decade, we project 331 million net additions (down from 368 million in the 2000–10 period), dropping to 284 million net additions in the second decade, when aging will place an even greater drag on global labor force growth.

Exhibit 17**Labor force growth will likely slow worldwide and become flat across advanced economies by 2030**

Labor force
Million workers



1 Includes 45 countries from the Young Middle-Income, China, India, Young Developing, and Russia & CEE clusters.

2 Includes 25 countries from the Young Advanced, Aging Advanced, and Southern Europe clusters.

SOURCE: United Nations Population Division (2010 revision); ILO; local statistics for China and India; McKinsey Global Institute analysis

Box 2. Overview of labor supply estimation

To estimate future labor supply, we build a model that projects labor force growth in six age and gender cohorts for each country.¹ To estimate cohort-level labor force, we use population projections from the United Nations and data from national sources (e.g., China National Bureau of Statistics, India Census, and India's National Sample Survey Organisation) and then apply our estimates of labor force participation rates. These estimates of labor force participation rates are based on a comprehensive set of variables such as GDP per capita, projected educational attainment levels, share of the population over 55 years, women's fertility rate, average marriage age, and other variables. These estimates are checked against aggregate projections available from sources such as Global Insight, Oxford Economics, and the Economist Intelligence Unit. In order to estimate the educational mix of the projected labor force, we use a combination of available estimates of population-level educational attainment (e.g., World Bank, International Institute for Applied Systems Analysis, China National Bureau of Statistics, and India's Ministry of Human Resources Development) with some adjustments for China and India, based on enrollment and completion rates.

For more details on our methodology, see the appendix.

1 We use this approach since most other estimates are either less granular or have a shorter-term horizon than the focus of this report.

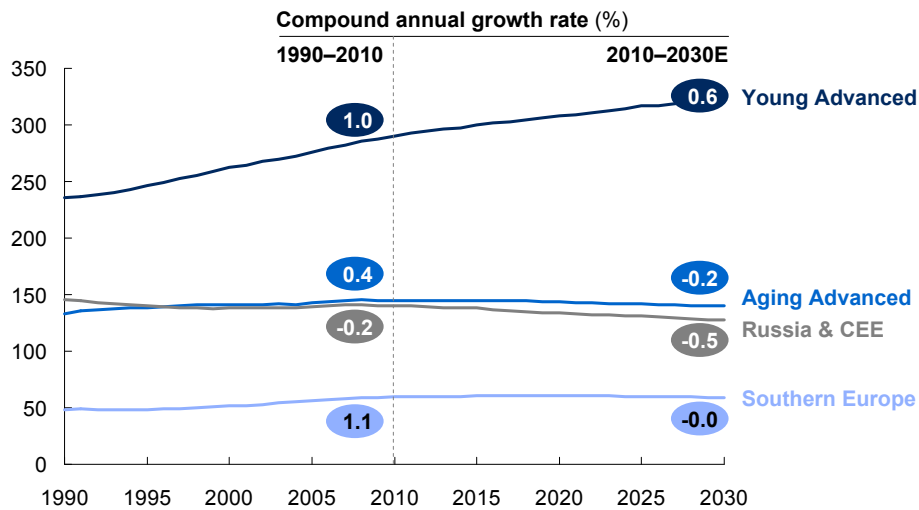
In advanced economies, we expect labor force growth to drop from 0.9 percent annually, the average from 1990 to 2010, to just 0.3 percent from 2010 to 2030. In total, advanced economies are projected to make only 30 million net additions to their labor forces by 2030. “Young advanced” economies (the United States, the United Kingdom, Canada, for example) will still grow their labor forces—by about 0.6 percent a year, down from 1.0 percent in the past—but labor forces in most “Aging advanced” economies will likely shrink (Exhibit 18). Assuming no significant changes in immigration policies in those nations, we project that labor supply will contract at 0.2 percent each year.³² The Japanese labor force is projected to shrink by 0.5 percent a year through 2030.

In the Southern Europe cluster, labor supply is projected to be virtually flat. In the Russia and Central and Eastern Europe cluster, which also has aging populations, we project that labor forces could shrink by 0.5 percent annually.

Exhibit 18

Labor force growth will slow in almost all advanced economies and, in some clusters, labor forces are likely to shrink

Labor force
Million workers



SOURCE: United Nations Population Division (2010 revision); ILO; McKinsey Global Institute analysis

In China, labor force growth is likely to slow by half, from the current 0.9 percent a year to about 0.5 percent through 2030. In our momentum case, the Chinese labor force will reach 861 million in 2030, with a net increase of about 79 million, compared with its growth of 126 million from 1990 to 2010. Growth will likely decelerate sharply in the decade from 2020 to 2030: to just 21 million from 58 million in the 2010–20 period, reflecting the effects of aging and declining birth rates.

China is also likely to see a decline in its overall labor force participation rate due to aging. At 70 percent, China had among the world’s highest participation rates in 2010. We project that figure will drop marginally to 67 percent by 2030 (Exhibit 19), when the number of Chinese aged 55 years and older will likely reach 43 percent of the population—up from 26 percent now (Exhibit 20). Even

³² For a related discussion of Germany’s labor force growth rates, see *Perspektive 2025—Fachkräfte für Deutschland* (Perspective 2025—Experts in Germany), Federal Employment Agency, Nuremberg, January 2011.

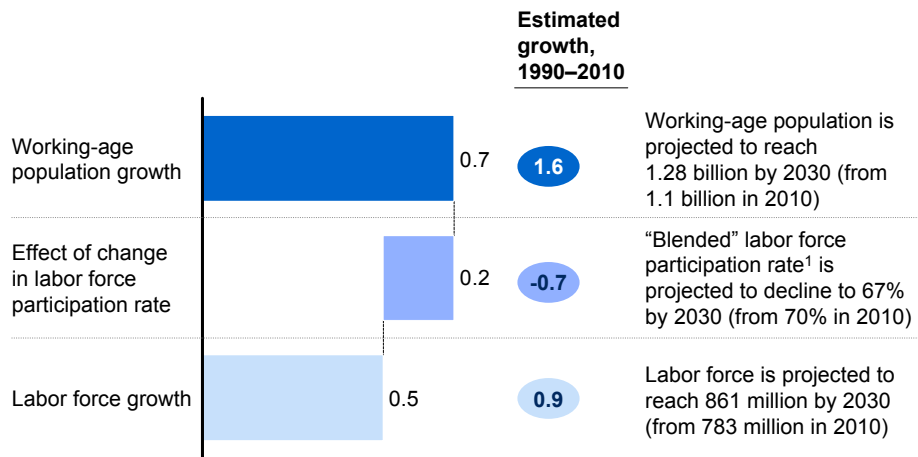
though we project that participation rates among older workers will rise—from 41 percent to 50 percent—it will not be sufficient to maintain labor force growth at historical levels beyond 2020.³³ And unlike some advanced economies, China has limited opportunity to raise female labor participation: at 82 percent, the labor participation rate of prime working-age Chinese women is not far from the highest in the world (85 to 87 percent in Nordic countries).

Exhibit 19

Labor force growth in China will likely decelerate due to slower growth in working-age population



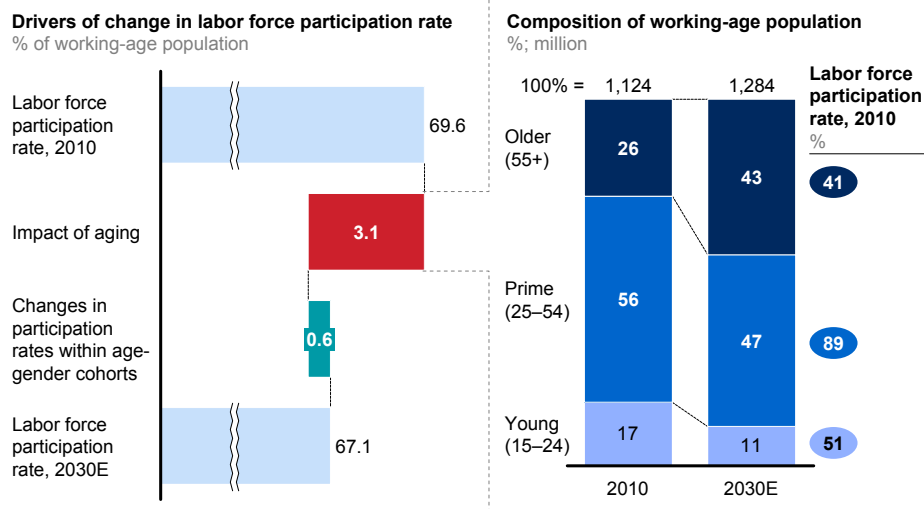
Decomposition of labor force growth by drivers, 2010–30E
Compound annual growth rate, %



¹ Weighted average of cohort-level participation rates for male and female young, prime working-age, and older workers.
SOURCE: China National Bureau of Statistics; United Nations Population Division (2010 revision); McKinsey Global Institute analysis

Exhibit 20

Aging will be the major driver of a projected decline in China’s labor force participation rate in the next two decades



NOTE: Numbers may not sum due to rounding.
SOURCE: China National Bureau of Statistics; United Nations Population Division (2010 revision); McKinsey Global Institute analysis

³³ See John Giles, Dewen Wang, and Wei Cai, *The labor supply and retirement behavior of China’s older workers and elderly in comparative perspective*, World Bank, Policy Research Working Paper No. 5853, October 2011.

DEVELOPING ECONOMIES WILL BECOME THE DOMINANT SOURCE OF BOTH HIGH- AND LOW-SKILL LABOR

With the number of workers entering labor markets slowing in advanced economies and in the next 20 years China, India, and nations in the “Young developing” cluster will become the biggest contributors to the global labor pool. India’s total labor force will continue to grow relatively quickly—at about 1.5 percent annually—with about 174 million net additions by 2030. We project the total labor force will reach 550 million by 2020 and 640 million in 2030. During this period, India’s working-age population is projected to grow about 1.5 percent annually, while its population will also begin to age—but far less dramatically than in China or in advanced economies. Overall, the number of Indians who fall into the prime working-age group (25 to 54 years) will hold steady at about 69 percent of the population.

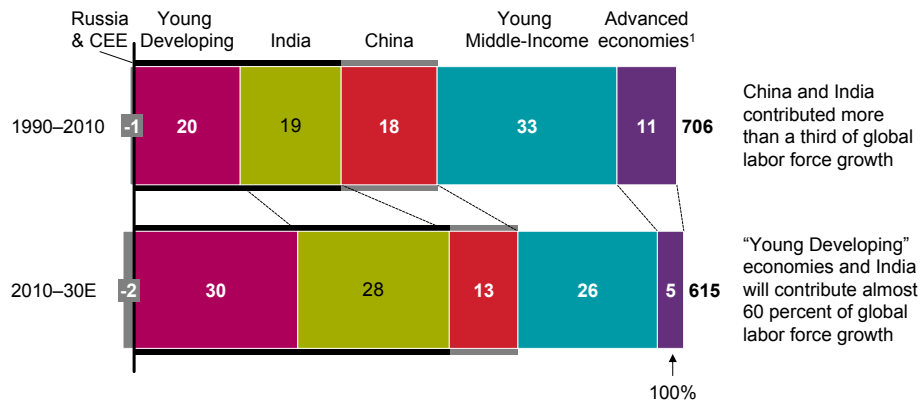
India’s relatively low labor force participation rate of 56 percent is not expected to rise significantly. More young Indians will stay in school, reflecting the trend toward rising educational attainment. Furthermore, India’s low female labor participation rate (about 38 percent today) is not likely to rise, because a growing number of households are expected to move out of subsistence, allowing more low-skill women to opt out of the labor force. High-skill women, on the other hand, will see rising participation rates, but their numbers will remain small compared to those of their low-skill counterparts.³⁴

The “Young developing” economies of South Asia and Africa (such as Bangladesh, Pakistan, Nigeria, and Kenya) will have the fastest-growing labor forces, growing at about 2.3 percent annually. That will add 187 million workers to the global labor market in the next two decades. Together with India, these nations will contribute about 360 million of the net new workers in the global labor force in the next 20 years, or about 60 percent of the growth. China’s contribution to net labor force growth will decline from 18 percent of the total to 10 percent (Exhibit 21).

³⁴ See Wendy Olsen and Smita Mehta, *A pluralist account of labor participation in India*, Global Poverty Research Group, Working Paper No. GPRG-WPS-042, May 2006 for a detailed account of the dynamics of female labor force participation in India.

Exhibit 21**China's contribution to global labor force growth will drop; India and "Young Developing" economies will lead labor force growth through 2030**

Net new additions to labor force
%; million workers



¹ Includes Young Advanced, Aging Advanced and Southern Europe clusters.

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations population division (2010 revision); ILO; Global Insight; Oxford Economics; Economist; local statistics for China and India; McKinsey Global Institute analysis

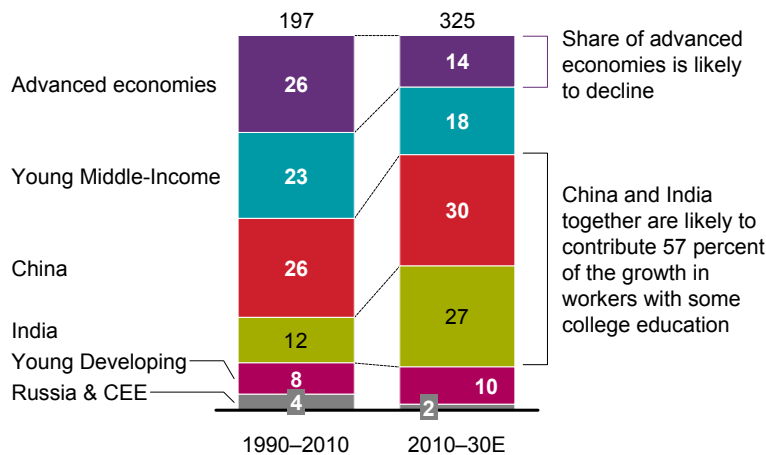
While China will be eclipsed as the world's leading source of low-cost labor, it will assume a new and potentially more important role as the largest supplier of college-educated workers to the global labor force. China's demographic dividend will likely be replaced by a "skill dividend," as the number of workers with college education in the labor force is projected to rise by 96 million in the next two decades, up from 52 million net additions of graduates in the last two decades. This would raise the proportion of young workers with tertiary education to 33 percent—about the projected average for advanced economies.

At its current rate of growth in college completion, India would be close behind. India is on track to raise the number of college-educated workers in its labor force by 88 million in the next two decades, up from 24 million added in the last two. Between them, China and India are on track to raise the world supply of college educated workers by 184 million, and 57 percent of all additional workers with some college education in 2030 are likely to come from those two nations (Exhibit 22). India and China will also be dominant suppliers of STEM graduates; based on current trends they will provide two-thirds of the increase in science and engineering graduates globally through 2030.

Exhibit 22

China and India are likely to contribute more than half of the world's supply of new workers with a college education through 2030

Net labor force additions with college education
%; million workers



1 Includes Young Advanced, Aging Advanced and Southern Europe clusters.
NOTE: Numbers may not sum due to rounding.
SOURCE: United Nations Population Division (2010 revision); ILO; IIASA; local statistics for China and India; McKinsey Global Institute analysis

However, sheer numbers will not guarantee India and China advantages in the contest for high-skill talent. There are still concerns about how well some institutions in those countries prepare students for high-skill work.³⁵ Employers and educators in both economies will need to ensure the quality of college education improves as these economies raise enrollment rates.

In advanced economies, at the current rates of growth in population and college enrollment and completion rates, the net increase of workers with tertiary education in the labor force is likely to decline. Even though the average college graduation rate across advanced economies is projected to rise from 24 percent to 31 percent by 2030, net additions of college-educated workers to the labor force are likely to fall from 51 million in the past two decades to 45 million through 2030. This drop reflects slower population growth and the likely loss of 12 million college-educated workers in advanced economies through retirement in the next 20 years.

At the opposite end of the labor market, there will be a persistently large number of low-skill workers. In 2030, the world will still have more than one billion workers without even secondary education, although this will represent a drop, to 30 percent of total labor force, from 40 percent in 2010. India will likely contribute more than one-third of these unskilled workers; a quarter will come from sub-Saharan Africa and other parts of South Asia, and China will contribute 15 percent.

35 China and India both need to improve the employability of their college graduates. See *American business in China* White Paper, May 2010, April 2011, and April 2012 issues by the American Chamber of Commerce in the People's Republic of China; and Hiroshi Saeki and Andreas Blom, *Employability and skill set of newly graduated engineers in India*, World Bank, Policy Research Working Paper, No. 5643, April 2011, for a detailed discussion on the employability of graduates in China and India.

THE IMPACT OF AGING

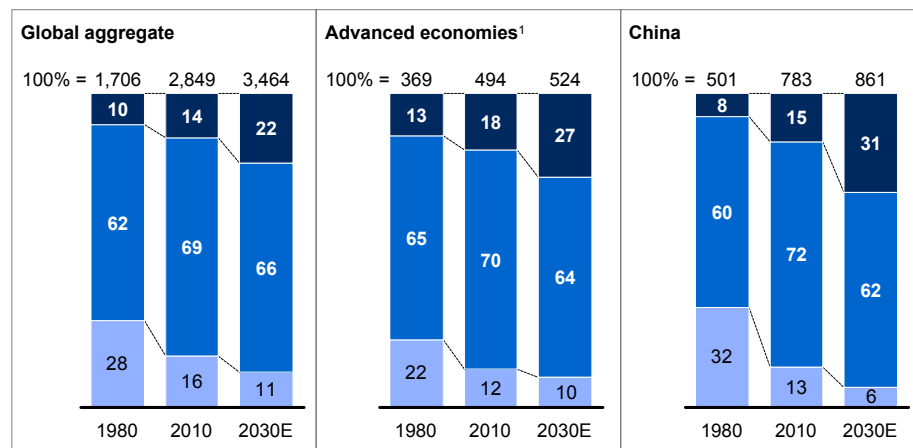
Aging, which has a strong influence on both the number and type of workers in the global labor force, will become an even more powerful factor in the next two decades. Since 1980, the share of older workers (those aged 55 and above) in the labor forces of advanced economies has risen gradually—from 13 percent of the labor force to 18 percent, or about 1.5 times over 30 years. It will take only 20 years for the proportion of older workers to grow by another 1.5 times: our momentum case projects that by 2030, 27 percent of the labor force of advanced economies will be 55 years of age or older. In the most rapidly aging economies, such as Japan and Germany, the ratio will exceed 30 percent. The proportion of workers aged 55 and over will grow even more rapidly in China—doubling over the next two decades to 31 percent of the workforce (Exhibit 23).

Exhibit 23

The share of older workers in the labor force is on course to more than double by 2030

Labor force by age
%; million workers

■ Older (55+)
■ Prime (25–54)
■ Young (15–24)



¹ Includes 25 countries from the Young Advanced, Aging Advanced, and Southern Europe clusters.

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations population division (2010 revision); ILO; local statistics for China and India; McKinsey Global Institute analysis

Even as the ratio of older workers grows, so too will the number of retirees in the world. Globally, the number of retirees³⁶ could swell by approximately 360 million over the next two decades—reflecting a growth rate of 2.3 percent per year, compared with the approximately 1 percent annual growth rate of the global labor force (Exhibit 24). This swelling population of retirees will affect labor markets and economies in several ways. Over the next 20 years, retirement could remove some 38 million college-educated workers from the global work force, thus exacerbating the growing skill shortage. While those workers might be induced to remain in the workforce and help employers fill skill gaps, more than 70 percent of workers approaching retirement are not high-skill. Their retirements will raise dependency ratios (the number of retirees per employed worker) and place escalating demands on social and health services.

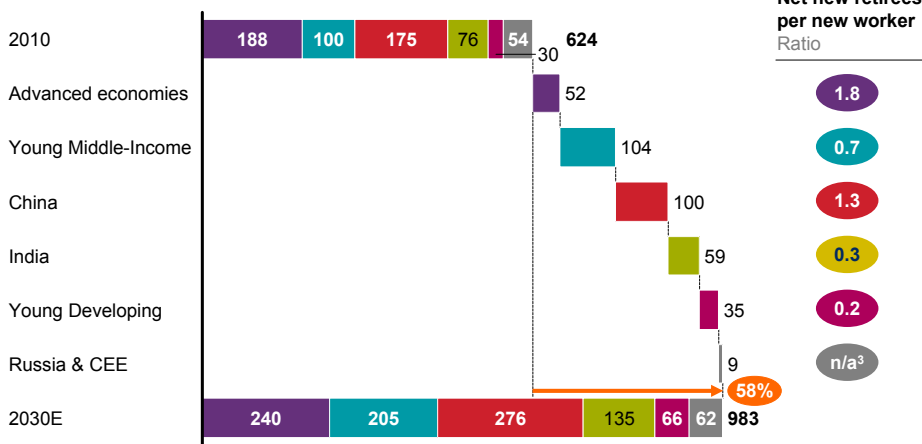
³⁶ Defined as the number of workers between 55 and 70 years old who are likely not to be in the labor force in 2030. We estimate labor force participation rates for this age cohort using MGI's labor supply model. See Box 2 and the appendix for details on estimation methodology.

Exhibit 24

360 million older workers are likely to exit the global labor force by 2030, creating challenging “dependency” ratios

Growth in worldwide pool of retirees¹

Million workers



1 Workers between 55 and 70 years old, who are likely not to be in the labor force in 2030.

2 Includes Young Advanced, Aging Advanced and Southern Europe clusters.

3 Not calculable due to projected net decrease in labor force over 2010 and 2030.

SOURCE: United Nations Population Division; ILO; Global Insight; Oxford Economics; Economist Intelligence Unit; McKinsey Global Institute analysis

The economic impact of aging will be significant in advanced economies. We estimate that “Aging advanced” economies such as Germany and the Netherlands will have to raise annual productivity growth rates by at least a third, to about 1.6 percent annually, to sustain historical growth rates of GDP per capita with smaller labor forces. The Southern Europe cluster will face an even steeper challenge: these economies would need to raise productivity growth to 1.4 percent a year, double the 0.7 percent rate of the past 20 years. “Young advanced” economies will need to sustain their historical productivity growth rate of 1.6 percent annually (Exhibit 25).

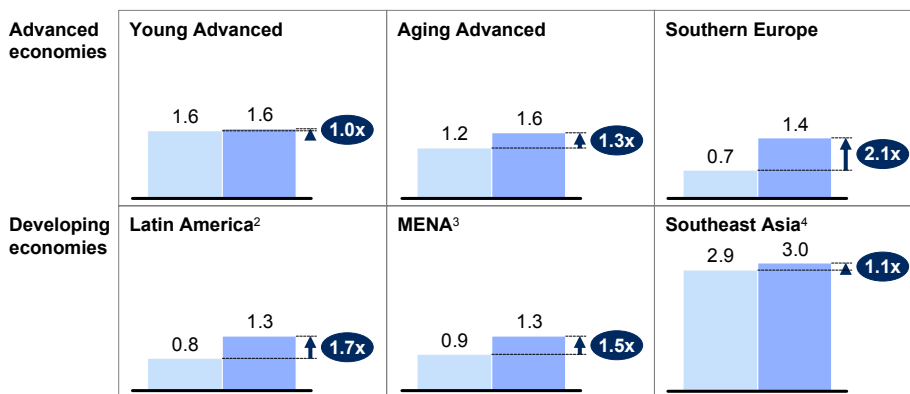
Exhibit 25

Absent higher participation rates, labor productivity will need to accelerate to sustain GDP per capita growth

Labor productivity compound annual growth rate

%

Historical (1990–2010)
Required (2010–30E) to maintain historical growth in GDP per capita¹



1 At 2010 labor force participation rates.

2 Includes Brazil, Mexico, Argentina, Colombia, Venezuela, Peru, Chile and Nicaragua.

3 Includes Algeria, Egypt, Jordan, Iran, Saudi Arabia, United Arab Emirates from MENA and select other economies from the cluster (e.g., Turkey, Kazakhstan, South Africa, Botswana).

4 Includes Indonesia, Malaysia, Thailand, Vietnam from Southeast Asia and select other economies from the cluster (e.g., Sri Lanka).

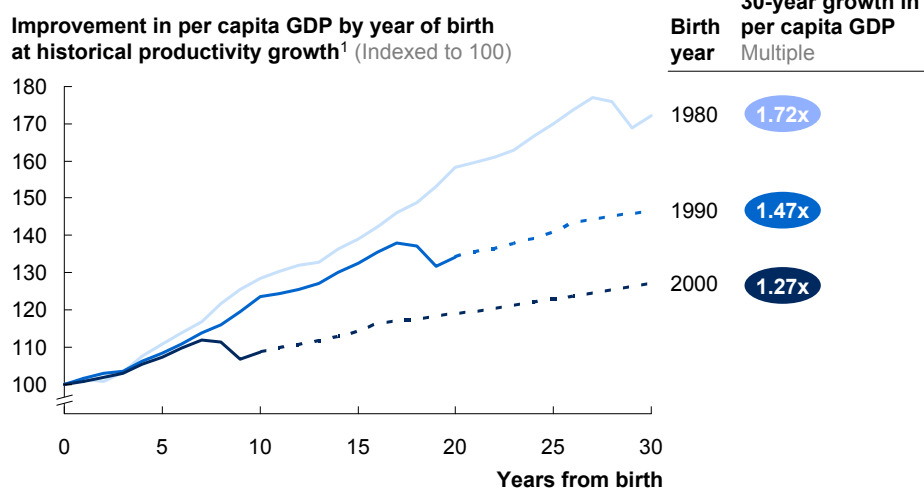
SOURCE: UN Population Division (2010 revision); ILO; McKinsey Global Institute analysis

China is not the only developing economy that will be affected by the aging trend. Even in Latin America, where the working age population is relatively young (median ages ranged from 26 to 30 in 2010), aging will slow labor force growth. We project that growth of the working-age populations in Latin American countries will drop from 2.1 percent per year to 1.3 percent, raising pressure to accelerate productivity growth in those economies, too.

Without compensating increases in productivity—or a surge in labor force participation rates—the ultimate effect of aging on slow-growing advanced economies would be a deceleration in per capita GDP growth. This would set up the possibility that upcoming generations could grow up with a lower rate of improvement in living standards than their parents (Exhibit 26)—and in some cases, such as in the Southern Europe cluster, the next generation could be poorer than their parents.

Exhibit 26

Maintaining historical productivity growth at current participation rates would curb GDP per capita growth for younger generations in advanced economies



¹ Future labor productivity growth rate assumed to be equal to the labor productivity growth rate from 2000 to 2010; labor force participation rates of 2010 assumed to remain constant.

SOURCE: UN Population Division (2010 revision); ILO; McKinsey Global Institute analysis

The productivity imperative would be even higher if advanced economies wish to maintain their historical growth in GDP, rather than GDP per capita. For example, “Aging advanced” economies would need to improve their productivity growth rates by about 60 percent, to about 1.9 percent annually, to sustain their historical GDP growth rate. Similarly, Latin American countries would need to accelerate productivity growth to 2.5 times historical growth levels to maintain GDP growth at past rates.

Productivity growth alone, then, is unlikely, to sustain GDP growth at historical rates in aging economies. Nations such as Germany and the Netherlands also will need to raise the labor force participation rates of older workers, from around 26 percent now to about 40 percent, about the level in Japan. On the other hand, Japan will need to increase the participation rate of prime working-age women from about 71 percent now to about 85 percent, near the top rates in the world. In the Southern Europe cluster, older worker participation rates would have to increase from the current 19 percent to about 30 percent, and the participation

rate of prime working-age women would need to rise from 71 percent to about 80 percent. South Korea is also likely to face a productivity challenge. To maintain GDP per capita growth over the next two decades, its productivity would need to rise at 1.25 times the historical rate, to compensate for flat labor force growth. Korea has opportunities to add to the labor force by raising participation rates of women and older workers, which could reduce the productivity imperative to a 1.08 multiple of current productivity growth.

A GROWING GLOBAL NEED FOR HIGH-SKILL TALENT

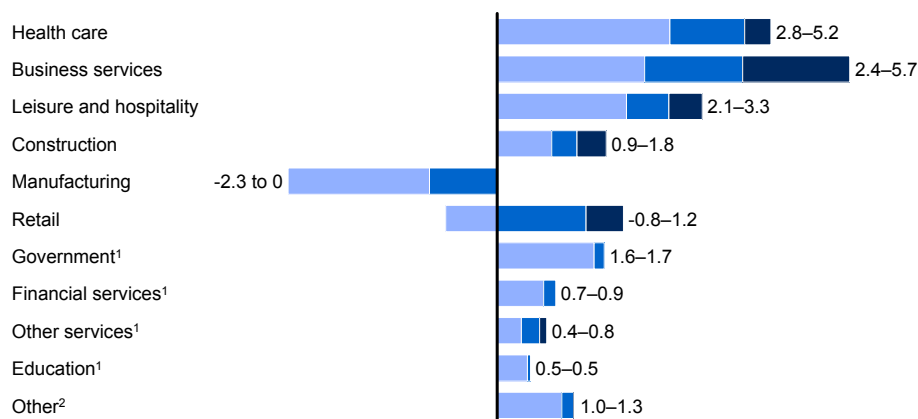
As population growth slows and the quest for productivity intensifies in advanced and developing economies, the need for high-skill talent will become even greater. Even now, MGI's work on the US jobs market³⁷ projects that job growth will be fastest in services, such as health care and business services (Exhibit 27). These are knowledge-intensive fields that require high-skill workers: 71 percent of employees in the health care sector have more than a high school education. Business services are projected to be the second-largest source of demand for labor in the service sector. In business services the share of high-skill jobs (in fields such as professional, scientific, and technical services) will rise, while the share of medium-skill jobs (in administrative and support services) will fall.

By 2020, we estimate that US employers will require college-educated workers for 36 percent of all jobs in 2020, up sharply from today's 24 percent. Similarly, MGI's research on the French labor market indicates that jobs requiring high-skill workers will grow by about 3.4 percent annually through 2020, more than three times the 0.9 percent rate of the overall job market. Based on the US and French examples, we project that similar patterns of demand for high-skill labor will be evident across advanced economies (see Box 3, "Overview of labor demand estimation").

Exhibit 27

Likely job growth in the United States is concentrated in services

Projected job creation to 2020
Million



¹ Job growth for the first six sectors listed comes from MGI job growth scenarios. For all other sectors, job growth is taken from Moody's Analytics.

² Other includes mining, utilities, wholesale trade, transportation and warehousing, information, self-employed, and agriculture.

SOURCE: McKinsey Global Institute, *An economy that works: Job creation and America's future*, June 2011

³⁷ *An economy that works: Job creation and America's future*, McKinsey Global Institute, June 2011 (www.mckinsey.com/mgi).

Box 3. Overview of labor demand estimation

To estimate the labor demand projections used in this report, we use a combination of bottom-up and top-down methods. For the United States, France, China, and India, we develop bottom-up sector-level perspectives of aggregate employment demand and skill composition. For all other economies, we estimate aggregate labor demand and skill composition based on a top-down methodology. For the United States and France, our bottom-up estimates come from other MGI work, where future demand for labor was estimated in each sector based on projected growth rates of GDP and productivity.¹ Current skill mixes were applied to these demand estimates, along with an adjustment based on historical rates of increase in skill requirement.

For China and India, we build sector-level perspectives on output growth, derived from national GDP forecasts from various economic forecasters.² We estimate productivity growth for three sectors in both China and India that represent more than 60 percent of aggregate employment (i.e., agriculture, manufacturing, and construction), based on historical drivers of productivity in each sector, such as the capital intensity of each sector, the share of organized enterprises in manufacturing, and the share of residential construction in total construction spending. For other sectors, productivity's share of GDP is assumed to evolve similarly to historical patterns for comparable countries. We estimate the educational composition of labor demand for these sectors using the relationship between the skill content of labor demand and productivity drivers, such as capital per worker, and by comparing estimated skill content for China and India in 2020 with that of comparable countries at different points in time.

We then use the bottom-up work for these four countries to estimate labor demand and skill composition for other countries in two steps. First, we estimate aggregate demand levels. In advanced economies (other than the United States and France), we use GDP growth estimates from Global Insight, the Economist Intelligence Unit, and Oxford Economics, and a range of +/- 5 percent of historical productivity for each country. For the "Young developing" economies, we do not project labor demand, but rather use "target" levels of non-farm job growth based on expected labor supply. Second, we estimate the future skill composition of jobs in advanced economies based on the estimated trend in the United States and France, and in the "Young developing" economies based on India's current skill content of farm and non-farm jobs.

For a more detailed description of our methodology, see the appendix.

1 For a more detailed discussion of the methodology used for the United States and France, see McKinsey Global Institute, *An economy that works: Job creation and America's future*, June 2011, and McKinsey Global Institute, *French employment 2020: Five priorities for action*, May 2012 (www.mckinsey.com/mgi).

2 See the appendix for a more detailed discussion of this methodology.

Demand for high-skill workers is likely to rise rapidly in both China and India, but these economies will diverge in their needs for medium-skill workers (with secondary education). India will need many more such workers as its labor-intensive industries expand, while Chinese industry will no longer need to add so many workers of this skill level, reflecting a shift to higher value-added activities.

We project China's labor demand using a GDP growth rate estimate of 6.9 percent annually, based on consensus forecasts through 2030 (down from the 10.6 percent annually in the past two decades) and a productivity growth rate of 6.5 percent annually. This productivity growth rate is 1.3 points higher than can be expected from historical sources (e.g., transitions from agriculture, investments in capital, and expansion of higher education). To achieve the extra productivity growth, China's businesses will be compelled to accelerate their drive up the manufacturing value chain, through greater use of automation and technology, process efficiencies, organizational improvements, and investment in research and development.

As it climbs the value chain, China's manufacturing sector would likely replace low-wage, labor-intensive jobs with machines and increase the share of high-skill workers the sector employs.³⁸ We project that the share of college-educated workers in the manufacturing sector would double from 10 percent in 2010 to more than 20 percent in 2030. Overall, we project that as China moves toward wealthy nation status, it will experience a sharp drop in the growth of manufacturing employment—adding just 18 million to 20 million jobs in the next two decades, down from 33 million jobs added in the past decade alone.

As hiring slows in Chinese factories and employment shrinks in Chinese farms, job creation in services will accelerate (Exhibit 28).³⁹ Service sectors are projected to grow from 49 percent of GDP currently to 54 percent by 2030, contributing 56 percent of the incremental value added by 2030. Service sectors that are moderately and highly skill intensive (i.e., excluding construction) are projected to add 64 million jobs in the next decade, accounting for two-thirds of total non-farm job growth. As a result of all these trends, China will create more knowledge-intensive jobs, both in tradable sectors such as biotech, high-tech manufacturing, and R&D services, and in domestic services such as health, education, finance, and business services.

India's evolving economic model will also shape its labor demand. Based on consensus forecasts, we use a GDP growth rate of 7.4 percent per year to 2030 (compared with 6.6 from 1990 to 2010), and annual productivity growth of 5.9 percent, up from 5.0 percent in the past two decades. This implies that India will move workers out of agriculture at a faster rate and will create 160 million new jobs in manufacturing and services. Services are projected to contribute 73 percent of the incremental value in the Indian economy and 79 percent of the net new non-farm jobs in the next decade. Retail and wholesale trade, and skill-intensive service sectors such as finance, real estate, health, and social services, are projected to generate 28 million jobs in the next decade, up from 20 million in the past decade. India is also likely to add 15 million jobs in manufacturing in the

38 *Trading myths: Addressing misconceptions about trade, jobs, and competitiveness*, McKinsey Global Institute, May 2012 (www.mckinsey.com/mgi) finds that a majority of jobs created in the manufacturing sectors of advanced economies will be high-skill services roles themselves.

39 Services sectors include construction; transport; post and telecom; wholesale and retail trade; banking, finance, and real estate; health and social services; education and government.

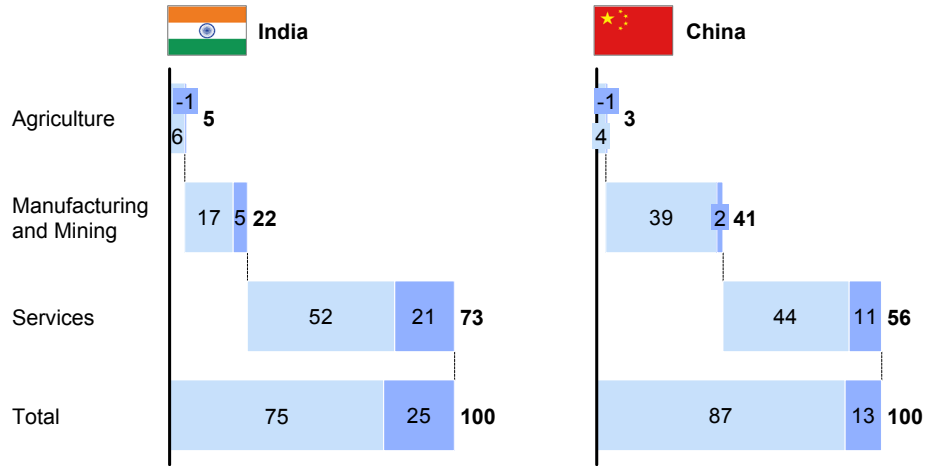
next decade, nearly double the eight million it created in the past decade. With these levels of manufacturing and service sector job growth, the share of low-skill jobs is likely to decline from 74 percent of employment in 2010 to 62 percent by 2020.

Exhibit 28

Fast-growing service sectors will drive employment growth in India and China

Breakdown of projected value added by labor productivity and employment, 2010–20E
%

■ Labor productivity
■ Employment



NOTE: Numbers may not sum due to rounding.
SOURCE: Global Insight; local statistics for China and India; McKinsey Global Institute analysis



As a result of the changes in global labor supply and demand described above, we anticipate labor market imbalances will become more likely and potentially more severe. Aging will heighten the need to accelerate productivity growth in many economies and will create even more demand for high-skill labor. China, India and other developing economies will have rapidly evolving non-farm sectors that will demand more high-skill workers, too. As a result, the challenges that have become apparent in advanced economies in the aftermath of the Great Recession could become more widespread, global, and enduring.

3. Where the gaps are

If present trends persist, many nations—particularly advanced economies—could face more severe and widespread skill shortages in the coming decades, as well as the prospect of swelling ranks of unemployed low-skill workers. Short of an unprecedented, large-scale effort to raise worker skills, we project that in 2020 the global labor supply could have 40 million too few workers with tertiary education and 90 million to 95 million too many medium- and low-skill workers.⁴⁰ Market forces will adjust labor markets in response these imbalances, but with potentially serious consequences: higher levels of unemployment, falling participation rates, widening income polarization between high- and low-skill workers, millions of workers trapped in low-income, marginal jobs, rising demands for public services, and heightened social tensions.

To avoid these imbalances, advanced and developing economies alike will need to accelerate the growth in completion rates in tertiary and secondary education by 2 to 2.5 times and raise the pace of job creation for low-skill workers by a factor of two to five times over the next decades.

ADVANCED ECONOMIES: SHORTAGES OF HIGH-SKILL TALENT, SURPLUSES OF MEDIUM-SKILL WORKERS

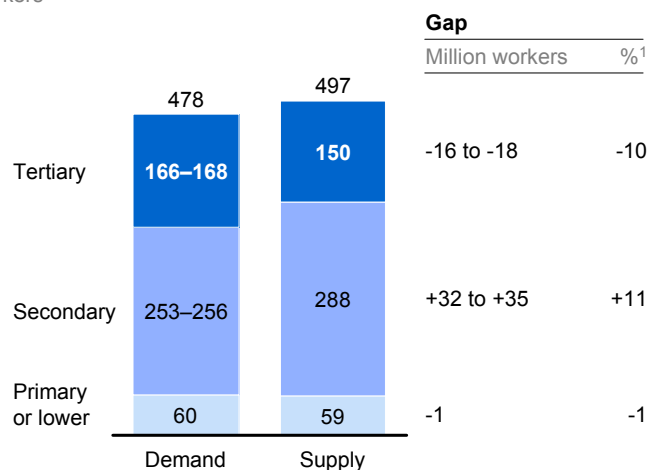
Based on current trends in GDP and productivity growth, we project that employers in advanced economies will likely demand 16 million to 18 million more workers with tertiary education by 2020 than their labor markets are likely to have (Exhibit 29). This gap of 11 percent between supply and demand in the momentum case is based on current rates of growth in educational attainment, which would not raise college completion rates to the level required to meet demand. The gap will likely be widest in the Southern Europe cluster, where educational attainment is the lowest and populations are relatively old. These countries could have as many as 3.5 million too few college graduates by 2020. Despite high college completion rates, “Aging advanced” economies such as Germany could also face a shortage of workers with tertiary degrees, equivalent to 10 to 11 percent of demand. In “Young advanced” economies, the gaps will likely be less severe, or about 6 to 8 percent. We project that the United States will have a lower gap of 3 percent, or 1.5 million too few workers with college or graduate degrees in 2020.

⁴⁰ In advanced economies, surpluses would be of workers with secondary education; in developing economies, the surplus would be in workers with primary education or less.

Exhibit 29**By 2020, advanced economies could have too few college-educated workers and too many workers with secondary degrees**

Comparison of projected labor demand and supply, 2020E

Million workers



1 Gaps are percent of demand for shortages, and percent of supply for surpluses.

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations Population Division (2010 revision); IIASA; ILO; Global Insight; GDP consensus estimates; country sources for the United States and France; McKinsey Global Institute analysis

While we use tertiary education as a proxy for high-skill in our gap analyses, we acknowledge that not all college graduates will qualify for the high-skill jobs that will be created. Indeed, based on the patterns in enrollment and completion, the skill gaps may be far larger in some nations and in some fields. For example, the share of graduates majoring in STEM specialties (science, technology, engineering and mathematics) in many advanced economies is low, and in some cases, declining. In the United States, for example, only 14 percent of college graduates earned degrees in STEM specialties in 2008, significantly lower than the ratio in China (42 percent), South Korea (35 percent), and Germany (28 percent).

Demand for workers in STEM occupations is escalating: according to projections by the US Bureau of Labor Statistics, jobs requiring STEM skills will grow at 1.6 percent annually in the 2008–18 decade, while overall job growth will average 1.0 percent.⁴¹ Our analysis shows that the current flow of STEM graduates into the US labor force will not be adequate to meet demand from employers in STEM occupations (e.g., engineering, computer science) and other fields, such as finance, and business and health care management⁴² (see Box 4, “Not all degrees are created equal”). To fill this gap, the United States would need to increase its share of STEM graduates to about 30 percent by 2018.⁴³ Immigration has helped to narrow the demand-supply gap in the United States; by 2008, 17 percent of workers in STEM occupations were foreign-born.

41 National Science Foundation (US) National Science Board, *Science and Engineering Indicators 2012*, January 2012.

42 For example, in *Big data: The next frontier for innovation, competition, and productivity*, McKinsey Global Institute, May 2011, MGI projects there could be a shortage of 140,000 to 190,000 workers with deep analytical talent, equivalent to 30 to 40 percent of demand by 2018 (www.mckinsey.com/mgi).

43 US Census, 2008.

Surpluses of medium- and low-skill workers

The flip side of excess demand for workers with tertiary education in advanced economies is an excess supply of low- and medium-skill workers compared to expected demand. Based on our analysis of demand patterns in the United States and France, we can project that across advanced economies there could be 32 million to 35 million more workers without post-secondary education than employers will demand in 2020, a surplus that would be equivalent to 10 percent of supply in that year. The surplus could imply a range of adverse social and economic outcomes—higher unemployment rates (even during economic expansions); rising numbers of discouraged workers who opt out of the labor force permanently; and more workers forced to accept marginal jobs, resulting in downward pressure on wages.

Not surprisingly, the oversupply of low-skill labor will be most acute where educational attainment is lowest. Based on current demand trends, we project that as many as 16 percent of the roughly 50 million workers without a post-secondary education in the Southern Europe cluster could struggle to find employment in 2020.

Addressing the skill gap: a multi-pronged effort will be required

Improving the supply of workers with the skills that employers will demand in the next two decades will require efforts on many fronts: sharply raising college completion rates (both among young people and mid-career workers who need retraining); increasing participation of high-skill workers in the labor force; and bringing qualified workers off the sidelines and into the labor force. In the past, advanced economies might have filled the gap with immigration alone, which currently accounts for about 13 percent of the college-educated workers in their labor forces. But avoiding the projected 2020 shortfall will require additional strategies.

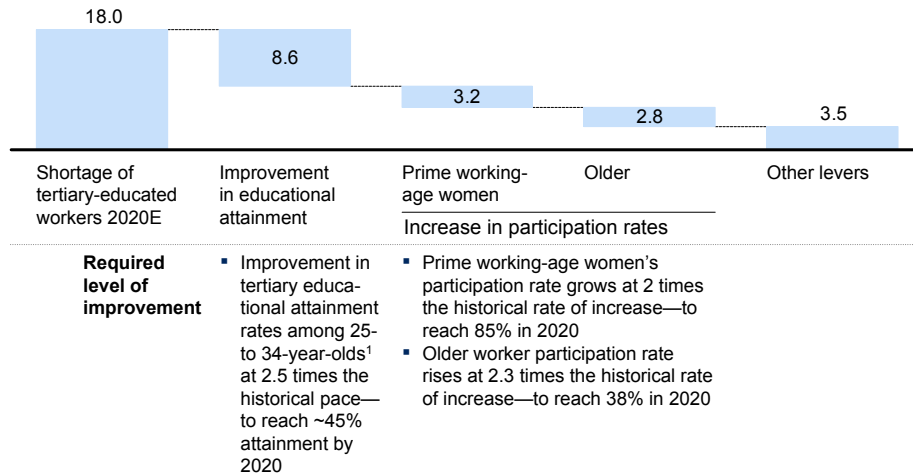
To understand how various strategies can work together to fill the notional skill gap of 2020, we look at each advanced-economy cluster and estimate the “headroom” available to raise the supply of high-skill talent. This headroom is defined as the gap between where nations stand today in terms of raising tertiary attainment and participation rates of high-skill workers and where their best peers are. If all advanced economies were best-performing, we estimate that they could raise the number of college-educated workers in their labor forces by 14.5 million by 2020. This would involve accelerating growth in college completion rates among young adults 2.5 times faster than in the past and increasing labor force participation rates of high-skill prime working-age women and older workers twice as fast as in the past (Exhibit 30).

Efforts to educate the young and encourage higher participation of older workers and high-skill women are not the only steps available to increase the supply of high-skill workers. Retraining medium-skill workers and attracting more high-skill immigrants also can help. Some countries already have implemented strategies to help their companies compete for high-skill immigrants; many have not. In New Zealand, for example, employers that are certified under the Accredited Employers program can offer a skilled immigrant a job and a visa that can lead to citizenship.

Exhibit 30

To increase the number of high-skill workers in the labor force, advanced economies would need to act on several fronts by 2020

Levers to address the high-skill worker shortage
Million workers, 2020E



¹ Those who are 15 to 24 years old in 2010.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Global Institute analysis

Box 4. Not all degrees are created equal

In itself, a college degree will not prepare workers for the high-skill jobs that will be created. In advanced economies, students need to be aware of sharp differences in demand for specific skills, the earning potential in various fields, and the likelihood of finding employment.

Consider the example of France (Exhibit 31). Unemployment rates for holders of degrees in the humanities are five times as high as for graduates in engineering or health care. In the United States the average STEM major earns \$500,000 more (in discounted lifetime earnings) than the average non-STEM major.¹ This premium holds even when the STEM graduate is employed in non-STEM occupations.

Similarly, it will not be enough to ensure higher rates of secondary school graduation in developing economies. It is equally critical to raise both the quality of graduates and their job readiness. In the Indian construction sector, for example, the wages of workers with formal vocational education rose at 1.5 times of the rate of wages for workers without such training (Exhibit 32).

¹ 2009 US dollars; Anthony P. Carnevale, Nicole Smith, and Michaelle Melton, STEM, Georgetown University Center on Education and the Workforce, 2011.

Box 4. Not all degrees are created equal (continued)

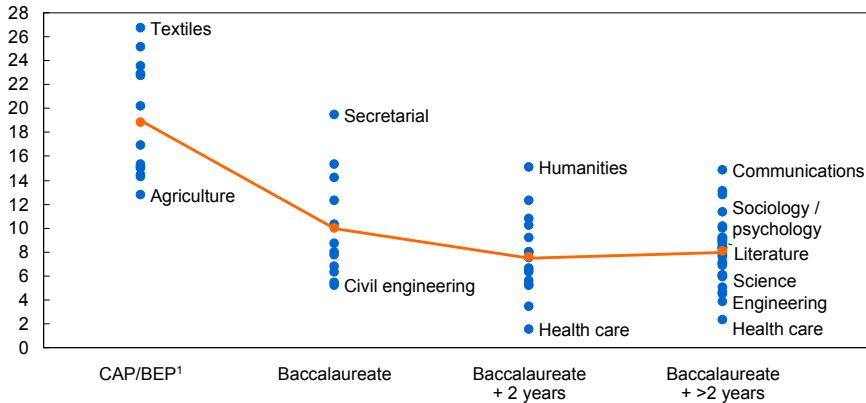
Exhibit 31

**In France, unemployment varies by education and by discipline—
science, engineering, and health care have lowest rates**



Members of the workforce who have graduated in the past ten years

Unemployment rate
%



1 CAP is "Certificat d'Aptitude Professionnelle;" BEP is "Brevet d'Etudes Professionnelles."

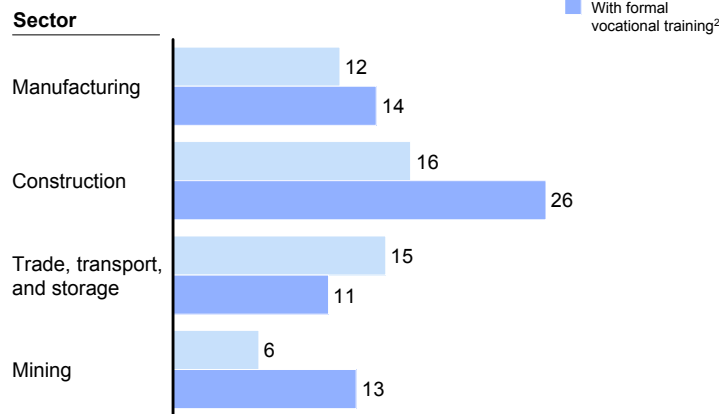
SOURCE: French National Institute of Statistics and Economic Studies; labor surveys from 2003 to 2009; McKinsey Global Institute analysis

Exhibit 32

**Wages for workers with vocational training grew faster than they
did for other workers in many moderately skill-intensive sectors**



Growth rate in wage rates, 2005–10
Compound annual growth rate, %



1 Broad level of education classified as secondary/higher secondary.

2 Broad level of education classified as diploma/certificate holders.

SOURCE: National Sample Survey Organisation Employment and Unemployment situation in India (2005-06 and 2009-10 reports); McKinsey Global Institute analysis

Addressing the surplus of less-skilled workers

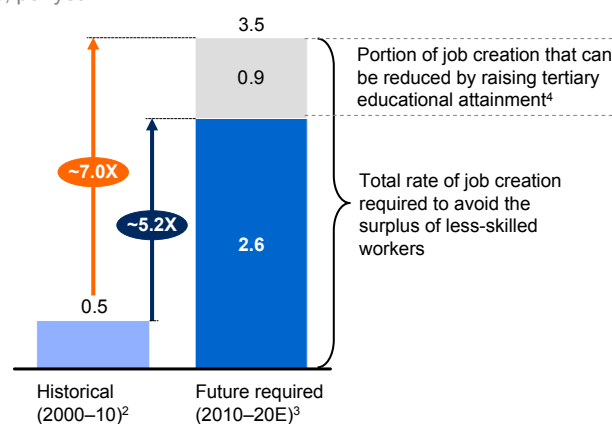
The most desirable approach for heading off a surplus of low- and medium-skill workers in the next decade would be to convert some of them to high-skill workers, thus addressing two labor force imbalances simultaneously. To avoid what could be a surplus of 32 million to 35 million medium- and low-skill workers in 2020, however, advanced economies will need concerted efforts in both education and job creation:

- Convert more future workers into college graduates.** By raising tertiary attainment rates among 25- to 34-year-olds⁴⁴ at 2.5 times the historical rate of increase, advanced economies could shift 8.5 million future workers from the ranks of the low- and middle-skill to the high-skill supply.
- Significantly increase the pace of job creation for medium- and low-skill workers.** To employ workers who will not complete college educations, advanced economies would need to create more than three million jobs annually for medium- and low-skill workers, compared to historical growth in such jobs of just half a million per year (Exhibit 33).
- Improve the skills of adult workers.** In addition to these measures, advanced economies will need to continually upgrade the skills of prime working-age and older workers. This will be critical to ensure that they have the levels of educational and vocational training that will be demanded by their jobs in the next two decades and will enable older workers to postpone retirement. This could take the form of on-the-job training, part-time educational arrangements, or delivery models, such as online training.

Exhibit 33

Jobs for medium-skill workers in advanced economies would need to grow at 5 to 7 times the historical rate to avoid a surplus

Job creation rate for medium-skill workers¹ in advanced economies
Million workers, per year



¹ Includes all employed workers who have less than tertiary attainment.

² Calculated as net additions of workers with less than tertiary attainment to the labor force.

³ Calculated as net growth in demand for workers with less than tertiary education in 2020.

⁴ Calculated based on improvement in tertiary attainment rates among 15- to 24-year-olds (in 2010) at 2.5 times historical pace.

SOURCE: United Nations Population Division (2010 revision); IIASA; ILO; Global Insight; GDP consensus estimates; country sources for the United States and France; McKinsey Global Institute analysis

DEVELOPING COUNTRIES FACE DAUNTING CHALLENGES TO EDUCATE WORKERS AND CREATE JOBS IN SUFFICIENT NUMBERS

To accommodate new entrants into their labor forces, we estimate that developing economies will need to create at least 380 million additional non-farm jobs over the next decade. For India, this would mean creating 1.4 times as many non-farm jobs in the next decade as it did in the past ten years. Young developing economies would need to create 1.3 times as many non-farm jobs as in the past, just to keep pace with growth in their labor forces.

To equip new workers for the jobs that will be created, developing economies will need to continue raising educational and training capacity. At the current rate of growth in supply, China could have too few high-skill workers to meet its needs as it moves up the value chain. India will face multiple challenges: a potential surplus of college-educated workers, a shortage of workers with a high school education, and not enough jobs for its large cohort of very low-skill workers. “Young developing” economies will face twin challenges: to prepare their young people for jobs, they will need to raise the rate of increase in the secondary school graduation rate by a factor of 2.5 times, and they will need to create an estimated 90 million non-farm jobs.

China

China has had strong growth in college education over the past decade. Its annual output of college graduates grew more than five times, from 1 million in 2000 to 5.3 million in 2009. In fact, this growth has exceeded the pace of rising demand, resulting in high unemployment rates for college graduates—nearly 25 percent at present. As China’s service sectors grow and its manufacturing sector moves up the value chain, however, demand for high-skill workers will rise at a faster rate. Meanwhile, with slower population growth, the flow of students into its colleges will decline marginally over the next decade. As a result, we expect shortages of college-educated workers to appear by 2020.

We project that Chinese employers will demand 140 million college-educated workers by 2020—or about 23 million more than it will likely be able to supply, despite the addition of about 50 million graduates in the coming decade (Exhibit 34). In the momentum case, China is projected to maintain tertiary graduation rates of eligible senior secondary students at around 50 percent. China could fill a part of its estimated gap of 23 million college-educated workers by raising enrollment and completion rates among recent secondary school graduates and offering more access to adult education.

- **Raising the college attainment rate to 85 percent of eligible secondary-school graduates by 2016.** This would increase the supply of college-educated youth by about 23 million by 2020, achieving the high rates of college enrollment seen in South Korea.
- **Increasing female participation rates would be challenging and yield only small benefits.** Some 82 percent of prime working-age women are already in the workforce, giving China one of the highest female labor participation rates in the world. Raising participation to 86 percent (the rate in the Nordic countries) could add 2.2 million more college-educated women to the labor force.

Unlike advanced economies, China is not likely to have an oversupply of workers with secondary education in the coming decade. Its supply—about 520 million in 2020—is projected to be roughly in line with demand, which will continue to rise despite the emphasis on higher value-added manufacturing and services.

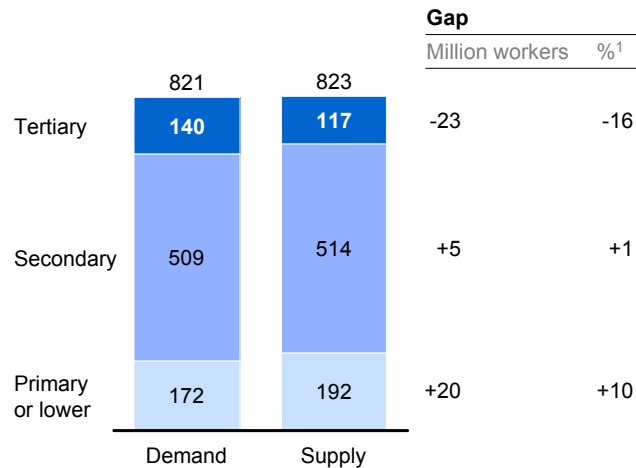
Exhibit 34

Demand for high-skill labor will likely grow faster than supply in China over the next decade



Comparison of projected labor demand and supply, 2020E

Million workers



¹ Gaps are percent of demand for shortages, and percent of supply for surpluses.
NOTE: Numbers may not sum due to rounding.

SOURCE: China National Bureau of Statistics; McKinsey Global Institute analysis

Brazil

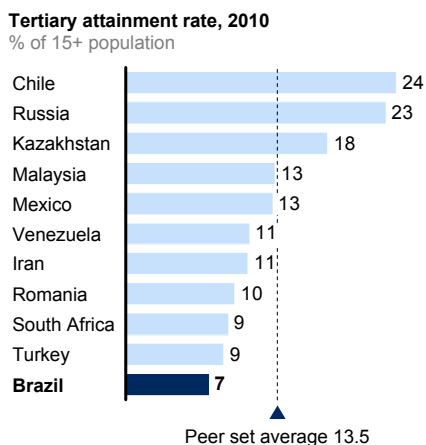
Brazil, which has experienced strong GDP growth aided by a demographic dividend, could also face gaps as its population growth slows. With a tertiary education attainment rate of just over 7 percent of working-age population, Brazil lags behind almost all economies within its peer group in creating a supply of high-skill workers. Indeed, highly educated workers are already in such short supply that workers with tertiary degrees command a large wage premium of 340 percent of the wage of primary educated workers. We estimate that due to a projected slowdown in the growth of its labor force, from 2.5 percent a year in the past decade to less than 1 percent in the next two decades, Brazil will face a severe productivity growth imperative. In order to meet this imperative, Brazil will have to substantially improve its tertiary attainment rate (Exhibit 35).

Exhibit 35

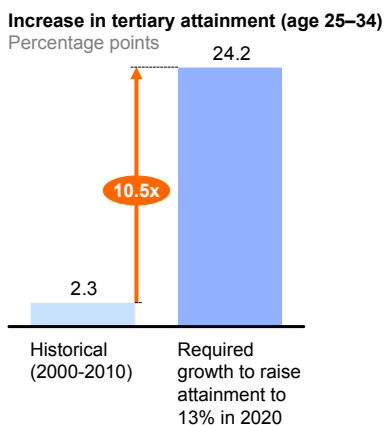
Brazil has a significant need to improve its tertiary education attainment rates



To reach tertiary attainment levels of its peer countries ...



... Brazil needs to significantly raise tertiary completion rates among young workers



1 Peers defined as countries with GDP per capita 25% higher or lower than Brazil's projected GDP per capita in 2020 (assuming historical growth rate in GDP per capita continues); from this group we exclude Botswana due to its small size
SOURCE: UN Population Database (2010 revision); IIASA; ILO; McKinsey Global Institute analysis

India

India's shift out of agriculture and its move up the value curve is proceeding more slowly than China's. As a result, it could face a unique set of labor market imbalances. First, because its industry is not expanding as quickly as the capacity of its higher education system, India could be among the few countries in the world with a surplus of high-skill workers. We project that India could raise the number of college graduates in its labor force by 36 million in the coming decade, about six million more than its domestic industries can employ, if current growth rates continue. (The demand outlook in India, it should be noted, is complicated by employer concerns about how well its universities prepare their students for high-skill work.)⁴⁵

Another serious labor market imbalance could arise from India's relatively low secondary school graduation rate. We project that India's secondary schools will produce 13 million fewer graduates in 2020 than employers will need—or 10 percent less than the number of medium-skill jobs that will be created by India's growing manufacturing, trade, and service sectors. This is despite a projected increase of secondary school enrollment rates to 70 percent from the current 52 percent by 2020 in our momentum case. As noted earlier, India already has a shortage of medium-skill workers, which is reflected in relatively rapid wage growth for vocationally trained workers in sectors such as construction and mining.

45 According to a survey by the World Bank, 64 percent of employers are "only somewhat satisfied or worse" with the quality of new hires. See Hiroshi Saeki and Andreas Blom, *Employability and skill set of newly graduated engineers in India*, World Bank, Policy Research Working Paper, No. 5643, April 2011. Also see *The emerging global labor market*, McKinsey Global Institute, June 2005 (www.mckinsey.com/mgi).

Finally, by 2020, if current population and education trends persist, India could wind up with 27 million too many low-skill workers (Exhibit 36), or 7 percent of all such workers. This growing surplus of low-skill workers would imply adverse social outcomes, including millions more people employed in low-productivity, low-income occupations.

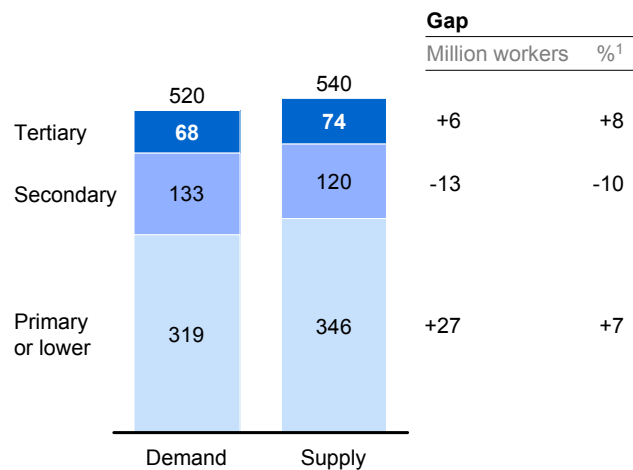
Exhibit 36

India is likely to have too few workers with secondary education and not enough job opportunities for low-skill workers



Comparison of projected labor demand and supply, 2020E

Million workers



¹ Gaps are percent of demand for shortages, and percent of supply for surpluses.
NOTE: Numbers may not sum due to rounding.

SOURCE: National Sample Survey Organisation; India Census; Ministry of Human Resources and Development; McKinsey Global Institute analysis

India would need an unprecedented increase in both education and job creation to address these labor market challenges. It would need to:

- Achieve 100 percent secondary school enrollment by 2020.** This would mean boosting school construction rates by a factor of 1.5 to 2 times the current rate and doubling the rate of teacher hiring to add 1.5 million teachers by 2020. Vocational skills would need to be imparted to a substantial proportion of these secondary school graduates.
- Retrain 285 million working Indians.** Beyond the challenge of educating the young, India has 285 million adult workers who have no secondary education.⁴⁶ Of these, 150 million have not even completed primary education. Providing job-relevant vocational skills to these workers is a unique challenge that India faces.
- Improve the performance of job-creating sectors.** To create sufficient numbers of jobs for its low-skill workers, India would need to achieve a step-change in growth of labor-intensive sectors. We estimate that India would need to quadruple its share of Asian exports of labor-intensive products such as apparel; double its rate of infrastructure construction and urbanization; and triple the output of domestic food processing industries in the next ten years.

⁴⁶ Workers between the ages of 15 and 54 years.

“Young developing” economies of South Asia (beyond India) and sub-Saharan Africa

By 2020, even these economies may face skill gaps. The economies of South Asia (other than India) and sub-Saharan Africa are projected to have a shortage of about 31 million workers with secondary education by 2020. These economies are on track to raise their labor forces by around 85 million to 90 million in the next decade. If all these workers were to find jobs in manufacturing and services, we project there would be need for 31 million more secondary educated, job-ready workers than schools are likely to be able to create. This amounts to some 19 percent of the total demand for high school-educated labor in 2020.

“Young developing” economies will also be challenged to find work for about 31 million low-skill workers, who have no education or just primary schooling. This implies a 14 percent oversupply of such workers. We base these estimates on the pattern of skill attainment among workers in India, which has a similar share of workers in agriculture and similar educational attainment as many “Young developing” economies. However, we do not apply the future increase in skill requirements that we project for India to the “Young developing” economies; thus our estimates of skill gaps for these nations are conservative.

To address these labor market imbalances, the “Young developing” economies will need to more than double the rate of growth in educational attainment, raising secondary enrollment and completion rates. We estimate that these nations would need to raise secondary education attainment to 46 percent of the population in 2020 from 31 percent in 2010, implying 2.5 times the current growth rate in attainment by 2020. At the current growth rate of secondary school graduation, these nations would only reach a 43 percent graduation rate in 2030.

Some of the “Young developing” economies may find that, like India, they have more college-educated workers than their industries are ready to employ. In many parts of Africa, unemployment among highly educated workers is 17 percent, better than the 20 percent rate among workers with secondary education, but far worse than the 10 percent rate for workers with only primary education. In North Africa, the unemployment rate for workers with a tertiary education is 20 percent, compared with 16 percent for workers with secondary educations and 8 percent for those with a primary education.⁴⁷ One measure of how far African nations have to go on their path from poverty: even now, only 28 percent of the African labor force is in stable wage-paying jobs.

ECONOMIC AND SOCIAL COSTS OF LABOR MARKET IMBALANCES

If the severe labor market imbalances that could arise in our momentum case materialize, advanced economies risk ever-larger economic and social challenges. The economic costs could be substantial. High rates of unemployment could put greater strain on social security programs, while depressing tax receipts. People who are not working or who are seeing their wages stagnate are unlikely to increase consumption, resulting in slower economic growth. At the same time, shortages of high-skill workers could also limit growth.

⁴⁷ *Key indicators of the labor market*, International Labor Organization, 2012.

Moreover, social costs are steep. The long-term unemployed have been shown to have more health problems and shorter life spans than workers who are employed consistently.⁴⁸ And the growing gulf between the fortunes of the well-educated and well-employed, and a rising cohort of citizens with no expectation of improving their standards of living, points to social and political instability.

In developing economies, behind the rising per capita GDP averages, there will likely be fast-growing income disparity. This pattern will likely be repeated in other nations as incomes rise and they become more dependent on high-skill labor to drive productivity improvement. Even now, income inequality is rising in urban areas. In Indian cities, the ratio of incomes of the top quintile of earners to that of the bottom quintile grew from six times in 2000 to nine times in 2010. In China, the ratio moved from less than 3 times to 4.3 times.

□ □ □

The magnitude of potential imbalances is too great to be ignored. In some nations, the consequences would be far slower economic growth, exacerbating employment challenges and, most likely, sharpening the divide between highly skilled workers and other members of the labor force. For some developing economies, the impact could be far more severe—slowing down or even halting the ability of the global economy to raise people out of poverty.

48 See Louis S. Jacobson, Robert J. LaLonde, and Daniel G. Sullivan, *The costs of worker dislocation* (Kalamazoo, MI; W.E. Upjohn Institute for Employment Research, 1993).

4. A global agenda for skills and jobs

The global economy faces two significant labor-market challenges: heading off a potential shortage of high-skill workers needed to maintain high growth and productivity and finding ways to create employment opportunities for a rising number of low-skill workers. These are daunting challenges for business leaders and policy makers. National governments will need to formulate long-range plans to address both supply and demand issues; they will need to raise the output of educational systems and eliminate barriers to job creation. In developing economies, governments will need to encourage expansion of sectors that employ low- and middle-skill workers.

Businesses operating in this skills-scarce world will need to dramatically step up their role in public education and training, invest in their own training programs, and develop innovative strategies to hire, train, and retain workers from under-leveraged labor pools, such as older workers and women. It will also be incumbent upon business to take a stronger role in shaping strategies that will improve their ability to compete in the global war for talent.

A GLOBAL “EDUCATION REVOLUTION”

To respond to the skills challenge in global labor markets, the traditional model for providing secondary and tertiary education will need to be transformed in both advanced and developing economies. Developing economies will be challenged to raise the capacity of secondary education systems and find ways to provide vocational training to new workers entering the labor market as well as to mid-career workers who lack the skills for 21st-century employment. The availability of teachers will be a constraint almost everywhere in the world and the capacity of governments to finance higher investments in education will be a limiting factor in many countries.

Conventional methods of building educational and training capacity will likely not be sufficient. Innovation in the delivery of education and training will be required to raise the productivity of the education sector and maximize scarce resources. Private investment will need to play a more important role, especially in developing countries, and active collaboration will be required among stakeholders—businesses, governments, college and school systems, corporate social responsibility (CSR) donors, and employee associations—to ensure that scarce resources are deployed in line with the needs of job markets. Key areas that will need new solutions include:

Raising secondary school capacity and attainment in developing countries

Many developing countries in South Asia and Africa have succeeded in achieving near universal primary education in the past decade. The challenge now is to raise the number of students who continue on to secondary schools and to improve secondary school graduation rates, while not compromising quality (see Box 5, “South Korea’s achievements in education”). This will require significant

investments in infrastructure. For example, to meet official targets for secondary school graduation rates, MGI estimates that India would need 82 million school seats by 2016, up from 48 million in 2009–10, or a growth rate of 8 percent each year, up from a historical rate of 5 percent. This may require new approaches to school construction using “design-to-cost” principles and private participation to supplement government resources.

To meet the enrollment targets at current levels of productivity in education, India will also need to hire 1.2 million more secondary school teachers, almost doubling the current 1.5 million (as of 2009). That will require expanding the teaching corps by 9 percent each year, compared with 5 percent annually in the past.

A radically different model will be required to produce the number of secondary school graduates with the skills that employers will need. The traditional academic curriculum would need to be redesigned to add more practical, job-oriented training. Schools could offer an optional vocational track that would also leave paths to higher education open. To meet the need for teachers, schools may need non-traditional recruits, perhaps candidates with specialized knowledge of relevant skills, but with lower formal teaching qualifications. Private enterprise can play a role in this transformation—as investors in public-private partnerships, as service providers to help with curriculum development and teacher training, and as donors through corporate social responsibility initiatives.

Box 5. South Korea’s achievements in education

Between 1950 and 1990, Korea undertook a carefully planned expansion of its educational system, which was part of a broader economic development program. Through the 1950s, the nation expanded access to primary education and achieved universal primary education in the 1960s. Middle school education followed in the 1970s, and universal access to high school education in the subsequent decade. In the 1990s, Korea focused on expanding tertiary education, to support knowledge- and R&D-intensive manufacturing.

Education was made job-relevant through the extensive promotion of vocational training and STEM disciplines. Vocational schools account for 25 percent of total secondary school enrollments, and nearly 75 percent of students completing vocational secondary education go on to tertiary education. Some 35 percent of college degrees awarded in 2008 were in STEM disciplines, a much higher ratio than many advanced economies.

After raising the numbers of graduates at the secondary and tertiary levels, Korea turned to quality improvements. Korea continued to recruit more teachers, reducing class sizes to levels seen in advanced economies. Pay was improved and standards were raised. Today, new teachers typically come from the top third of their classes. In recent years, Korea has also introduced specialized high schools, increased investments in technology, and allowed schools greater autonomy in designing curricula and selecting teachers. As a result, Korea educational outcomes have placed it among the top five countries globally on various parameters, although the system can be criticized for not teaching creative thinking.

Align education with employment demand

Employers will need not just more workers with college degrees, they will need graduates with training in specific specialties, particularly in scientific and technical fields. In the past, advanced economies could count on immigrants to fill this gap. Immigrant workers were eager to train at universities in places like the United States and stay on to take high-paying jobs. Now, ambitious young workers from developing economies can complete their technical training at home and find job opportunities, too. This will heighten the need for advanced economies to build home-grown supplies of high-skill talent.

Not only do the United States and other advanced economies need to increase the number of students who enroll in the more challenging disciplines in science, math, and engineering, but graduation rates must also improve. In the United States, for example, one-third of STEM majors drop out or switch to other majors. A weak grounding in mathematics in secondary school contributes to this.⁴⁹ Targeted “booster” training can help students improve completion rates.

For students who will not go on to college or who will go directly from high school to the workforce, job-specific training is essential. Programs can be designed to provide training and credentials for a specific occupation—welder or machinist, for example—through intensive, short-duration classes. This way, in three or six months, a young person could be ready for a first job and then continue his or her education part-time, rather than deferring work for two to four years while earning a degree.

Vocational training can be focused on specific occupations, such as nursing aides, dental assistants, and medical technicians—jobs that require only certification or associate degrees. In the United States, demand for such workers is projected to grow at 1.8 to 2.9 percent per year to 2018, far higher than the 0.6 to 1.6 percent annual growth rate of jobs that are typically open to high school diploma holders. Making information available about what types of jobs are in demand is a critical step in helping young workers select the most useful training and raise their chances of employment.

Comprehensive thrust on vocational education

This applies both to skilled trades, such as welding or auto repair, and to fast-growing service sectors. Collaboration between hiring industries and training institutions is essential for making instruction job-relevant and creating a smooth school-to-work path.

Secondary schools can offer full-credit, vocational tracks on an integrated basis with general education tracks to provide students the flexibility to switch at any stage. For instance, Australia’s VETiS (Vocational Education and Training in Schools) program is offered in more than 90 percent of higher secondary schools, enrolling about 40 percent of eligible students, or 230,000 students in 2010. The VETiS program allows senior secondary students in Australian schools to earn a nationally recognized vocational certification, while keeping all paths open to higher education.

49 Nearly half of high school seniors who are interested in STEM majors in college do not have STEM proficiency. See BHEF, *Increasing the number of STEM graduates: Insights from the US STEM Education and Modeling Project*, 2010.

Germany has an employer-led dual system of vocational training, catering to students leaving school after completing nine years of mandatory full-time schooling.⁵⁰ Under the dual system, vocational schools and companies jointly deliver vocational education and training. Students spend one or two days per week in vocational school and the remainder working for an employer. They also continue to earn credits that will keep them on a path to higher education—20 percent of students return to higher education after having completed training in dual system. Companies benefit by seeding the labor market with properly trained workers. About 70 percent of firms with more than 50 employees participate in this program. The program has helped Germany limit youth unemployment to half the OECD average.

Post-secondary youth can also be trained by industry-skill councils or by private training companies in collaboration with industry. In the United States, Bluegrass Commercial and Technical College, a community college in Kentucky, worked with Toyota to create a replica of an auto factory, where Toyota workers, students and workers from other manufacturing companies can attend classes before or after their shifts to participate in training and hands-on problem solving that prepares them for multi-skilled auto maintenance and production jobs. The National Skills Development Corporation (NSDC) in India is a public-private partnership company that focuses on funding and catalyzing skill building initiatives through industry skill-councils. Zhongzhi Beifang Automobile Vocational Training School is a private for-profit company in China that provides automotive vocational training to 100,000 students a year in partnership with major auto manufacturers.

Mid-career workers who are most in need of retraining can gain access to skill-building programs by linking them to unemployment programs, as in Germany. Austria offers “intensive apprenticeship” programs to teach adult workers vocational skills in specific trades in modules that last one year, instead of three.

Reaching the millions of unskilled adult workers in poorer countries (i.e., those with elementary education or less) will require innovative training models and focus on teaching the basics that employers demand: punctuality, communication with supervisors, teamwork, time-management, etc. In South Korea, adult “paraschools” are operated by social and non-governmental agencies to offer short-duration literacy courses to low-skill adult workers.⁵¹ The Adult Basic Education and Training Institute at Unisa (a leading distance learning institution in South Africa) has trained more than 60,000 teachers to teach literacy, numeracy, English, trades, health, environmental science, and water and sanitation management.

A “new technology” of education

By adopting innovative technologies, educational institutions can reach millions of students at low cost. With more remote delivery of content, the role of the classroom can be transformed from a place where lectures are delivered to one where teachers interact with students face-to-face to guide them individually. Traditional bricks-and-mortar educational institutions already are adopting digital delivery methods to supplement their core classroom models (see Box 6, “Open

50 Federal Ministry of Education and Research, *Germany's vocational education at a glance*, 2003.

51 See *Better skills, better jobs, better lives: A strategic approach to skills policies*, OECD Publishing, May 2012.

access to education through digital platforms”). Online learning now gives millions of students access to the world’s best teachers and teaching systems, and can be customized to suit individual objectives. More complex aspects of learning, which require human interaction, can be provided remotely through interactive online features and occasional face-to-face interaction. Emerging models could be funded through a combination of corporate social responsibility grants, government grants, research grants, and at a later stage by private investors.

Box 6. Open access to education through digital platforms

Digital teaching models are evolving and world leaders in higher education and technology are coming together with entrepreneurs and educators to create learning and training systems that are tuition-free, online, and open-access. A range of innovations in education technology is in evidence from primary schooling to higher education.

In primary and secondary education, not-for-profit Khan Academy offers over 3,200 videos on arithmetic, algebra, physics, finance, and a variety of other subjects to students, teachers, parents, home-schoolers, and adults returning to education. Its library of videos, interactive challenges, and assessments is offered free to millions of subscribers.

Digital StudyHall (DSH), with support from Microsoft Research’s India Lab and India’s Digital Inclusion program, runs a program to improve education for poor children. In 2011, DSH ran pilot programs in which lessons in English, math, and science from the best grassroots teachers in India, Pakistan, and Nepal were recorded and distributed on DVDs to schools in poor rural areas and urban slums. Local teachers lead these video lessons in the classroom.

Harvard University and the Massachusetts Institute of Technology (MIT) recently launched edX, a \$60 million online learning venture for higher education. The not-for-profit joint venture builds upon MIT’s existing online learning platform, MITx, which runs courses for around 120,000 students worldwide. MIT founded its open education platform in 2002 through the OpenCourseWare project that put all educational materials from MIT’s undergraduate- and graduate-level courses online, partly free and openly available to anyone, anywhere. The OpenCourseWare project has more than 2,000 courses online, some of them with streaming video lecture content and interactive web demonstrations. The edX platform will offer a variety of learning methods: video tutorials, discussions, labs, online quizzes, and interactive learning. Other universities can use edX’s open-source platform to deliver high-quality teaching remotely, and let their own professors concentrate on working face-to-face with students.

The online, tuition-free University of the People (UoPeople), offers college degree programs in business administration and computer science. UoPeople, a nonprofit, has partnered with New York University and with Hewlett-Packard to open up virtual research internships for UoPeople students.

CREATING MORE JOBS FOR LOW- AND MEDIUM-SKILL WORKERS

Even the most successful efforts to raise educational attainment, make curricula job-relevant, and retrain older workers will likely not eliminate the potential surplus of low- and middle-skill workers. Advanced economies are projected to have inadequate job openings for about 38 million medium-skill workers by 2020. By raising educational attainment and providing targeted vocational training and retraining, perhaps 12 million of that notional surplus can be addressed. That would leave 25 million workers who would likely join the ranks of the unemployed or be consigned to subsistence work. However, this surplus can be further reduced by raising demand in labor-intensive sectors. Creating demand for less-skilled labor will also be critically important to developing economies.

Advanced economies

- **Reforms to promote job growth in non-tradable sectors.** Even in advanced economies, many sectors of the economy have jobs that cannot be automated or relocated: food preparation and serving, retail sales, construction, cleaning, and material moving. Demand for many of these occupations is projected to grow at a slower rate in coming years.⁵² Regulatory reform (for example, reviewing rules in health care that restrict the kind of work that can be performed by less skilled workers), and policies to promote demand for workers in labor-intensive industries such as hospitality (by simplifying visa processes for tourists) can help create jobs in these sectors. Retail is another sector that uses low- and middle-skill labor, but many countries still restrict retail store formats and hours, which limits the number of jobs that are created in the sector.
- **“Marketization” of home production and elder care.** According to US Bureau of Labor Statistics estimates, household chores and providing care for household members (i.e., “home production”) account for approximately 580 million labor hours per year of work in the United States. If 10 percent of this home production were turned over to full-time workers, it could generate six million to seven million low-skill jobs by 2020, while freeing up time of high-skill workers. And as populations in the advanced economies age, there will be more demand for home-production services as well as for in-home health care services.

“Marketization” is the process of transferring to the market the home production work that is now done by family members. Some form of tax incentive can accelerate the shift of home production work from family members.⁵³ Germany, for example, encouraged marketization of household work with tax reforms in 2003, including tax deductions for employing legal domestic workers under its “mini-jobs” program for unemployed and marginally employed workers.⁵⁴

⁵² US Bureau of Labor Statistics, *Occupational Outlook Handbook*, 2008–18.

⁵³ For an analysis of such incentives, see Liwa Rachel Ngai, and Christopher Pissarides, *Taxes, social subsidies and the allocation of work time*, Center for Economic Policy and Research (CEPR) Discussion Paper No. 8328, April 2011.

⁵⁴ Mini jobs are part-time jobs paying up to €400 per month.

In 2006, the Swedish government introduced a 50 percent tax deduction for wages paid for household services such as cleaning, washing, and child care. The tax break was later extended to include payments made to workers who cared for elderly relatives who lived in a different household. Separately, as part of a program to reduce the cost of running old age homes, municipalities have hired low-skill workers (often through private contractors) to help with household chores and provide in-home care, enabling the elderly to remain in their own homes.

Additional incentives would be required in the United States and other advanced economies to transfer jobs in housekeeping, child care, and gardening from the “off-the-books” economy to the formal economy. This transfer would also create a market opportunity for professional services companies that could place, train, and supervise household workers. Sweden and Denmark used targeted child care supports to help convince women to remain in the labor force after childbirth. In addition to fulfilling the primary goal of raising female participation rates,⁵⁵ the incentives helped create a large number of low-skill jobs in child care.

- **Subsidies for job preservation and creation.** Government incentives can facilitate job creation for low-skill workers and reduce job losses in economic downturns. Germany, for example, has made the explicit decision to subsidize employment, rather than simply pay unemployment benefits to avoid the economic and social costs of high joblessness. This includes the mini-job program as well as the ‘Kurzarbeit’ job-sharing system. Job sharing encourages companies to reduce working hours to adjust for falling demand during economic downturns, rather than laying off workers. For up to 24 months, the government pays up to two-thirds of the lost income per worker and 100 percent of social security payments. This system has reduced mass layoffs, permitted employers to retain skilled workers, and avoided the prolonged unemployment that leads to loss of skills and decreases employment prospects.

Developing economies

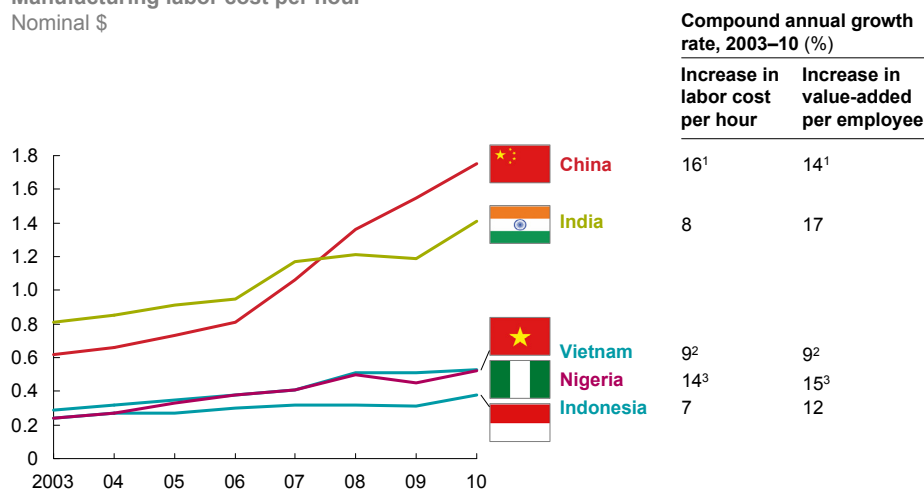
- **Increasing employment in labor-intensive manufacturing.** As labor markets evolve over the coming decades, opportunities will arise for countries to capture larger shares of the global economy’s labor-intensive jobs (Exhibit 37). Already, Vietnam, Indonesia, Bangladesh, and Cambodia are experiencing growth in labor-intensive industries, because of the cost advantages these nations now offer. Countries also create more jobs when they move up the value chain—exporting finished goods, rather than raw material or intermediate products. For example, China’s finished textile exports generate 2.5 times as many jobs per dollar of output as raw material exports. Similarly, 90 to 95 percent of Chinese rubber exports are now in the form of finished goods (e.g., tires) compared with only 15 to 20 percent of Indonesian rubber exports. Côte d’Ivoire and Ghana cut export taxes on processed foods, helping to raise the proportion of processed cocoa to 40 to 50 percent of exports in 2010, up from less than 10 percent in 2000.

⁵⁵ At 87 percent, Sweden and Denmark have the highest labor participation rate for prime working-age women in advanced economies.

Exhibit 37

With wages rising in China and India, other developing economies have an opportunity to gain share in global exports and create jobs

Manufacturing labor cost per hour
Nominal \$



1 2003–09.
2 2005–10.
3 2003–07.

SOURCE: Economist Intelligence Unit; Global Insight; country labor ministries; McKinsey Global Institute analysis

- **Removing barriers to growth and job creation:** Many developing economies fail to maximize growth in export sectors because of rigidities in business environments. For example, it takes 119 days to start a new business in Brazil compared to 6 days in Malaysia. The cost of registering a new business is equivalent to 71 percent of the annual per-capita income in Nigeria, compared with 6 percent in Thailand. High shipping costs are another barrier to export-led job creation; it can cost twice as much to ship from India and some other developing nations than from China, for example.⁵⁶ By building cold storage, processing, and packaging capacity, and by upgrading the food retail sector, developing nations can pave the way toward a stronger domestic food industry that would create low-skill jobs.
- **“Frugal innovation” in products and services.** Frugal innovation involves minimizing cost of production and distribution to give many more people access to a range of products and services. In developing economies, mass-market businesses have created employment for millions of local workers, often with little formal education, as part of their programs to reach consumers in rural villages and in poor urban areas. For example, the introduction of “top-up” vouchers helped bring telecom services to low-income groups in India and led to millions of jobs for local agents and mobile repair shop owners. As the mobile subscriber base in India increased from five million in 2001 to 890 million in 2011, the industry added an estimated eight million to ten million jobs. In sub-Saharan Africa, mobile penetration increased from 0.3 percent in 1998 to 33 percent in 2008 and is estimated to have created 3.5 million jobs. In the consumer sector in India, Unilever created a low-cost distribution model to reach consumers in villages, which generated at least 68,000 rural jobs for distribution agents, three-quarters of them for women.

⁵⁶ World Bank, *Doing Business* report, 2012.

- **Lowering barriers to housing and infrastructure projects.** Urbanization is a powerful engine of job growth in developing economies. India and China's construction sector generated 24 percent of job growth from construction in the past decade (see Box 7, "Potential to create jobs in India's construction sector"). With forward and backward linkages to industries such as cement and steel production, every job in construction has a multiplier effect. Many developing economies can unlock the potential of the construction sector to create jobs by removing barriers along the value chain of creating projects, awarding contracts, securing funding, and obtaining regulatory clearances, and implementation.

Box 7. Potential to create jobs in India's construction sector

We estimate that India's infrastructure and housing sectors can create 3.6 million more jobs for workers each year (than would be created under current projections) if the country accelerates investments in infrastructure and affordable housing beyond historical rates—and focuses on getting planned projects completed. From 2009 to 2011, just 27 percent of planned national highway contracts were actually awarded.

India's urbanization (including the modernization of existing cities) has been held back by a slow rate of construction of low-cost housing. In previous work,¹ MGI found that the housing shortage would grow from seven million units in 2007 to 38 million in 2030, with India fulfilling just 25 percent of demand for affordable housing. Various factors impose barriers to the progress of infrastructure and housing construction projects. Slow and centralized approval processes, inflexible bidding mechanisms, frequent policy changes leading to redrafting and reworking of RFQ documents, and lack of development of raw material linkages limit award of projects. Delays due to slow land acquisition processes and weak dispute resolution affect the execution of awarded projects.

Resolving these issues can create a significant number of construction jobs in infrastructure and housing construction. We estimate that an additional 1.3 million workers would find work directly in the construction sector each year if India increased its planned rate of expansion in power and roads by 50 percent. Similarly, achieving half of India's demand for affordable housing by 2030 would create jobs for 0.7 million more construction workers each year. With a multiplier of 1.8 jobs in forward- and backward-linked sectors (e.g., cement and steel production) for every one job in construction, India could create 3.6 million more jobs by removing barriers to growth in the infrastructure and urban housing sectors.

1 McKinsey Global Institute, *India's Urban Awakening: Building inclusive cities, sustaining economic growth*, 2010.

WHAT BUSINESS CAN DO

Our projection of a deficit of high-skill workers implies an intensifying global war for talent. Businesses that hone their abilities to source and develop talent will gain strategic advantage in their industries; companies that fail to attract and retain the strongest talent will be at risk. Beyond meeting their own skill needs, businesses can play a more active role in mitigating the economic and social consequences of surpluses of low- and medium-skill workers. Finally, the likely explosion of demand for education and training all over the world will open investment and business development opportunities.

- **Understand individual labor markets to craft a competitive global labor footprint.** In a global labor market, companies will need to anticipate trends in education, aging, and wages in order to fine-tune foreign direct investment (FDI), recruitment, and offshoring strategies. In addition to sizing pools of appropriately skilled workers, companies will need to assess the quality of national educational systems and the market dynamics that determine wage differentials. This analysis will become increasingly granular, down to knowing the number of college graduates and workers with specific training in cities around the world. Firms can gain advantage by using this data to create their own maps of global skills supply, which will inform decisions about where to invest.
- **Take an active role in public education and training systems.** India's IT industry learned early on that it needed to shape the curricula at engineering colleges and provide on-campus training to ensure that students got the skills they needed. Companies can play a larger role in shaping educational content in colleges. For example, they can help develop specific requirements tied to real-world job requirement in STEM education, or design medical technology and health care certification courses in community colleges that fit their needs. The "Great Minds in STEM" initiative, funded in part by Boeing, is committed to increasing STEM education attainment among Hispanic students in the United States through an extensive community and school outreach program.
- **Participate directly in the education sector.** The education and training industry is large and has strong growth potential. With total educational spend of about \$2.7 trillion, it accounted for about 4.25 percent of the world's GDP in 2010. Private-sector players will have opportunities from rising demand in segments not well covered by the public education system (e.g., adult education and vocational training). For example, Anhanguera, Brazil's leading for-profit professional education company, has become the largest post-secondary education institution in the country. Its 73 campuses handle more than 400,000 students per year in vocational and training programs. It also has 500 distance-learning centers.
- **Shift investments in technology and innovation from labor-saving strategies to skill-saving ones.** Technology innovators have been very successful in developing solutions to optimize labor costs. In a skills-scarce world, the focus will need to shift to making the most of the skills that workers have. Technologies that substitute skills make workers more productive. For instance, companies in retail trade that invested in bar-coding devices made their staff at check-out counters more efficient. In other cases, technology can help reduce the level of education or skill required to perform a job. Smart technology devices used by low-skill workers can equip them to

perform more high-skill jobs. For example, 20,000 less-skilled workers are now working as rural banking agents in Southern India, as part of a financial inclusion program, disbursing payments via smart cards, cell phones and kiosks. Crowd-sourcing, meanwhile, is emerging as a viable work model for finding workers to perform routine “micro-tasks.” For example, Amazon’s Mechanical Turk, an Internet marketplace, enables businesses to hire workers to perform simple tasks such as writing product descriptions or identifying people in photographs. Such a platform could also be deployed for high-skill work. Open innovation platforms like InnoCentive’s challenge platform and TopCoder, an online competitive community for software development and digital asset creation, represent another model, geared more toward high-skill workers.

- **Offer flexible work and compensation structures for older workers.** Companies can take steps to retain the skills and institutional knowledge of their older employees, while accommodating their lifestyle preferences. Instead of losing experienced workers overnight to full retirement, companies can give older workers the option to cut back to part-time and work remotely. In Japan, Toyota has a re-employment program under which about half of all retiring employees are rehired, in new half-time roles at Toyota or in affiliate companies, with compensations reset to reflect their part-time roles.
- **Improve productivity of knowledge workers.** Companies also have an opportunity to address potential skill gaps by rethinking how their organizations work so they can do more with fewer knowledge workers. Compared with other occupations, professional and managerial work has not received as much attention in corporate productivity efforts as more labor-intensive occupations. According to MGI research that is under way,⁵⁷ by using social platforms as a primary way to communicate and collaborate, large organizations could realize improvements in knowledge-worker productivity in the region of 20 percent. This would come from vastly reducing the time it takes to write and answer emails, eliminating lengthy searches for internal knowledge and expertise, and other tasks that consume the equivalent of a day’s work per week. So far, few corporations have been willing to commit fully to social technologies, which require a level of open communication and information sharing that challenges existing norms.
- **Shape corporate social responsibility initiatives around employment priorities.** Companies can focus CSR efforts on the issues of youth unemployment and the challenge of bringing the long-term unemployed back into the workforce. The beverage company Diageo, for example, set up Tomorrow’s People, a UK-based charity that has helped more than 400,000 long-term unemployed find jobs, education, or training. Three-quarters of the people it helps place remain employed after a year. Diageo supported the charity, now an independent entity, with investments of nearly \$40 million, jobs in Diageo-owned businesses, and operational help.

⁵⁷ This research is due to be published in an MGI report on the impact of social technology in the summer of 2012 (www.mckinsey.com/mgi).



Throughout the 20th century, industrialization, innovation, and advances in technology resulted in record wealth creation and rising living standards across advanced economies, which globalization has shared with developing economies in the past 30 years. Work itself evolved. It takes less human labor to grow food and build products, but it takes more human knowledge and ingenuity to innovate, raise productivity, and manage complex systems. As the 21st century unfolds, we see that too many of the world's workers are not properly prepared for the evolving global labor market. We also see that the resulting skill gaps could create large imbalances that may lead to undesirable outcomes. Rising income polarization, growing pools of unemployed or under-employed workers, and soaring social costs are real possibilities—and could place a permanent drag on growth and retard progress in living standards. To keep such possibilities from becoming realities, policy makers, business leaders, and workers themselves must find ways to bring education, training, and job creation into the 21st century.

Appendix: Technical notes

These technical notes provide more detail of definitions, data, and methodologies used in this report. We address the following points:

1. Rationale for building independent perspectives on labor supply and demand
2. Data sources
3. Classification of countries
4. Projecting labor supply
5. Projecting labor demand

1. RATIONALE FOR BUILDING INDEPENDENT PERSPECTIVES ON LABOR SUPPLY AND DEMAND

We build independent perspectives on the future evolution of demand and supply of labor by skill levels of labor force participants. Supply of labor is defined as the number of working-age people (aged 15 years and older) who are willing to work, adjusted for the rate of unemployment. Demand for labor is defined as the number of jobs required to deliver a certain output level, assuming a certain level of labor productivity. Supply and demand for labor always match in history. When we project supply and demand over a ten- or 20-year time frame, we use the natural rate of unemployment to project supply. In the long run the natural rate of unemployment is assumed to be the rate of unemployment at which supply is equal to demand.

Imbalances that we project at a skill level are thus notional—they will never really materialize. Market forces and changes in behavior are likely to rebalance supply and demand in the long term. A surplus of labor in a certain skill category can be corrected by workers in that category opting out of the labor force. Wages can fall to the point where employers can get a desired quantity of output for a desired cost. Or output can be reduced to reflect a tight or too costly labor supply. Skill shortages can be corrected through higher wages, which will attract more workers with the needed skills; eventually, as supply rises, wage growth will slow. Notional imbalances can also be addressed through trade and offshoring. Modeling “imbalances” is a useful methodology to frame a discussion about the implications of current demand and supply trajectories for labor markets a decade or more in the future.

2. DATA SOURCES

We use data on population from the United Nations Population Division, 2010 revision, for the period of 1980 to 2030. For labor force participation rates, we use ILO LaborSta. Our data on national and sector GDP come from McKinsey's Global Economic Growth database and three external sources: Global Insight, Oxford Economics, and the Economist Intelligence Unit. For educational attainment, we use estimates from the International Institute for Applied Systems Analysis (IIASA) of the share of working-age population in four education buckets (no schooling, primary, secondary, and tertiary) for the 1980 to 2030 period.

Additional data sources extensively used include the World Bank for various socioeconomic indicators (e.g., GINI index), the United Nations for several demographic variables (e.g., median age, average marriage age, average maternal age, total fertility count), OECD for metrics on advanced economies (e.g. retirement ages), and EU KLEMS for detailed sector-wise breakdown of output, employment, and labor compensation for the OECD countries. For China's labor model, we use the China census data, China National Bureau of Statistics, other government sources such as the Ministry of Education, and MGI's China Urbanization database. For India's labor model, we use India census data, National Sample Survey Organization's Employment and Unemployment Survey (1993, 2000, 2005, 2008, and 2010), Ministry of Human Resources Development, and other sources such as IndiaStat and Barro-Lee. Our work on the US labor model uses data from the US Bureau of Labor Statistics, while that for France makes extensive use of data from France's INSEE (National Institute of Statistics and Economic Studies).

3. CLASSIFICATION OF COUNTRIES

Our global labor supply and demand model covers 70 countries, accounting for 87 percent of world population and 96 percent of world GDP. To develop a meaningful way of analyzing these diverse countries, we classify them into eight clusters based on three key labor market characteristics: GDP per capita, median age, and an education index based on estimates of the average years of schooling of the working-age population in 2010. Our data on GDP per capita are based on consensus estimates from Global Insight, the Economist Intelligence Unit, and Oxford Economics, and on median ages from the United Nations. We calculate the education index using the shares of working-age population at each educational attainment level, and provide weights reflecting years of schooling each level implies. These are approximations of years of schooling and therefore should be interpreted as relative measures of aggregate educational attainment rather than absolute levels of schooling. Using these parameters, we classify countries into eight distinct clusters:

- 636 million workers in the four advanced economy clusters. Of these, three clusters, comprised of countries with GDP per capita greater than \$20,000, are described as “advanced economies” throughout this report. The fourth cluster, “Russia and Central and Eastern Europe,” shares many characteristics with the more advanced economies, but average per capita GDP is not greater than \$20,000.
 - **The “Aging advanced” cluster** comprises 145 million workers in ten countries. The working-age populations of these countries have median ages of 41 years or higher and education indices of greater than 11. Their GDP per capita was between \$30,000 and \$45,000 at PPP 2005 levels in 2010. Countries classified as “Aging advanced” are Japan, Germany, the Netherlands, Belgium, Sweden, Austria, Switzerland, Hong Kong, Denmark, and Finland.
 - **The “Young advanced” cluster** comprises 290 million workers in 11 countries. The working-age populations of these countries have median ages lower than 40 years and education indices of greater than 11. Their GDP per capita was between \$25,000 and \$50,000 at PPP 2005 levels in 2010.⁵⁸ Countries classified as “Young advanced” are the United States, France, the United Kingdom, South Korea, Canada, Australia, Israel, Singapore, Norway, Ireland, and New Zealand.
 - **The “Southern Europe” cluster** comprises 60 million workers in four countries. The working-age populations of these countries have median ages of 41 years or higher⁵⁹ and education indices of nine to 11 years. GDP per capita in 2010 was between \$20,000 and \$30,000 at PPP 2005 levels. Countries classified as the Southern Europe cluster are Italy, Spain, Greece, and Portugal.
 - **The “Russia and Central and Eastern Europe” cluster** comprises 141 million workers in eight countries. The working-age populations of these countries have median ages over 35 years and education indices of greater than 10. Their GDP per capita was between \$10,000 and \$20,000 in 2010.⁶⁰ Countries classified as the “Russia and Central and Eastern Europe” cluster are Russia, Ukraine, Poland, Romania, Czech Republic, Hungary, Slovakia, and Croatia.
- 2.2 billion workers in four developing economy clusters, each with GDP per capita less than \$20,000⁶¹ at a 2005 PPP level.
 - **China** comprises 783 million workers. Its working-age population has a median age of 35 years and its education index is ten in 2010. Its GDP per capita was around \$6,700 at 2005 PPP levels in 2010.
 - **India** comprises 469 million workers. Its working-age population has a median age of 25, and its education index is seven in 2010. Its GDP per capita was around \$3,100 at 2005 PPP levels in 2010.

58 With the exception of South Korea (\$22,297).

59 With the exception of Spain (40.2 years).

60 With the exception of the Czech Republic (\$23,485) and Ukraine (\$6,000).

61 With the exception of United Arab Emirates (\$28,540).

- **The “Young middle-income” cluster** comprises 640 million workers in 24 countries. The working-age populations of these countries have median ages between 22 and 35 years and education indices of eight to 11 in 2010.⁶² Their GDP per capita was greater than \$3,000 and less than \$20,000 at PPP 2005 levels in 2010.⁶³ Countries classified as part of this cluster are Brazil, Mexico, Colombia, Argentina, Venezuela, Peru, Chile, Nicaragua, Iran, Egypt, Algeria, Saudi Arabia, United Arab Emirates, Jordan, Indonesia, Vietnam, the Philippines, Thailand, Turkey, South Africa, Malaysia, Sri Lanka, Kazakhstan, and Botswana.
- **The “Young developing” cluster** comprises 322 million workers in 11 countries. The working-age populations of these countries have median ages lower than 25 years, and education indices of less than nine in 2010. Their GDP per capita was less than \$3,000 at PPP 2005 levels in 2010.⁶⁴ Countries classified as the “Young developing,” mainly from South Asia and sub-Saharan Africa, are Pakistan, Bangladesh, Nigeria, Ethiopia, Tanzania, Kenya, Morocco, Uganda, Ghana, Mozambique, and Côte d’Ivoire.

4. PROJECTING LABOR SUPPLY

Estimating aggregate employable labor force

Supply of labor is defined as the number of working-age people (aged 15 years and above) who are willing to work, minus the number of workers who are unemployed. To estimate the labor supply projections used in this report, we build a model of labor force participation rates for each of six age and gender cohorts in each country, apply these to population estimates from the United Nations, and adjust for estimated natural unemployment rates. We then estimate the educational mix of the projected supply using a combination of available estimates of population-level educational attainment and our model of labor force educational attainment. We focus on two periods, the decade up to 2020, and the subsequent decade to 2030.

We use the following labor supply relationship to define the employable labor force:

$$\begin{aligned} \text{Employable labor force} = & \\ & \text{Working-age population} \times \text{labor force participation rate} \\ & \times (1 - \text{natural unemployment rate}) \end{aligned}$$

We apply this approach to world population, as represented by our sample of 70 countries in 2010, to estimate the total employable labor force. These countries represent a total population of 6.0 billion people, 4.5 billion of whom are of working age. Of the working-age population, 62 percent are employed or willing to work, resulting in a labor force of 2.9 billion. Unemployment takes away 0.2 billion potential workers worldwide to leave an employed labor force of 2.7 billion in 2010 (Exhibit A1).

62 With the exception of Kazakhstan (12.5 years education index).

63 With the exception of United Arab Emirates (\$28,540).

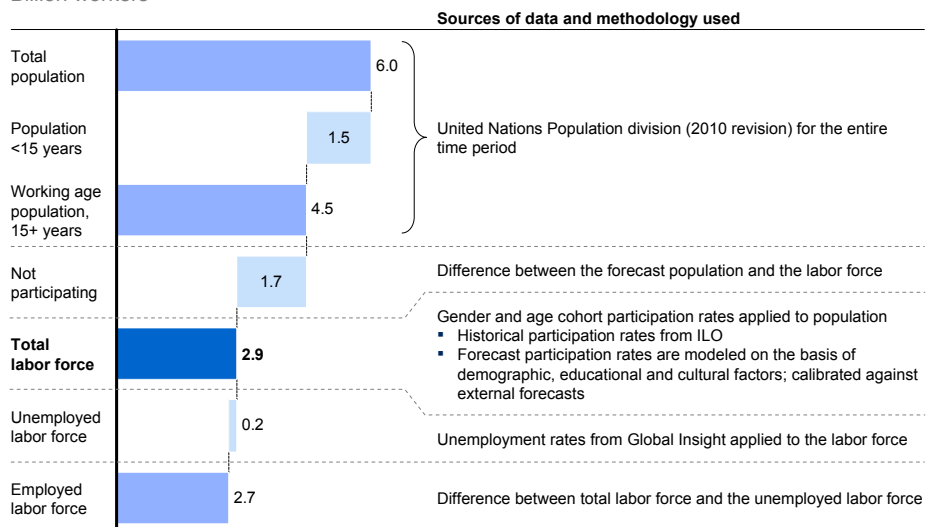
64 With the exception of Morocco (GDP per capita of \$7,095 and median age of 26.2 years).

Exhibit A1

Labor supply overview—global aggregate

■ Detailed further

Global labor supply, 2010
Billion workers



SOURCE: United Nations Population Division (2010 revision); ILO; local statistics for China and India; McKinsey Global Institute analysis

We use this relationship to estimate the employable labor force for each country from 1980 to 2010, using the actual rate of unemployment each year. We use the same identity to project employable labor force growth from 2010 to 2030 for each country, assuming that the natural rate of unemployment will prevail in the long term. For the United States and France, we use detailed labor supply projections from previous MGI studies.⁶⁵ For India and China, we build bottom-up country-level estimates of these numbers using a combination of government data and global data sources. For the other 66 countries, we draw exclusively on global data sources.

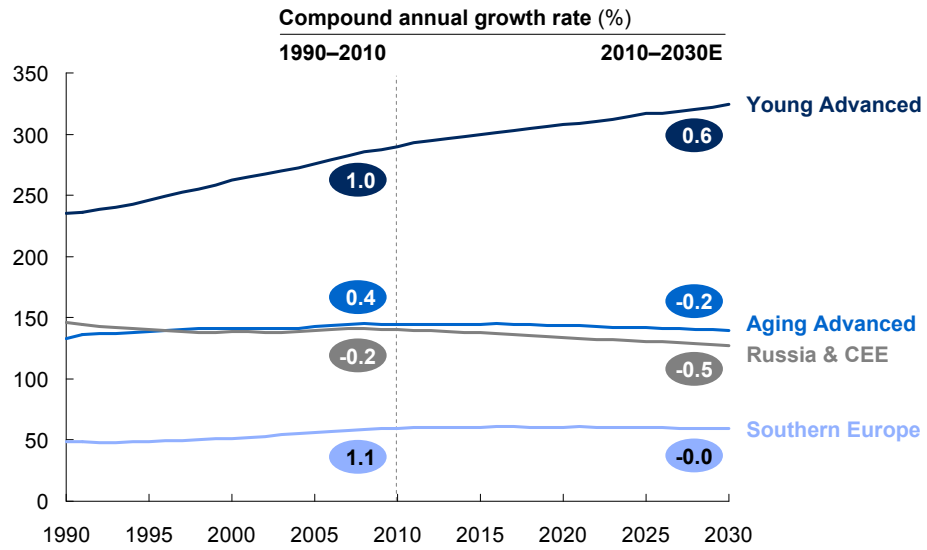
For population, we use forecasts from the United Nations Population Division, 2010 revision (medium variant), for both historical and forecast time period 1980–2030. We estimate labor force participation rates using a methodology described in the following section. We then estimate the unemployed proportion of the labor force using estimates of the natural rate of unemployment from Global Insight. Our projections suggest that all clusters will experience slower growth rates in labor force in the decades to come, even as the deceleration of labor force growth in the advanced economies and China will be the most significant (Exhibits A2 and A3).

⁶⁵ *French employment 2020: Five priorities for action*, McKinsey Global Institute, March 2012; and *An economy that works: Job creation and America's future*, McKinsey Global Institute, June 2011 (both available at www.mckinsey.com/mgi).

Exhibit A2

Projected global labor force growth across clusters

Global labor force, advanced clusters
 Million workers

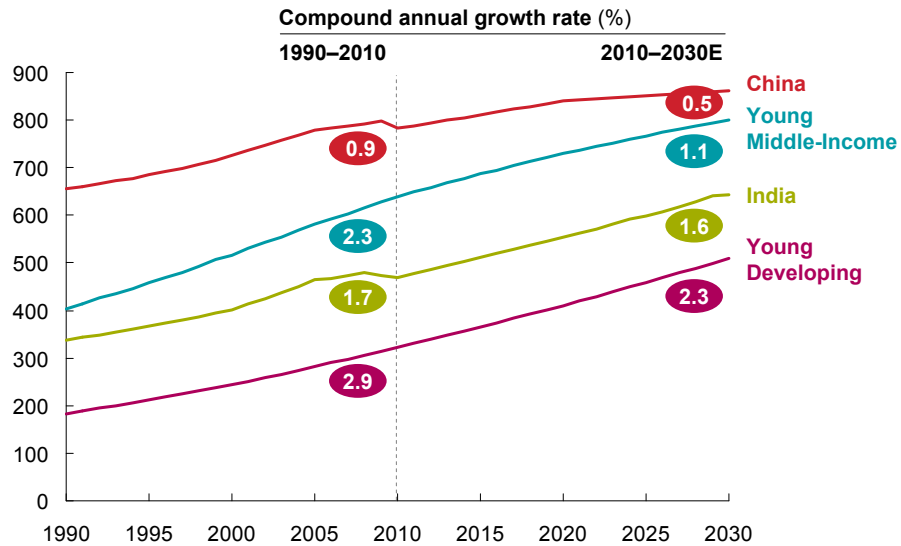


SOURCE: United Nations Population Division (2010 revision); ILO; McKinsey Global Institute analyses

Exhibit A3

Projected global labor force growth across clusters

Global labor force, advanced clusters
 Million workers



SOURCE: United Nations Population Division (2010 revision); ILO; McKinsey Global Institute analyses

Estimating labor force participation rates

To project the labor force participation rates, we divide the countries into three groups based on broad stages of development, and estimate participation drivers for each age and gender cohort. Ordinary least squares (OLS) regressions are used for each gender and age cohort to identify historical drivers of participation rates, and projected values of these independent variables are then applied to these regression equations to estimate participation rate in the future. Finally, we validate our projections of labor supply, aggregated across age and gender cohorts, against projections of total labor force by Oxford Economics, the Economist Intelligence Unit, Global Insight, and the ILO.⁶⁶ Based on this methodology, we project a 1.7 percentage point decline in the global labor force participation rate through 2030. Most of this decline is a function of the aging population structure. We estimate that the global labor force participation rate would decline by 1.2 percentage points based on 2010 age and gender cohort levels. For instance, the share of older people (i.e., older than 55 years) is projected to increase from 23 percent of the global working-age population currently to 31 percent by 2030. People in this age cohort have an estimated participation rate of 39 percent, compared with 80 percent for the prime working-age population (Exhibit A4).

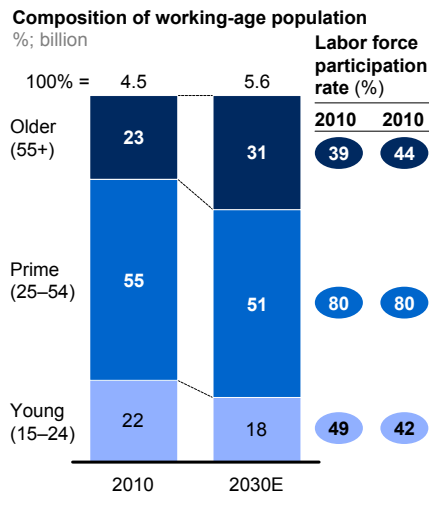
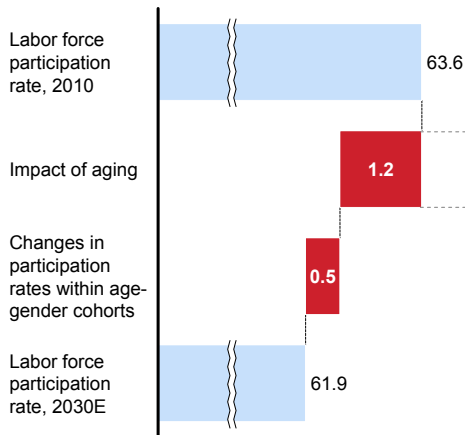
Exhibit A4

Aging is projected to drive a decline in the global labor force participation rate by 2030



Global aggregate

Drivers of change in labor force participation rate % of working-age population



NOTE: Numbers may not sum due to rounding.

SOURCE: China National Bureau of Statistics, United Nations Population Division (2010 revision), McKinsey Global Institute analysis

The participation rates in each age and gender cohort are influenced by a diverse set of drivers. Overall, we project that the participation rate of the young segment will decline as more young people seek higher education, while that of older workers is projected to increase, as they stay in the labor force longer to augment retirement savings. Participation rates for prime working-aged women are likely to hold steady at a global level; rates will likely decline in developing economies that are transitioning to higher income and education levels and will likely increase in the advanced economies (Exhibit A5).

⁶⁶ We use this approach since most other estimates are either less granular or have a shorter-term horizon than the focus of this report.

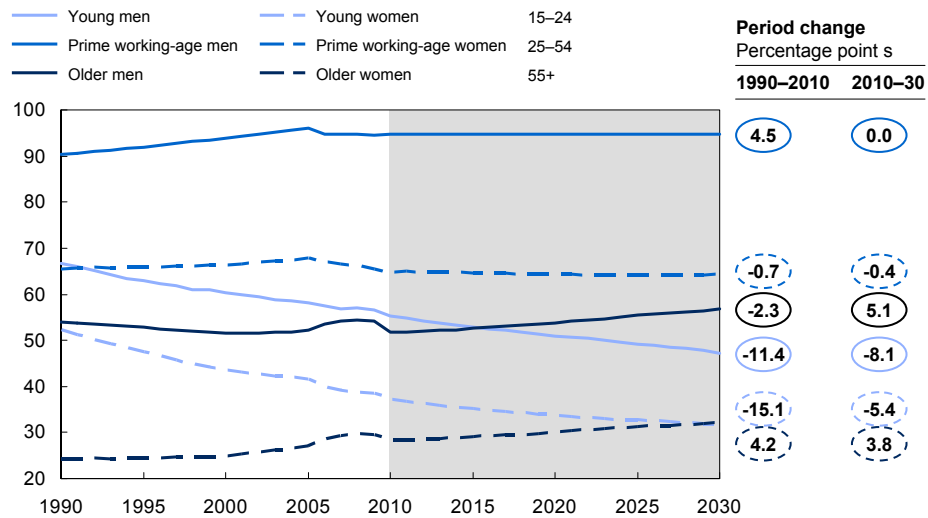
Exhibit A5

Projected trends in global participation rates by age and gender

■ Modeled

Labor force participation rate, global

% of 15+ population



SOURCE: United Nations Population Division (2010 revision); ILO; local statistics for India and China; McKinsey Global Institute analysis

- **Young workers, aged 15 to 24 years:** Higher educational attainment and rising income are the key factors that drive labor participation rates across countries. Rising national levels of secondary and tertiary education result in a lower participation rate during these years, because young people remain in school longer rather than entering the workforce. Also, as incomes rise, families can afford for their children to pursue higher education, rather than contribute to family income. In addition, favorable social norms (e.g., rise in marriage age), improves participation among young women in developing countries.⁶⁷
- **Prime working-age workers, aged 25 to 54 years:** Across countries, higher education and rising income levels are the main drivers of rising participation for male workers in this age cohort. More education imparts more skills and enhances job opportunities. As incomes and overall economic activities in a nation rise, employment opportunities also increase. Additionally, a rising share of trade in overall national output (e.g., in nations such as China, Latin America, and the Middle East) generates employment opportunities and drives up participation. In poorer countries, growth in the share of labor-intensive agriculture and service sectors boosts participation rates. Like men, prime working-age females increase their participation with higher educational attainment. However, cultural norms also affect participation decisions of prime working-age female workers. In advanced economies, higher ages of child bearing and the rising availability of part-time work options boost participation. In developing countries, higher marriage ages and lower fertility

⁶⁷ Alessandra Fogli and Laura Veldkamp, *Nature or nurture? Learning and the geography of female labor force participation*, *Econometrica* Vol. 79, No. 4, July 2011.

rates (i.e., number of children born per woman) drive an increase in the participation rate.⁶⁸

- **Older workers, aged 55 years and more:** The most critical driver of participation among senior people is the economy's rate of aging, measured as the share of working-age population aged 55 years and over. A greater share of older people in the population leads to higher economic need for seniors to work. Particularly in advanced economies, the rate of aging, along with higher life expectancy and rising retirement ages, tends to increase the participation rates of older workers. In developing countries, as income levels rise out of subsistence, older workers have improved opportunities for retirement and leisure, and thus senior participation rates tend to drop with higher income levels.⁶⁹

Estimating the educational attainment of labor supply

Having projected employable labor force, we then project the educational attainment rates of our estimated labor force. Again, for the United States, France, China, and India, we build detailed educational attainment models for secondary and tertiary attainment of the working-age population, based on past and estimated future gross enrollment ratios and completion rates for key age and gender cohorts, as well as official government estimates and targets. For the other countries in our sample, we use IIASA estimates of educational attainment for the entire 1980–2030 period. This method assumes constant participation rates across different education levels.

For China and India, we conduct a bottom-up estimation of the educational attainment. First we compute the number of people currently enrolled by multiplying gross enrollment ratios with population in the corresponding age bucket. Next, we divide the people enrolled by average number of course years and adjust for dropouts to estimate yearly flows. Finally, we add this to the previous year's stock and adjust for mortality to calculate next year's stock.

These projections suggest that the share of the working-age population with tertiary education in the advanced economies will rise to 31 percent by 2030, from 24 percent in 2010 (Exhibit A6). China is likely to have 2.5 times as many college graduates in 2030 as it did in 2010, despite only a 14 percent rise in the working-age population over this period (Exhibit A7). India, aided by both expanding cohorts of young people as well as increasing attainment, is projected to triple the number of citizens with tertiary education and almost double the number of people with a secondary education by 2030. However, the share of people with primary education or less will stay high, at 55 percent (Exhibit A8). All other economies⁷⁰ in aggregate are likely to see a 60 percent increase in their share of population with secondary or higher educational attainment, but with a continued large share (37 percent) with primary schooling or less education (Exhibit A9).

68 Saul D. Hoffman, "The changing impact of marriage and children on women's labor force participation," *Monthly Labor Review*, Vol. 132, No. 2, 2009 and Julie L. Hotchkiss, "Changes in the aggregate labor force participation rate," *Federal Reserve Bank of Atlanta Economic Review*, Vol. 94, No. 4, 2009.

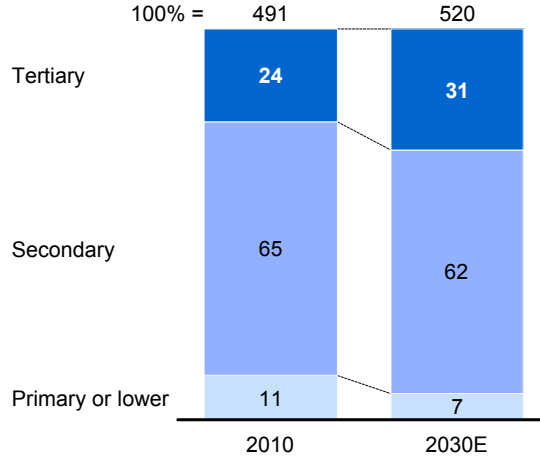
69 Martin O'Brien, "Older male labour force participation in OECD countries: Pension reform and 'The Reserve Army of Labour,'" *International Labour Review*, Vol. 149, No. 3, 2011.

70 Includes Young developing, Young middle-income, and Russia and Central & Eastern Europe clusters.

Exhibit A6

By 2030, the number of workers with tertiary education in advanced economies is projected to rise to 31 percent

Composition of labor force¹
%; million workers



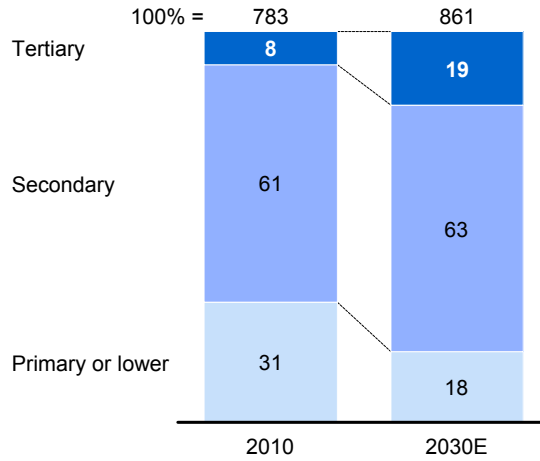
¹ Includes Young Advanced, Aging Advanced and Southern Europe clusters.
NOTE: Numbers may not sum due to rounding.
SOURCE: United Nations Population Division (2010 revision); ILO; IIASA; local statistics for India and China; McKinsey Global Institute analysis

Exhibit A7

China is projected to have about 2.5 times as many workers with tertiary education in 2030 as it had in 2010



Composition of labor force
%; million workers



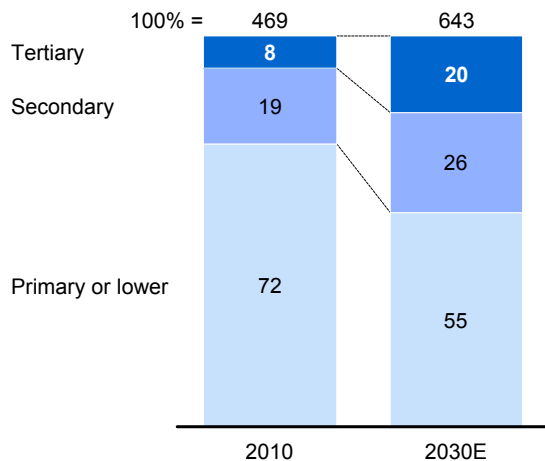
NOTE: Numbers may not sum due to rounding.
SOURCE: United Nations Population Division (2010 revision); ILO; IIASA; local statistics for India and China; McKinsey Global Institute analysis

Exhibit A8

India is projected to triple the college graduates in its labor force by 2030 and nearly double secondary school graduates



Composition of labor force
%; million workers



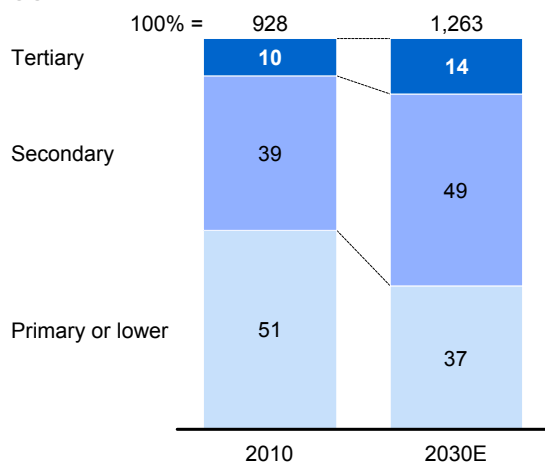
NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations Population Division (2010 revision); ILO; IIASA; local statistics for India and China; McKinsey Global Institute analysis

Exhibit A9

In developing economy clusters the number of workers with secondary or higher education is projected to grow by 60 percent

Composition of labor force¹
%; million workers



¹ Includes Young Middle-Income and Young Developing clusters

NOTE: Numbers may not sum due to rounding.

SOURCE: United Nations Population Division (2010 revision); ILO; IIASA; local statistics for India and China; McKinsey Global Institute analysis

5. PROJECTING LABOR DEMAND

Estimating aggregate labor demand

Demand for labor is defined as the number of jobs required to deliver a certain GDP level, assuming a certain level of productivity (output per worker). We assume that countries need to reach a targeted level of GDP growth, which they achieve through a combination of productivity and job growth.

We use the following labor demand relationship to project future employment demand:

$$\text{Labor demand} = (\text{Output} \div \text{Labor force productivity})$$

While we project labor supply for all 70 countries in our sample, we project labor demand for a smaller set of countries. For our four deep-dive countries, we use this labor demand formula to estimate aggregate labor demand on a sector-by-sector basis, and for other advanced economies, we build a top-down broad estimate of aggregate labor demand. For the United States and France, we use detailed sector-level labor demand projections from previous MGI studies. For China and India, we build a model to project labor demand at a sector level, described below. For other advanced economies, we project aggregate demand using top-down GDP growth forecasts from Global Insight, Oxford Economics, and the Economist Intelligence Unit, along with a range of productivity growth rates that are +/- 5 percent of historical growth rates. Finally, we estimate labor demand for non-farm sectors broadly for the “Young developing” nations, by assuming this is equivalent to their growth in labor supply.

For China and India, we build detailed bottom-up projections of labor demand at a sector level. First we project total output using a range of GDP forecasts, including forecasts from Global Insight, Oxford Economics, the Economist Intelligence Unit, and McKinsey’s Global Growth Model. We then translate these output assumptions into sector-level output growth forecasts within each country, by aligning sector output forecasts obtained from Global Insight to match with aggregate economy growth rates (obtained from consensus of above sources). For each sector, we develop an estimate of likely productivity growth.

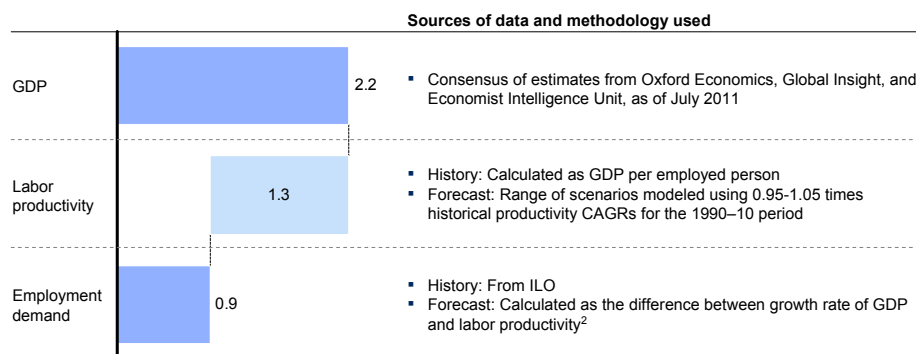
For key sectors such as agriculture, manufacturing, and construction, which account for almost two-thirds of global employment, we build sector productivity estimates using independent variables such as capital intensity, and sector-specific variables such as the size of agricultural landholding for agriculture, the share of manufacturing in the organized manufacturing sector, and the share of construction in residential housing for the construction sector. For other sectors, we project productivity by examining the historical trend in the relationship between output growth and productivity growth, which we check using cross-country benchmarks. Based on these projections, we derive labor demand for each sector as an outcome of output growth, less productivity growth. These projections suggest that productivity gains are likely to drive some 60 percent of global GDP to 2030 (Exhibit A10). For China and India, the share of productivity is likely to be even higher.

Exhibit A10

Productivity gains are projected to drive 60 percent of the future output growth in advanced economies

Growth of labor demand, advanced economies, 2010–30E¹

Compound annual growth rate, %



¹ Includes Young Advanced, Aging Advanced and Southern Europe clusters.

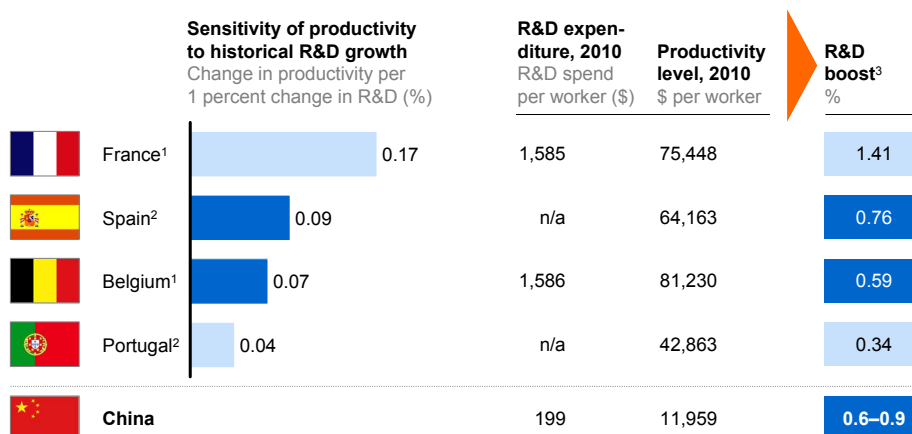
² All estimates at a sector-level for the United States, France, China, and India.

SOURCE: United Nations Population Division (2010 revision); ILO; Global Insight; Oxford Economics; Economist Intelligence Unit; local statistics for China and India; McKinsey Global Institute analysis

For China, we estimate an aggregate productivity growth of 6.5 percent annually to 2030 that will account for more than 90 percent of forecast GDP growth of 6.9 percent per year. Of this productivity growth, about 5.2 percent can be obtained through historical drivers, such as rising tertiary education and rising investments in capital. The balance, about 1.3 percentage points per year, would have to come from additional measures to raise productivity, such as higher investments in R&D. We estimate that higher R&D expenditure per worker can get China 0.9 points per year of productivity. This assumes R&D will rise to the levels of European countries such as Spain, Portugal, and Belgium by 2030 and will deliver the same level of output increase per unit of R&D for China as such investment has done in those economies. R&D expenditure covers a range of productivity-enhancing initiatives (such as organizational restructuring, process streamlining, and complete redesign of assembly plants using new technologies) that China's manufacturing and services sectors are likely to implement in the coming decades in response to tighter supply dynamics in the labor market (Exhibit A11). As in the advanced economies in the past three decades, job growth in China will likely to be concentrated in services sectors in the next two decades, with virtually all the output growth in agriculture, mining, and manufacturing arising from productivity gains rather than employment growth (Exhibit A12).

Exhibit A11

Based on experience of Belgium and Spain, China could boost productivity growth by up to ~0.9 percent through higher R&D spending



1 Estimated using ordinary least squares (OLS) regression of productivity against R&D spending per worker, gross fixed capital formation per capita, and higher education rate.

2 Estimated using OLS regression of productivity against the share of older population, R&D spending per worker, gross fixed capital formation per capita, and secondary education rate.

3 Assuming the R&D growth rate of 8.39% per annum.

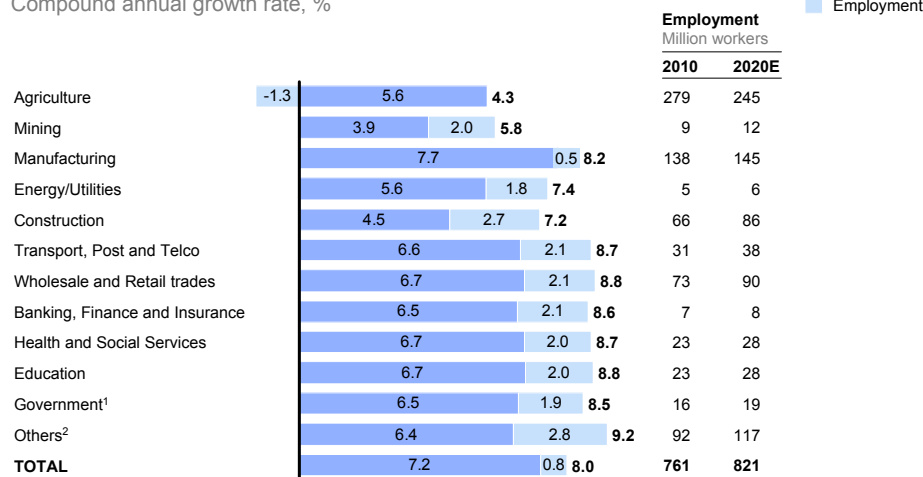
SOURCE: China National Bureau of Statistics; Global Insight; McKinsey Global Institute analysis

Exhibit A12

70 to 75 percent of the growth in China's non-farm sectors through 2020 is projected to come from productivity gains

Sector productivity and employment growth, 2010–20

Compound annual growth rate, %



1 Government agencies, party agencies, and social services.

2 "Others" included in the tertiary sector by China National Bureau of Statistics.

SOURCE: China National Bureau of Statistics; Global Insight; Oxford Economics; Economist Intelligence Unit; McKinsey Global Growth Model; McKinsey Global Institute analysis

For India, we project productivity growth of 5.9 percent annually to 2030, which will account for about 80 percent of forecast GDP growth of 7.4 percent per year. Of this productivity growth, about 5.6 points are likely to come from historical drivers such as rising tertiary education rates and rising investments in capital. In India, we anticipate that over the period from 2010 to 2020, non-farm sectors will start to generate sufficient job growth to reduce farm employment on a net basis, providing additional productivity improvements for the economy. Our projections suggest that India’s manufacturing sector will add 36 million jobs in the next two decades, compared with just 8 million from 2000 to 2010. This scenario assumes that India will capture a larger share of global manufacturing jobs. At the same time, India’s service sector is likely to continue to grow jobs in line with the historic trend (Exhibit A13).

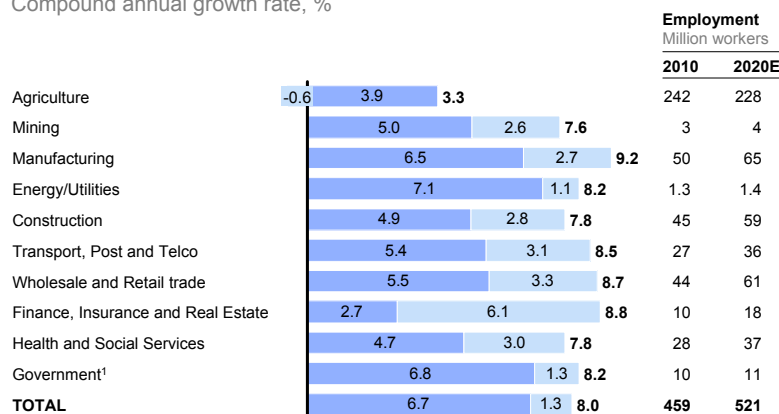
Exhibit A13

Productivity gains will contribute more to growth than new employment across most Indian economic sectors

Sector productivity and employment growth, 2010–20
Compound annual growth rate, %



■ Productivity
■ Employment



1 Public administration and defense.

SOURCE: National Sample Survey Organisation; Global Insight; Oxford Economics; Economist Intelligence Unit; McKinsey Global Growth Model; McKinsey Global Institute analysis

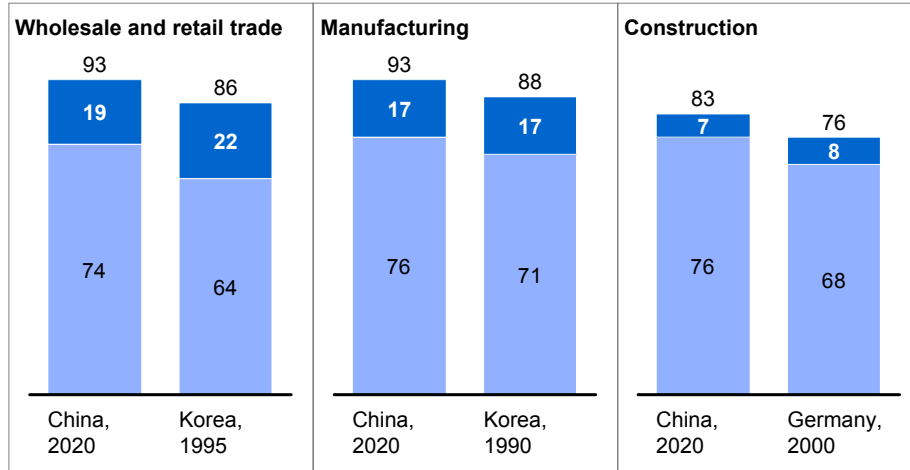
Estimating skill content or educational mix of labor demand

For the United States and France, we use detailed sector-level labor demand projections by skill level from previous MGI studies. For China and India, we build a perspective on the skill content of employment in major sectors. For three key sectors—manufacturing, trade, and construction—we estimate skill content by correlating the skill content of these sectors in a range of economies, including the United States, Germany, South Korea, and Brazil, against their capital intensity levels. We use the resulting relationship to project skill content for China and India, based on the expected level of capital intensity we project to 2020. For the higher-skill services sectors (i.e., other than trade and construction), we assume an estimated skill content of labor demand based on the historical trend within these countries and the experience of advanced economies (Exhibits A14 and A15). We then use the skill content of the United States and France to develop projected ranges of educational mix of labor demand for all other advanced economies. We use the current skill content of India to project the educational mix of labor demand in the “Young developing” economies.

Exhibit A14**In terms of skills required for key sectors, by 2020, China's labor profile is projected to resemble South Korea's in 1990**

Demand for secondary- and tertiary-educated workers
% of workers demanded by sector

■ Tertiary
■ Secondary



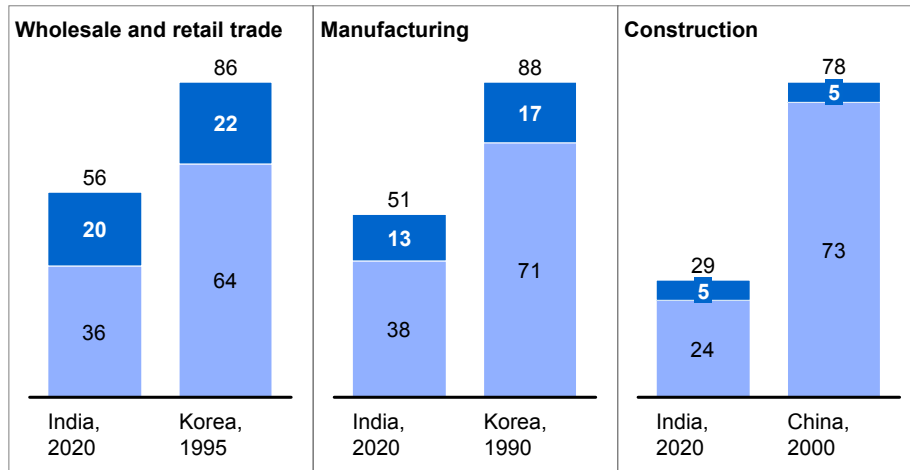
NOTE: Numbers may not sum due to rounding.

SOURCE: China National Bureau of Statistics; Korea's National Statistical Office; Germany's Federal Statistics Office; McKinsey Global Institute analysis

Exhibit A15**India would have less demand for workers with secondary and tertiary degrees in 2020 than South Korea or China at similar stages**

Demand for secondary- and tertiary-educated workers
% of workers demanded by sector

■ Tertiary
■ Secondary



NOTE: Numbers may not sum due to rounding.

SOURCE: National Sample Survey Organisation; Korea's National Statistical Office; China National Bureau of Statistics; McKinsey Global Institute analysis

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