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GLOBAL GROWTH: CAN PRODUCTIVITY SAVE THE DAY IN AN AGING WORLD?

JANUARY 2015

HIGHLIGHTS

Demographic shift
Peak employment in sight

Productivity challenge
Productivity needs to drive growth

Enabling growth
Competition, innovation, labor, and global integration

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The McKinsey Global Institute (MGI), the business and economics research arm of McKinsey & Company, was established in 1990 to develop a deeper understanding of the evolving global economy. Our goal is to provide leaders in the commercial, public, and social sectors with the facts and insights on which to base management and policy decisions.

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MGI is led by three McKinsey & Company directors: Richard Dobbs, James Manyika, and Jonathan Woetzel. Michael Chui, Susan Lund, and Jaana Remes serve as MGI partners. Project teams are led by the MGI partners and a group of senior fellows, and include consultants from McKinsey & Company's offices around the world. These teams draw on McKinsey & Company's global network of partners and industry and management experts. In addition, leading economists, including Nobel laureates, act as research advisers.

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GLOBAL GROWTH: CAN PRODUCTIVITY SAVE THE DAY IN AN AGING WORLD?

JANUARY 2015

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PREFACE

There is a great deal of emphasis currently on the short-term outlook for growth as many economies continue to experience disappointing recoveries from the 2008 global recession. However, there are pressing questions about the long-term growth outlook given fundamental and dramatic demographic shifts that are now under way.

The past 50 years was a period of exceptionally rapid economic expansion. Average per capita income almost tripled, and the global economy expanded sixfold in GDP terms. But the long-term growth outlook is extremely uncertain. Some observers raise the issue of challenging demographics; they talk about "secular stagnation" and express doubts about whether future growth can match its rapid upward trajectory of recent decades. Others point to the transformative impact of technology and paint a more optimistic picture. The debate about growth goes even deeper and broader than this. Many question whether—and how—growth can be sustainable and inclusive. There is a lively discussion about whether GDP is the right measure of growth. Amid such debate, it is difficult for policy makers and businesses to respond effectively.

In this report, the McKinsey Global Institute (MGI), which has studied growth in 30 industries in more than 20 countries over the past 25 years, reviews patterns of global growth over the past half century, focusing on the two key drivers of that growth—labor and productivity. Our broad finding is that, in the face of declining population growth that is putting pressure on the pool of available labor, the rate of GDP growth is set to be 40 percent lower than its rate over the past 50 years. To compensate fully for weakening labor growth would require productivity growth to accelerate by 80 percent from its historical rate. Drawing on five detailed sector case studies, we find that it is possible—but extremely challenging—to boost productivity growth by this margin. However, aggressive action would be needed to enhance competitiveness, harness technology, mobilize labor and further open up and integrate the world economy. Collectively, we need to engage in a frank conversation about the tough trade-offs that such action would entail.

In this analysis, MGI has taken a "classical" GDP and per capita GDP–based view of long-term growth. However imperfect a measure GDP is, it does provide an indication of the rate at which economic opportunities are expanding. The size of the overall economy matters for companies. The market opportunities for their products and services reflect both the number of consumers in each market as well as their average incomes. In developed markets, growth would make it easier to pay for rising pensions, social services, and public debt, and provide resources to spend on valuable non-economic goals, from environmental protection to art and culture, that some consider luxuries. Yet, in many parts of the world, there is still a very large vulnerable class that is nowhere near aspiring to a middle-class life. For them, continued growth in per capita GDP is an opportunity to climb the income ladder, join the expanding global consumer class, and achieve a basic standard of living enjoyed by so many others.

This research was led by Jaana Remes, an MGI partner based in San Francisco, together with the three directors of MGI: Richard Dobbs, James Manyika, and Jonathan Woetzel, who are based in London, San Francisco, and Shanghai, respectively. Eric Labaye, MGI Chairman and a director of McKinsey based in Paris, provided invaluable guidance throughout the effort. Andrew Jordan led the project team. The team comprised Neha Ajmera, Matt Linderman, Raman Sharma, Yihan Tan, Anna Thomas, Anna Volynets, and Amber Yang. We would like to acknowledge the helpful support and input of MGI colleagues Jonathan Ablett, Tim Beacom, Yougang Chen, Michael Chui, Alan FitzGerald, Susan Lund, Anu Madgavkar, Jan Mischke, Ganesh Raj, and Vivien Singer.

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This report contributes to MGI's mission to help business and policy leaders understand the forces transforming the global economy, identify strategic locations, and prepare for the next wave of long-term growth. As with all MGI research, this work is independent and has not been commissioned or sponsored in any way by any business, government, or other institution, although it has benefited from the input and collaborations that we have mentioned. We welcome your emailed comments on the research at MGI@mckinsey.com.

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January 2015

Worker operating factory computer
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CONTENTS

HIGHLIGHTS

Demographic tailwinds wane

Productivity-growth potential

Five sector cases

In brief

Executive summary **Page 1**
GDP has grown exceptionally rapidly over the past 50 years, powered by the twin engines of employment growth and productivity growth. But employment growth is set to slow dramatically, placing the onus on productivity growth to drive the world economy.

1. The growth debate **Page 13**
At a time of demographic and technological change, the outlook for growth is highly uncertain, making it difficult for policy makers and businesses to make decisions. There is contention about almost every aspect of the growth story.

2. Employment in an era of challenging demographics **Page 29**
Slowing growth in number of employees is reining back the rate of GDP expansion over the next 50 years. Peak employment is likely to occur in many countries within that period. Dependency ratios are rising.

3. Productivity prospects **Page 41**
At the (rapid) rate of productivity growth of the past 50 years, the rate of global GDP growth is set to decline by 40 percent and per capita GDP by almost 20 percent.

4. Productivity opportunities by sector **Page 53**
Five sector case studies suggest that there is scope to boost annual productivity growth to 4 percent. Three-quarters of that scope comes from catching up to best practice and the other one-quarter from innovation.

5. Ten key enablers to unlock long-term growth potential **Page 87**
Ample opportunities to boost productivity growth do not mean they are tapped into. Ten enablers that create transparency and competition, encourage innovation, mobilize labor, and further integrate the world economy can create the right environment.

6. A new conversation about long-term growth **Page 113**
A frank conversation is needed about the tough trade-offs required to boost productivity and growth. In the challenging era to come, all aspects of growth need to be debated, including its sustainability, equity, and even how to measure it.

Technical appendix **Page 119**

Bibliography **Page 125**

IN BRIEF

GLOBAL GROWTH: CAN PRODUCTIVITY SAVE THE DAY IN AN AGING WORLD?

What are the prospects for growth in the decades ahead? What will it take to get global growth going? These are contentious questions that MGI has attempted to answer in a new report focused on the G19 (the G20 minus the European Union) and Nigeria, which generate 80 percent of global GDP. The main findings include:

- GDP growth was exceptionally brisk over the past 50 years, fueled by rapid growth in the number of workers and in their productivity. Now the first of these is weakening, and even reversing in some countries. Employment growth of 1.7 percent between 1964 and 2014 is set to drop to just 0.3 percent a year. Peak employment is likely to occur within 50 years.
- The onus is therefore on productivity to drive long-term GDP growth. Even if productivity were to grow at the (rapid) 1.8 percent annual rate of the past 50 years, the rate of GDP growth would decline by 40 percent over the next 50—slower than in the past five years of recovery from recession. The global economy expanded sixfold in the 50 years after 1964 but would grow only threefold between 2014 and 2064, making it more difficult to meet social and debt obligations. To compensate fully for slower employment growth, productivity growth would need to be 80 percent faster, at 3.3 percent a year.
- The declining prime-working-age population share implies a 19 percent decrease in per capita income growth over the next 50 years. The waning of demographic tailwinds is expected to affect both developed and emerging economies. In Australia, Canada, Saudi Arabia, Brazil, and Mexico, per capita GDP could fall by more than 30 percent at historical productivity-growth rates. Globally, the standard of living would rise 2.3 times in the next 50 years from 2.8 times over the previous 50. To sustain past per capita income growth, historical productivity growth would need to accelerate by 22 percent.
- Five sector case studies—agriculture, food processing, automotive, retail, and health care—suggest that annual productivity growth to 2025 in the G19 and Nigeria could be as high as 4 percent, more than needed to counteract demographic trends. About three-quarters of the potential comes from the broader adoption of existing best practices—"catch-up" productivity improvements. The remaining one-quarter—counting only what we can foresee—comes from technological, operational, and business innovations that go beyond today's best practices and "push the frontier" of the world's GDP potential.
- Ten enablers could lift global GDP growth closer to its potential—although this will be extremely challenging—by creating transparency and competition, incentivizing innovation, mobilizing labor, and further integrating the world economy.
- We need a new, frank conversation about the tough trade-offs that will be required. We need more attention on resource productivity to avoid rapid growth imposing undue damage on the environment, and on how the fruits of growth are distributed not just between nations but within them. Finally, we need to improve how we measure growth.

The global growth challenge of the next 50 years

In the past 50 years, GDP growth has been achieved equally by increasing **productivity** and labor, but this is changing

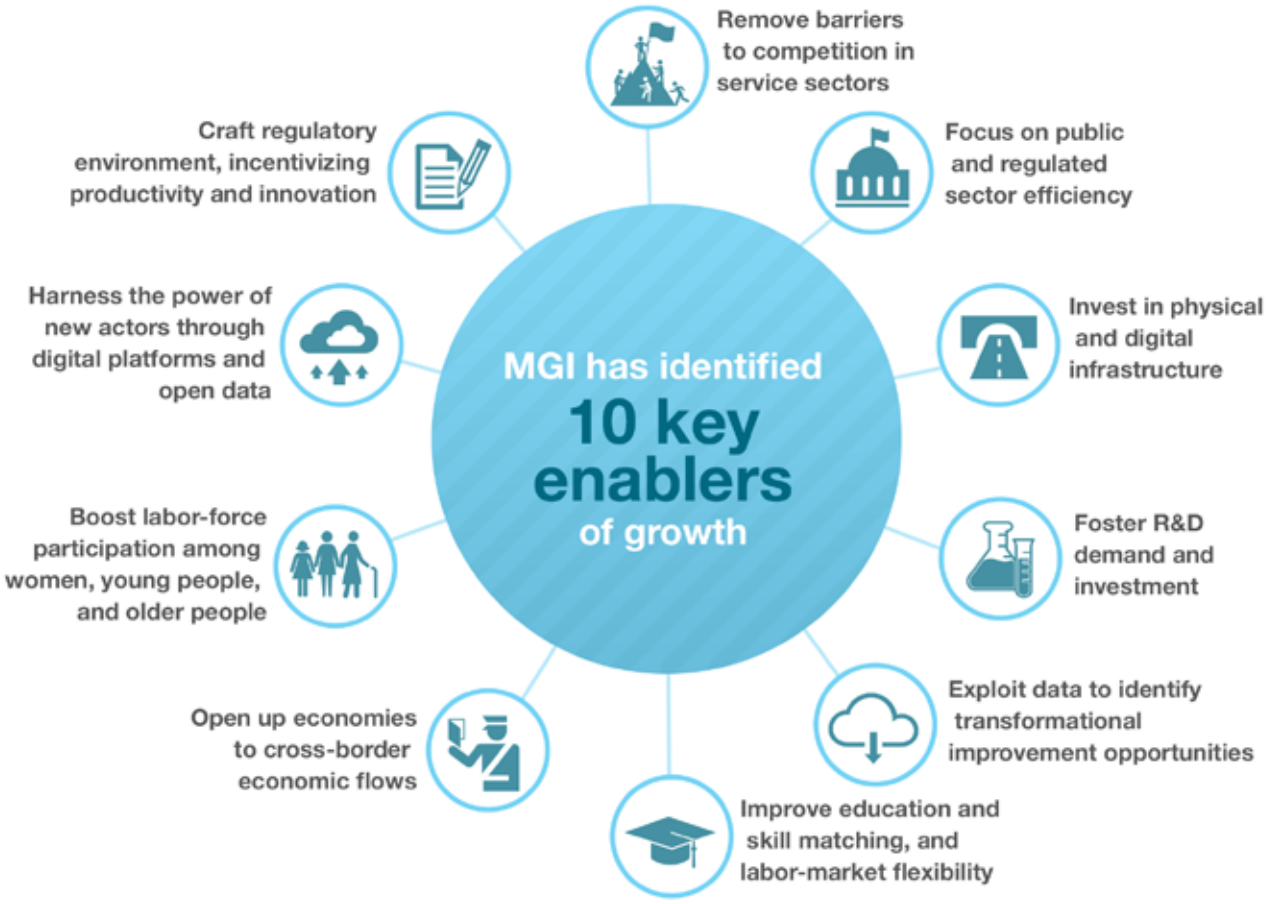
Even if productivity growth continues, labor expansion will *slow sharply,* cutting GDP growth

Five sector case studies find more than enough **productivity-acceleration scope** to counter slower labor growth

75%
from catching up to best practice

25%
from pushing the frontier

Achieving this acceleration will require an **enabling environment**



Auto assembly line, Cologne, Germany
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EXECUTIVE SUMMARY

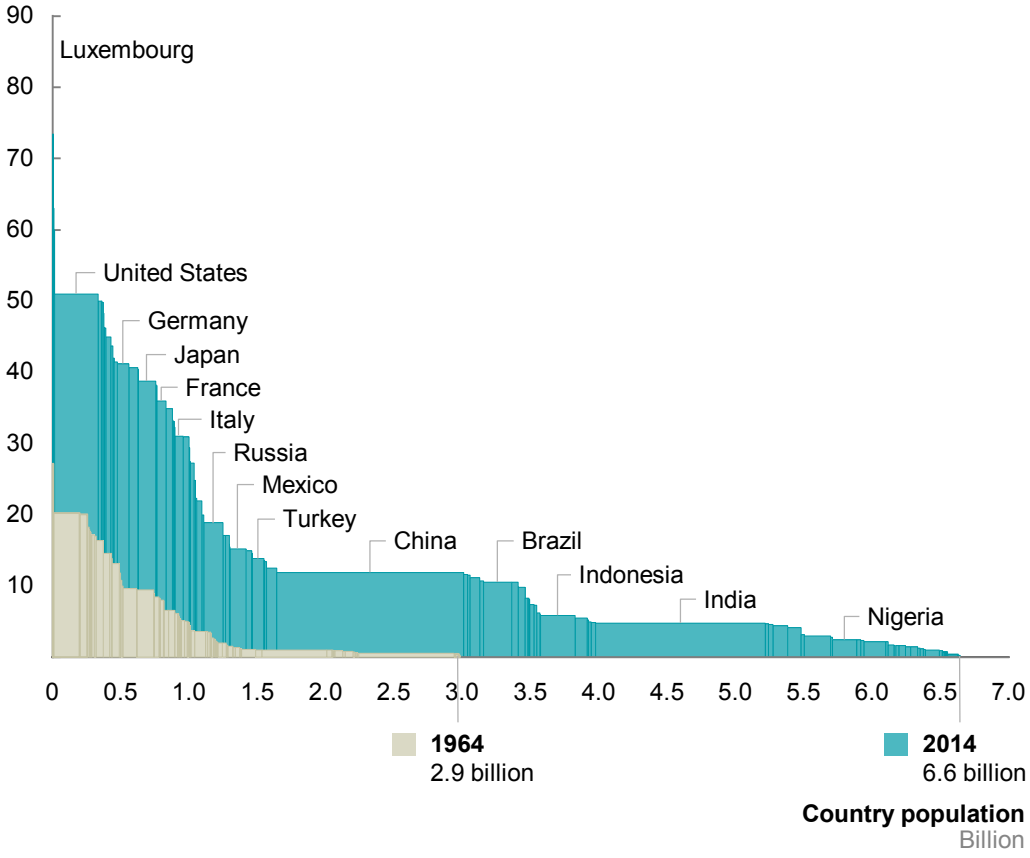
Over the past 50 years, the global economy expanded sixfold as the world's population and per capita income each grew at unprecedented speed. The global population more than doubled while average per capita income almost tripled to about $13,000 at 2012 purchasing power parity (Exhibit E1). However, there are significant doubts that this growth bonanza will continue in the long term given that the demographic tailwinds of the past half century are now waning.

6x
expansion in global GDP 1964–2014

3x
over next 50 years

Exhibit E1

Countries' population and per capita GDP have each grown strongly over the past 50 years[1]



1 Based on data for 99 countries, 1964–2014.

SOURCE: The Conference Board Total Economy Database; McKinsey Global Institute analysis

Views on the outlook for long-term growth diverge. Many people question whether growth is measured well (see Box E1, "GDP: Strengths and weaknesses"). Some even question whether growth should be a primary aspiration. However, the McKinsey Global Institute (MGI), the business and economics research arm of McKinsey & Company, has undertaken a major research effort on economic growth because we believe it matters. We do not see growth as an end in itself but as a critical enabler for meeting a much broader set of

Box E1. GDP: Strengths and weaknesses

We use changes in gross domestic product (GDP) as the metric for economic growth. Given the 50-year historical horizon of our analysis, there are no measures for assessing the overall economic evolution of a large number of countries other than GDP, the most widely available and commonly used metric.[1] We anchor our analyses on changes in aggregate GDP and look at changes in per capita GDP as a component of the total. Per capita GDP growth indicates improvements in material living standards and is itself a key economic indicator. The size of the overall economy matters, too. For companies, the market opportunities for their products and services reflect the number of consumers in each market as well as their average incomes. To assess environmental sustainability nationally and globally, incorporating the impact of the overall population is critical. More broadly, demographic trends can dramatically shape the economic, social, and political challenges and opportunities facing governments (for example, the capacity to meet social and debt obligations).

We fully acknowledge the many measurement challenges and conceptual shortcomings associated with GDP and welcome the many initiatives under way to refine and broaden the measurement of growth.[2]

[1] The one alternative could be gross national income (GNI), which allocates income from production by the nationality of the owner rather than the output of production based on the physical domicile of operations. However, for our analysis that looks at how employment and labor productivity contribute to changes in output, the geographic data available on jobs and establishments makes the latter a more suitable choice.

[2] For an overview of the evolution of GDP as a measure of economic performance and the challenges in its measurement and use, see Diane Coyle, *GDP: A brief but affectionate history*, Princeton University Press, 2014. For further discussion, see Human Development Reports published by the United Nations Development Programme since 1990 at www.hdr.undp.org/en; Millennium Development Goals reports and Beyond 2015 reports at www.un.org/millenniumgoals/reports.shtml; and the OECD's Better Life Index at www.oecdbetterlifeindex.org/. Also see Joseph Stiglitz, Amartya Sen, and Jean-Paul Fitoussi, *Report by the Commission on the Measurement of Economic Performance and Social Progress*, 2009; Yusuf J. Ahmad, Salah El Serafy, and Ernst Lutz, eds., *Environmental accounting for sustainable development*, World Bank, June 1989; and *Moving towards a common approach on green growth indicators*, Green Growth Knowledge Platform scoping paper, April 2013. See Chapter 6 for further discussion.

desirable goals. Growth is a way to expand economic opportunities to the many millions of people who remain vulnerable and poor. The challenges of meeting pension and other social obligations that increase as the population ages and of managing public debt are less severe in a growing economy. Forthcoming MGI research suggests that countries such as the United Kingdom and France would need to achieve long-term GDP growth that is more than 50 percent faster than historically in order to start reducing the ratio of public debt to GDP, given current fiscal balances and interest rates.[1]

The deep uncertainty about long-term growth prospects makes it difficult for decision makers in the public and private sectors to prepare for the future. This research is an attempt to clarify the potential paths ahead. The analysis draws on nearly a quarter century of MGI research on economic growth across the globe. The aim is to provide a fact base of past performance and future outcomes if current trends continue, and then to identify and estimate the size of the levers that could alter the long-term growth trajectory. This report focuses on the G19 and Nigeria, looking in particular at trends in employment—people working outside the home as employees or self-employed (including subsistence farmers)—and productivity, the two major drivers of long-term GDP growth.[2]

[1] Given that debt levels are fixed at nominal currency, what matters for debt level reduction are changes in nominal GDP levels, not real GDP that is adjusted for inflation and is the focus in the rest of the report. This means that the 50 percent acceleration requirement applies to nominal GDP growth and can be met with different real GDP growth and inflation levels. Assuming inflation remains at historical levels, real GDP would need to accelerate by 50 percent; higher inflation in turn would reduce the real GDP growth threshold. The calculation on the GDP-growth acceleration required to start deleveraging assumes fixed projected interest rates on government bonds and inflation rates. For analysis on this topic, see the forthcoming McKinsey Global Institute report on debt and deleveraging.

[2] For many countries, time-series data going back 50 years is limited for both employment components and labor productivity, defined as output per employee, by industry. For this reason, we chose to focus on 20 countries: the G19 (the G20 grouping without the European Union as a composite member) plus Nigeria. These 20 countries include a wide range of economies at different stages of their development with a major impact on global GDP and employment. Together, they account for 63 percent of the global population and 80 percent of global GDP.

Rapid GDP growth over the past 50 years was exceptional

Over the past 50 years, two factors powered exceptionally fast GDP growth: a rapidly expanding labor force and rising average productivity.

Growth in the labor force was fueled by two demographic trends. The first was brisk population growth, reflecting initially high fertility rates, falling infant-mortality rates, and lengthening life expectancy as hygiene and health-care provision advanced and expanded, and casualties of war were reduced.[3] The second was a rising share of those of working age in the population—a demographic dividend. Over time, the number of children in each family declined, and the share of people of working age—15- to 64-year-olds—in the population climbed sharply, from 58 percent in 1964 to 68 percent in 2014. Employment in the G19 and Nigeria grew at an annual rate of 1.7 percent in this period, doubling the total labor force and contributing about 48 percent of GDP growth in these economies.

Rising productivity generated the other 52 percent of GDP growth. Productivity grew at an average annual rate of 1.8 percent between 1964 and 2014. A number of factors propelled productivity growth, including a shift from low-productivity agriculture to more productive manufacturing and service-sector jobs in cities, automation and more efficient operations, and increasing integration of the world economy that led to more productive modern businesses gaining share from less productive ones. The average employee generates 2.4 times as much output today as in 1964. Although the average pace of productivity growth was brisk, there were significant differences in the rate of that growth among economies. In Western European nations and the United States, labor productivity grew by between 1.5 percent and 1.9 percent a year from 1964 to 2014 from a relatively high base. Productivity growth during this period was exceptionally strong in South Korea and Japan, rising 4.6 and 2.8 percent per annum respectively, allowing these economies to narrow their aggregate productivity gaps with Western Europe and the United States.

Productivity in developed economies today remains almost five times that of emerging economies.

Among developing economies, the variance in productivity performance has been much wider. There is no typical rate of productivity growth in these economies. China's productivity grew at an annual pace of 5.7 percent between 1964 and 2014. In contrast, Mexico and Saudi Arabia clocked less than 1 percent annual productivity growth over this period. Overall, it is striking that the absolute gap between productivity in emerging and developed economies has not narrowed. Productivity in developed economies today remains almost five times that of emerging economies. Narrowing this gap is one of the biggest opportunities for—and challenges to—long-term global growth.[4]

Peak employment will occur in most countries within 50 years

The strong demographic tailwind that powered GDP growth has come to an end and is starting to turn into a headwind in some countries. Fertility rates have declined, in many countries falling below the replacement threshold that needs to be met to keep the population steady. Population growth is expected to fall in all countries in the G19 but continue to grow rapidly in Nigeria. The boost to growth from a favorable shift in age structure has also come to an end. As the bulge of working-age people grows older, the

[3] Robert S. McNamara and James G. Blight, *Wilson's ghost: Reducing the risk of conflict, killing, and catastrophe in the 21st century*, Public Affairs, 2003.

[4] MGI has studied the reasons for sustained productivity gaps in more than 20 countries over the past 20 years. For more on this research, see www.mckinsey.com/mgi.

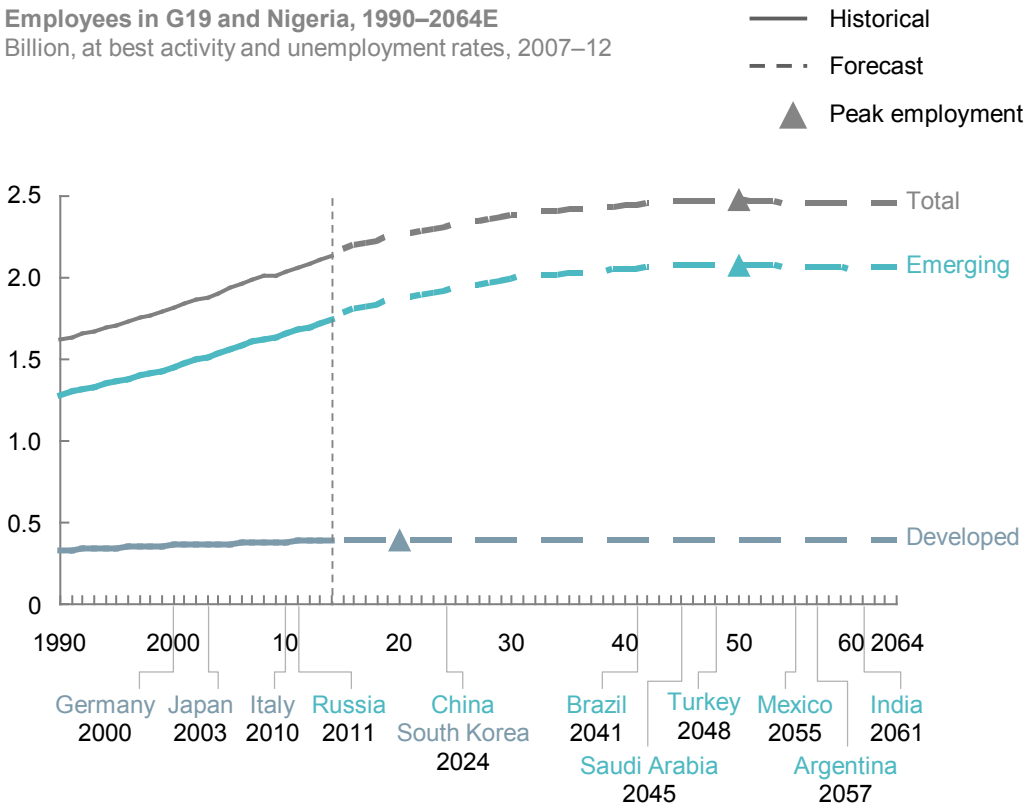
average share of the prime-working-age population in the G19 and Nigeria is expected to fall to 61 percent from 68 percent today. Only Nigeria bucks this trend.

Taking all factors into account, average employment growth in the 20 countries studied is expected to wane to 0.3 percent a year over the next 50 years, less than one-fifth of the 1.7 percent growth observed between 1964 and 2014. There is a distinct prospect that employment in the 20 countries overall could peak around 2050 and then settle into a declining path (Exhibit E2).

Exhibit E2

The global number of employees is likely to peak around 2050

Employees in G19 and Nigeria, 1990–2064E
Billion, at best activity and unemployment rates, 2007–12



SOURCE: The Conference Board Total Economy Database; United Nations Population Division; World Bank; International Labour Organisation; McKinsey Global Institute analysis

Employment prospects vary significantly. The number of employees has already peaked and started to decline in Germany, Italy, Japan, and Russia; their labor pools could shrink by up to one-third by 2064. In most other countries, employment is likely to peak within 50 years. In China and South Korea, the peak is expected as early as 2024. China and India, the countries with the largest and second-largest populations in the world, respectively, are expected to follow very different paths. India's labor pool could expand by 54 percent over the next 50 years, but China's could shrink by one-fifth. Other nations, including Indonesia, South Africa, and the United States, are likely to continue to experience rising employment, albeit at slower rates.

There is scope to use policy to boost labor-market participation among women, young people, and those aged 65-plus. We estimate that it is possible to double employment growth from 0.3 percent today to 0.6 percent in the 20 countries studied. However, achieving this doubling would require each gender and age group across countries to close

the employment gap with high performers for the group—which would be very difficult.[5] In any case, even 0.6 percent growth in employment is still only about one-third of the rate of the past 50 years, and insufficient to counter the erosion of the growth of the labor pool.

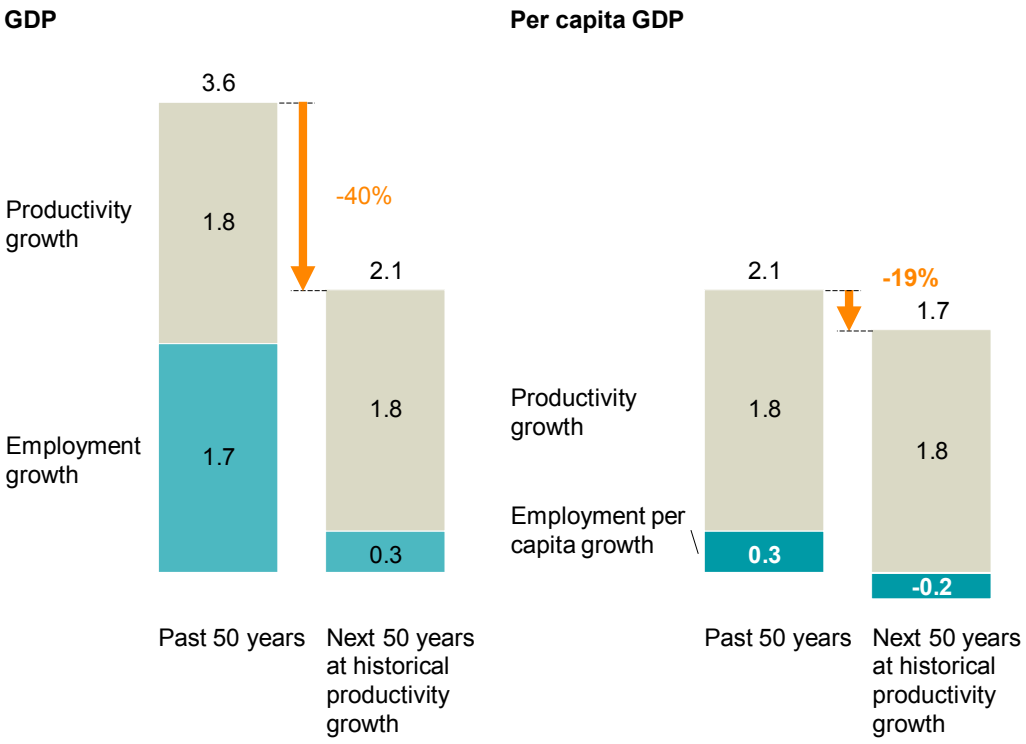
At historical productivity-growth rates, long-term GDP growth would be 40 percent slower than its rate of the past 50 years

If productivity growth continued to rise over the next 50 years at its average rate between 1964 and 2014, the rate of global GDP growth would decline by 40 percent in the G19 and Nigeria—from 3.6 percent a year to only 2.1 percent (Exhibit E3). Putting this into perspective, average GDP growth over the next five decades would be one-third lower than it was over either the past five years of recovery from the global recession or the energy-crisis decade of 1974 to 1984. Over the course of 50 years, such a slowdown in growth would add up to a significant shift in the world's growth trajectory. While the global economy expanded sixfold in the 50 years from 1964, it would grow only threefold between 2014 and 2064 (Exhibit E4).

Exhibit E3

At past rates of productivity growth, GDP growth would slow down by about 40 percent and per capita GDP growth by about 20 percent

G19 and Nigeria
Compound annual growth rate, %



NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; McKinsey Global Institute analysis

[5] To estimate the size of the potential to expand employment, we assume that all countries close current gaps to the employment rate of top-quintile performing nations in each demographic category. For prime-working-age women (aged 15 to 64), Norway and Canada, with a participation rate of 75 percent and unemployment at 5 percent, are the benchmarks. For young people, pre-recession United States is the benchmark, with a 55 percent participation rate and 10 percent unemployment rate. For prime-working-age men, the benchmark is 90 percent participation and, at most, 5 percent unemployment. For those aged 65-plus, the potential participation rate is set at 25 percent and unemployment rate at 10 percent. For nations that exceed these benchmarks in any of the categories, we use their current participation rates instead.

Exhibit E4

At historical productivity-growth rates, GDP and per capita GDP growth are set to slow in most G19 countries

Employment, productivity, and growth
Medium UN population scenario, best activity and unemployment rates, 2007–12; compound annual growth rate (CAGR), %; future 50 years assumes past productivity growth rates for next 50 years

NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; International Labour Organisation; McKinsey Global Institute analysis

The expected impact of waning demographic tailwinds on the global standard of living measured by per capita GDP is not as dramatic as it is on GDP growth. The expected fall in the share of the prime-working-age population age implies a 19 percent decline in the growth rate of per capita income from the rate of the past 50 years. This would mean the standard of living rising by 2.3 times over the next half century compared with an increase of 2.8 times over the previous 50 years.

Changing the long-term growth trajectory that appears to be in prospect will largely depend on the rate of productivity growth. Princeton University professor Alan Blinder commented in November 2014, "Maybe some of the copious attention now being devoted to assessing labor-market slack should be redeployed to studying productivity growth. It might be more productive."[6]

Faster productivity gains can compensate for the waning of demographic tailwinds. To do so fully, productivity growth over the next 50 years would need to be 80 percent faster than the already high rate of the past 50 years. Productivity would need to accelerate by 22 percent to compensate for the shift in demographics on per capita income. In turn, productivity growth that is below its historical rate would mean even slower GDP and per capita income growth.

4%
annual productivity growth potential

There is large potential to improve productivity if all available levers are fully deployed

MGI developed five sector case studies—agriculture, food processing, automotive, retail, and health care—to help us to understand the potential scope for accelerating productivity growth.[7] Drawing on this analysis, we find that it is possible—but extremely challenging—to boost the annual rate of productivity growth in the G19 and Nigeria to as much as 4 percent a year over the next decade. This would be more than the 80 percent acceleration required to compensate fully for waning demographic tailwinds.

However, all available means to boost productivity growth would need to be deployed. The issue, in our view, is not that the world is running out of technological potential for growth but rather how to ensure that governments and company managers have a strong incentive to pursue higher productivity by adopting proven best practices from others and by innovating. Achieving a step change in productivity growth would necessitate strenuous efforts by business owners, managers, and workers to change established ways of doing things and to adopt new approaches that improve how they operate. Efforts to improve the traditionally weak productivity performance of large and growing government and health-care sectors around the world will be particularly important.

6 Alan S. Blinder, "The unsettling mystery of productivity," *The Wall Street Journal*, November 25, 2014.

7 We used MGI's micro-to-macro approach to assess opportunities for productivity gains in our five sector case studies. The sectors we studied are large employers that collectively represent diverse industries and productivity patterns. We drew on sector data from the World Input-Output Database, dozens of MGI country and industry studies, and McKinsey's industry expertise across regions to understand patterns in productivity performance. We limit our projections to the period to 2025 rather than to 2064 because that is the period for which understanding today's starting position can help to guide informed projections.

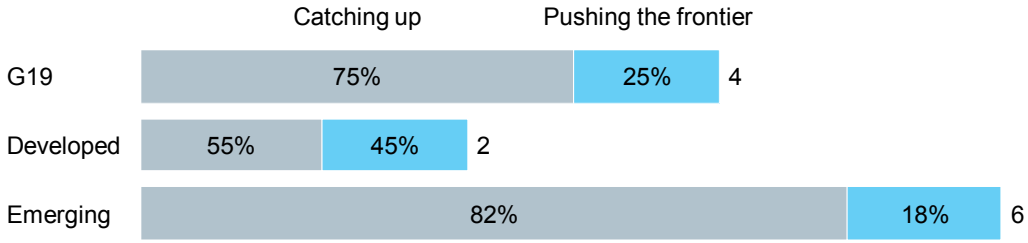
Catching up to best-practice productivity could deliver three-quarters of the opportunity

Roughly three-quarters of the total global potential for productivity growth that MGI has estimated comes from the broader adoption of existing best practices—which we can characterize as "catch-up" productivity improvements (Exhibit E5). The positive message here is that these types of opportunity are all known to us and exist somewhere in the world. Eighty percent of the overall opportunity to boost productivity in emerging economies comes from catching up. Opportunities include increasing the share of modern retail formats, increasing the scale and capacity utilization of auto assemblers, improving operational efficiency in health care, reducing waste in food processing, and shifting to a greater share of higher-value products or services.

Exhibit E5

Approximately three-quarters of the productivity potential identified comes from catching up, and the rest from pushing the frontier

Potential per annum productivity growth rate
%



SOURCE: McKinsey Global Institute analysis

In developed economies, more than half—55 percent—of the productivity gains that MGI's analysis finds are feasible could come from closing the gap between low-productivity companies and plants and those that have high productivity. There are opportunities to continue to incorporate leaner supply-chain operations throughout retail, and to improve the allocation of the time spent by nurses and doctors in hospitals and health-care centers, for example. Across countries, large differences in average productivity within the same industry indicate industry-wide opportunities for improvement. For instance, low productivity in retail and other service sectors in Japan and South Korea reflects a large share of traditional small-scale retailers. High costs in the US health-care system partly reflect the excessive use of clinically ineffective procedures. Even agriculture, automotive manufacturing, and other sectors that have historically made strong contributions to productivity growth have ample room to continue to diffuse innovations and become more efficient.[8]

[8] For additional examples, see the MGI reports *Growth and renewal in the United States: Retooling America's economic engine*, February 2011; *European growth and renewal: The path from crisis to recovery*, July 2011; *Beyond Korean style: Shaping a new growth formula*, April 2013; and *Why the Japanese economy is not growing: Micro barriers to productivity growth*, McKinsey Global Institute, July 2000. For further examples of cross-country productivity gaps in different industries based on MGI's productivity research over more than 20 years, also see James Manyika, Jaana Remes, and Jonathan Woetzel, "A productivity perspective on the future of growth," *McKinsey Quarterly*, September 2014.

Pushing the productivity frontier through innovation could deliver the remaining one-quarter of the opportunity

The remaining one-quarter of the opportunity to boost productivity growth—or about one percentage point a year—comes from technological, operational, and business innovations that go beyond today's best practices and that "push the frontier" of the world's GDP potential. In contrast to some observers, we do not expect a drying up of technological or business innovations to constrain growth. On the contrary, we see a strong innovation pipeline in developed and emerging economies in the sectors we studied.[9] We cannot account for future developments that we cannot foresee today, and it is quite possible that waves of innovation may push the frontier far more than we can anticipate on the current evidence.

In contrast to some observers, we do not expect a drying up of technological or business innovations to constrain growth.

Some opportunities require simply continuing existing industry research programs, such as agricultural research into tailoring and improving seeds and agronomical practices to raise crop yields in new geographies, and automotive industry initiatives to power cars using more efficient fuel technology. Others rely on technological innovations that could potentially transform many different industries. For example, highly efficient and intelligent robots—or bots—are already boosting efficiency in retail warehouses where they are deployed, mobile technology is increasingly being used to deliver health care in remote regions, and automobile manufacturers are installing a broader range of digital features in cars. Advanced materials such as nanolaminates—edible lipids or polysaccharide compounds—can be sprayed on food to provide protection from air or moisture and reduce food spoilage, while carbon-fiber composites can make cars and airplanes both more resilient and lighter.[10] The Internet of Things can cut time spent in production processes by detecting potential failures early, increase crop yields by measuring the moisture of fields, and cut the cost of monitoring health dramatically.[11] Such innovations are not confined to developed economies but are happening in emerging economies, too. For instance, Aravind Eye Care of India, which has become the largest eye-care facility in the world, performs cataract surgeries at one-sixth of the cost and with fewer infections than the National Health Service in the United Kingdom achieves.[12]

[9] MGI has published extensively on the outlook for technology. See, for example, *Big data: The next frontier for innovation, competition, and productivity*, May 2011; *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, May 2011; *The social economy: Unlocking value and productivity through social technologies*, July 2012; *China's e-tail revolution: Online shopping as a catalyst for growth*, March 2013; *Game changers: Five opportunities for US growth and renewal*, July 2013; *Lions go digital: The Internet's transformative potential in Africa*, November 2013; *Disruptive technologies: Advances that will transform life, business, and the global economy*, May 2013; *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, April 2014; and *China's digital transformation: The Internet's impact on productivity and growth*, July 2014. Also see the discussion of the transformative power of technology in *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

[10] *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

[11] *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013.

[12] "Driving down the cost of high-quality care: Lessons from the Aravind Eye Care System," *Health International*, McKinsey & Company's Health Systems & Services Practice, issue 11, 2012. Visit www.mckinsey.com/client_service/healthcare_systems_and_services/latest_thinking/health_international/archive/issue_11.

The cross-cutting effects of digitization, including big data, and combinations of these technologies could yield astounding results. Think of the impact of a combination of big data and synthetic biology. The cost of gene sequencing is falling sharply, making a huge amount of genetic data available. Scientists and companies are using these data to develop new techniques to write DNA and insert it into cells and are even designing DNA from scratch to produce desired traits—a practice known as synthetic biology.[13]

Ten enablers need to be in place to fuel long-term global growth

Having ample opportunities to improve productivity does not guarantee that they will be realized. MGI first identified some of the productivity gaps that persist today more than ten years ago. Drawing on many years of analysis of productivity and growth as well as the new case studies in this report, we detail ten key enablers that would need to be in place to boost productivity growth and thereby help to lift the world economy's long-term growth rate closer to its potential. These enablers broadly fall into four groups.

- **Enabling catch-up by creating transparency and competition.** The first group of three reflects the barriers to catching up found in our sector case studies, as well as what we have learned from past MGI productivity studies: remove barriers to competition in service sectors, focus on efficiency and performance management in public and regulated sectors, and invest in physical and digital infrastructure, especially in emerging markets.

- **Helping to push the frontier by incentivizing innovation.** The next four enablers reflect the case studies in this report and MGI's research on the economic impact of technology: craft a regulatory environment that incentivizes productivity and supports innovation, foster demand for and R&D investment in innovative products and services, exploit existing and new data to identify transformational improvement opportunities, and harness the power of new actors in the productivity landscape through digital platforms and open data.

- **Mobilizing labor to counter the waning of demographic tailwinds.** The third group of enablers draws on the demographic analysis in Chapter 2 of this report as well as MGI's body of analysis on global labor markets: put in place regulation and social support to boost labor-market participation among women, young people, and older people; and improve education and matching skills to jobs, and make labor markets more flexible.

- **Opening up economies to cross-border economic flows, from trade in goods and services to flows of people.** Being open to global economic activity allows companies and economies to benefit from competition, the flow of ideas, and better practices and personal connections. This enabler draws on our sector case studies and previous MGI analysis of global flows.[14]

Companies are crucial to seizing the full range of opportunities to boost productivity growth. Much of the scope to improve productivity can be achieved independently from government policy, whether this involves mechanization in agriculture in emerging countries or the adoption of best practices in merchandising and online retailing. Businesses need to play a full part as investors in upgrading capital and technology. They need to take risks by investing in R&D and unproven technologies and processes. They are central to efforts to mitigate the erosion of the growth of the labor pool by providing a more flexible working environment for women and older workers, and training and mentorship for young people. In an environment of potentially weaker global economic growth, and certainly evolving growth dynamics, executives need to be adaptable and informed. They need to anticipate where

[13] *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013.

[14] *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, April 2014.

market opportunities are coming from, and the competitors they will meet in those markets. Above all, companies need to be competitive in a world where productivity will increasingly be the arbiter of success or failure.

In this report, we have looked at growth from a traditional economic standpoint. We have defined growth as expanding GDP and rising per capita GDP. But we acknowledge that this approach has limitations and that some big questions now being actively debated have not been addressed in any detail in this report. Some of the productivity enablers we have discussed will require making trade-offs that might be uncomfortable. Continued rapid growth will require increasing attention on productivity in resources if that growth is not to place undue strain on our environment. The good news here is that MGI has identified opportunities for being smarter about how we use our resources and therefore achieve growth that is ecologically responsible. The issue of how the fruits of growth are distributed has also become subject to intense debate in recent years. Rapid GDP growth has contributed to a significant closing of the income gap among nations but there appears to be increasing inequality within nations. While perspectives vary on potential solutions to rising inequality, the reality is that changes in average income will not be enough to increase demand if most of the gains accrue to individuals whose needs have already been met. Broad-based income gains will therefore also matter for the growth of markets for many products and services. We welcome these questions and hope that this report represents the start of a broader conversation about the nature of long-term growth and its implications for society.

•••

The past 50 years have been ones of extraordinary economic expansion around the world. But now one of the twin engines of growth—rapid labor-pool growth—has lost power. The world economy must forge ahead with just one remaining engine, productivity, firing at full throttle. Boosting productivity growth is now the only way to drive growth. However, the business and policy changes needed to sustain and accelerate productivity gains will undoubtedly involve tough trade-offs. We need to be clear-minded and have a frank discussion about the difficult decisions ahead. Leaders of companies will need to think even harder about every aspect of how they do business. Governments need to act on many fronts to help craft an environment that is conducive to growth. Only sweeping change—and being smarter about growth—will meet the challenge. Productivity and innovation need to be at the core of all conversations about long-term growth. Without giving them our full attention, global prosperity is in jeopardy.

Mother with child holding plant
© Alamy

1. THE GROWTH DEBATE

1964
entire global economy was the size of China's today

In a period of great economic uncertainty and transformational demographic and technological change, there is a lively debate about prospects for long-term growth in the decades ahead. In this report, MGI has taken a "classical" view of growth based on GDP and per capita GDP, but even here there is deep disagreement. At one end of the spectrum are growth pessimists who point to the waning power of population growth as a driver of economic expansion. The phrase "secular stagnation," introduced in 1938 by Keynesian economist Alvin Hansen, is back with a vengeance.[15] At the other end of the spectrum are many people—call them "technology optimists"—who are upbeat about prospects for growth. They see global growth being propelled forward by a powerful tailwind in the form of continued innovation.[16]

These varying perspectives on GDP growth make it difficult for many decision makers in both the public and private sectors to prepare for the future. This research is an attempt to clarify the potential paths ahead. It draws on nearly a quarter century of MGI research on economic growth across the globe. Our goal is to provide a fact base of past performance and future outcomes if current trends continue, and then to identify and estimate the size of the levers that could alter the long-term growth trajectory.

Rather than an ultimate goal in itself, we see growth as a critical enabler for meeting a much broader set of desirable goals.

We have undertaken a major research effort on economic growth because we believe that it matters. It is the way to expand economic opportunities to the many millions of people who remain vulnerable and poor. Growth over past decades has already been the engine driving millions out of poverty, but more growth is needed in the years ahead to bring most of the world's population solidly into the consuming class.[17] In mature economies, meeting rising pension and other social obligations and managing public debt is easier in a growing economy. Forthcoming MGI research suggests that countries such as the United Kingdom and France would need to achieve long-term GDP growth that is more than 50 percent faster than its historical rate in order to start reducing the ratio of public debt to GDP, given

15 Alvin Harvey Hansen, *Full recovery or stagnation?* W. W. Norton, 1938.

16 Erik Brynjolfsson and Andrew McAfee, *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*, W. W. Norton, 2014; Erik Brynjolfsson and Andrew McAfee, *Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy*, Digital Frontier Press, 2012. Also see David M. Byrne, Stephen D. Oliner, and Daniel E. Sichel, "Is the information technology revolution over?" *International Productivity Monitor*, volume 25, spring 2013.

17 *Urban world: Cities and the rise of the consuming class*, McKinsey Global Institute, June 2012.

current fiscal balances and interest rates.[18] Economic growth makes resources available to spend on broader objectives such as eradicating diseases, addressing natural or man-made hazards, reducing pollution, and protecting local and global ecologies.[19] Rather than an ultimate goal in itself, we see growth as a critical enabler for meeting a much broader set of desirable goals (see Chapter 6 for a broad discussion about growth, equity, and sustainability).

In this chapter, we provide an overview of the broad patterns of global GDP growth over the past 50 years, describe the current debate on global long-term growth prospects, and outline our approach in the rest of this report. We focus on the two components that have fueled global growth throughout history—the expanding pool of workers, and the rising productivity of each worker.

The contribution of emerging economies to global GDP has risen from less than one-third to more than half over the past 50 years.

1 BN+
taken out of extreme poverty in the past 20 years

Economic growth has been exceptionally rapid over the past 50 years

Over the past half century, global GDP has grown at a compound annual rate of 3.7 percent, an exceptionally rapid rate compared with growth rates prior to the mid-20th century (Exhibit 1). Improved hygiene, advances in medicine and access to health care, and a reduction in war casualties contributed to record rates of population growth in many developed and emerging economies.[20]

The global population more than doubled from 3.4 billion to 7.2 billion over the past 50 years. Growth in per capita incomes far outstripped that of previous centuries. Between 1964 and 2014, the average income of the world's population almost tripled, rising from just over $5,000 at 2012 purchasing power to about $13,000. To put this in context, average per capita GDP in 1964 was comparable to the level of Ghana or Yemen today, while the average today is comparable to average national income in China or the Dominican Republic. Together, these two factors contributed to a sixfold increase in global GDP. In purchasing power terms, global GDP in 1964 was smaller than that of the United States or China today.

[18] Given that debt levels are fixed at nominal currency, what matters for reducing debt levels is changes in nominal GDP—not real GDP that is adjusted for inflation and is the focus of this report. The 50 percent acceleration required applies to nominal GDP growth and can be met with different real GDP growth and inflation levels. Assuming inflation remains at historical levels, real GDP would need to accelerate by 50 percent; higher inflation would reduce the real GDP growth threshold. The calculation on the GDP-growth acceleration required to start deleveraging assumes fixed projected interest rates on government bonds and inflation rates. For previous analysis on this topic, see *Debt and deleveraging: The global credit bubble and its economic consequences*, McKinsey Global Institute, July 2011; and *Debt and deleveraging: Uneven progress on the path to growth*, McKinsey Global Institute, January 2012.

[19] MGI has published extensively on the evolving resources landscape and the need to boost the productivity with which the world uses resources in order to ease the imbalance between supply and demand and to mitigate stress on the environment. See, for instance, *Curbing global energy-demand growth: The energy productivity opportunity*, May 2007; *Fueling sustainable development: The energy productivity solution*, October 2008; and *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, November 2011.

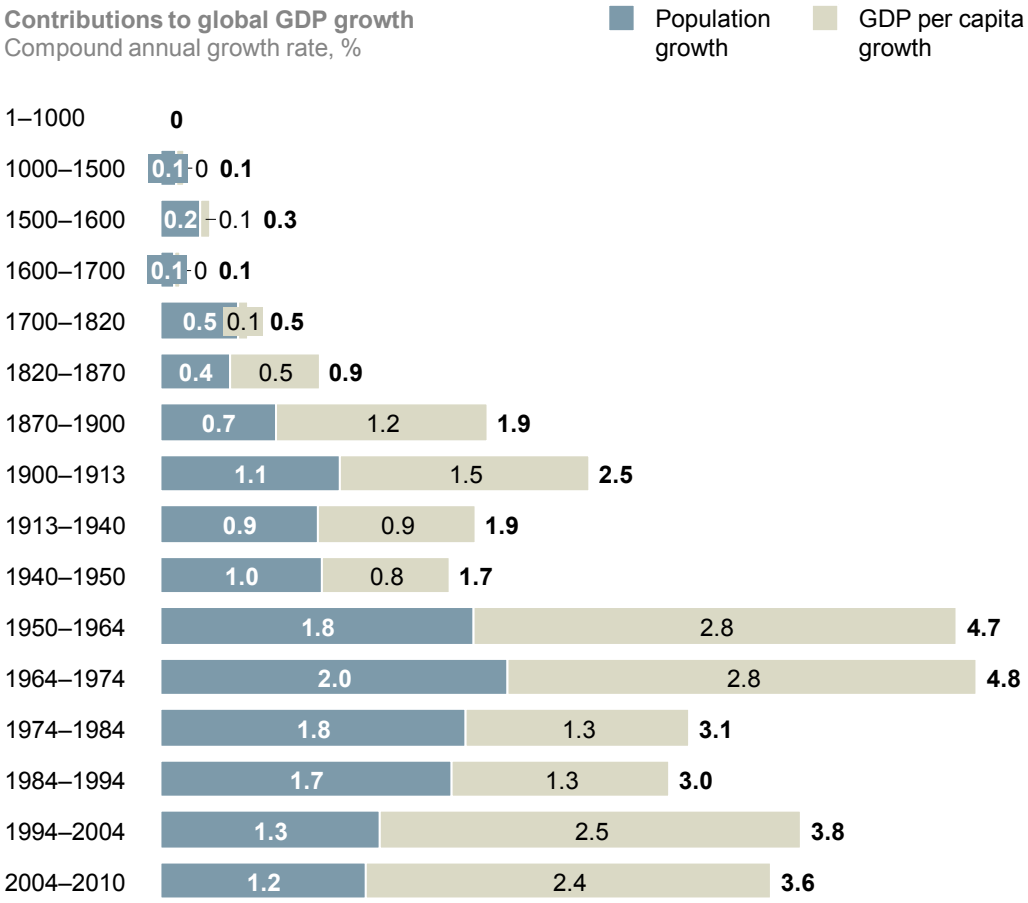
[20] Robert S. McNamara and James G. Blight, *Wilson's ghost: Reducing the risk of conflict, killing, and catastrophe in the 21st century*, Public Affairs, 2003.

The contribution of emerging economies to global GDP has risen from less than one-third to more than 50 percent over the past 50 years. The overall population of these economies grew at more than double the pace of populations in developed economies, boosting their share of the global total from 75 percent in 1964 to 84 percent in 2014. Per capita income in emerging economies increased at a 50 percent higher rate than the developed economies, narrowing the gap in percentage terms. In 1964, per capita incomes in emerging economies were 14 percent of those in developed economies; by 2014, they were 20 percent—although the absolute gap between the two widened significantly.

Rising incomes have helped to improve many aspects of human development and well-being. In the past 40 years, life expectancy in developing economies has increased by 20 years. Over the past 30 years, adult illiteracy in those parts of the world has nearly halved. In the past 20 years alone, more than one billion people have been taken out of extreme poverty.

Exhibit 1

The world has experienced unprecedented levels of GDP growth since 1950, driven by strong population and income growth



NOTE: Numbers may not sum due to rounding.

SOURCE: Jutta Bolt and Jan Luiten van Zanden, *The first update of the Maddison Project: Re-estimating growth before 1820*, Maddison Project working paper number 4, University of Groningen, January 2013; United Nations Population Division; McKinsey Global Institute analysis

There is no consensus on prospects for growth over the next 50 years

Economists and other observers disagree on many, if not most, of the central aspects of the growth story in the years ahead. We observe four broad areas of debate. Will emerging markets continue their growth and narrow the income gap to developed economies? What role will technology play in growth? What is the role of demand in growth likely to be? What are the prospects for jobs in a world with increasing technology-enabled productivity? We look at each of these in turn.

Will emerging markets be able to narrow the income gap to developed economies?

Emerging markets generated roughly 60 percent of global GDP growth in the past half century as they caught up with developed economies. The multitrillion-dollar question is whether they will continue to be the engine of rapid growth. Perspectives vary. There are market optimists, including Robert Barro and Andrei Shleifer, who draw on past convergence patterns as an indication of future potential.[21] Another group of people whom we might call cautious optimists includes Daron Acemoğlu, Dani Rodrik, and Michael Spence.[22] While all anchor their analyses on the power of the labor force moving from low- to high-productivity activities to drive structural change, they differ in the emphasis they put on the role of institutions, government, and other necessary enablers. Others are less optimistic, particularly about whether the lowest-income nations can ignite long-term growth. This camp includes Jeffrey Sachs, Paul Collier, and William Easterly, who nevertheless differ in their recommended solutions.[23]

This research directly addresses the potential for emerging economies to continue to catch up, building on MGI's extensive industry-level productivity work. In Chapter 4, we study the operational changes needed to close the gap to better-performing peers in specific industries and identify incentive-related or policy reasons why productivity improvements may not be achieved.[24]

What are the prospects for technology as a source of sustained long-term growth?

Technology has altered the path of growth in the past, but will it do so again? There is a wide disparity of views between those who believe that we are in the middle of a period of rapid technological innovation that will continue to push out the productivity frontier, and those who believe that technological change is running out of steam. Skeptics include Robert Gordon and Tyler Cowen, who argue that previous technological revolutions were the exception rather than the rule, that the current technological improvements do not alter labor productivity or the standard of living as dramatically, and that they therefore have

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21 Robert J. Barro and Xavier Sala-i-Martin, "Convergence across states and regions," *Brookings Papers on Economic Activity*, number 1, 1991. Also see Robert J. Barro, *Convergence and modernization revisited*, NBER working paper number 18295, August 2012, and Nicola Gennaioli, Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer, "Growth in regions," *Journal of Economic Growth*, volume 19, number 3, September 2014.

22 See, for example, Daron Acemoğlu and James Robinson, *Why nations fail: The origins of power, prosperity, and poverty*, Crown Business, reprint edition, 2013; Margaret S. McMillan and Dani Rodrik, *Globalization, structural change and productivity growth*, National Bureau of Economic Research (NBER), working paper number 17143, June 2011; Dani Rodrik, "Unconditional convergence in manufacturing," *Quarterly Journal of Economics*, volume 128, issue 1, February 2013; Vitor Trindade, "The big push, industrialization and international trade: The role of exports," *Journal of Development Economics*, volume 78, number 1, October 2005; and Michael Spence, *The next convergence: The future of economic growth in a multispeed world*, Picador, 2012.

23 William Easterly and Ross Levine, "What have we learned from a decade of empirical research on growth? It's not factor accumulation: Stylized facts and growth models," *World Bank Economic Review*, volume 15, issue 2, 2001; Paul Collier, "African growth: Why a 'Big Push'?" *Journal of African Economies*, volume 15, supplement 2, 2006; Paul Collier, *The bottom billion: Why the poorest countries are failing and what can be done about it*, Oxford University Press, 2007; Gordon C. McCord and Jeffrey D. Sachs, *Development, structure, and transformation: Some evidence on comparative economic growth,* NBER working paper number 19512, October 2013.

24 William Lewis, *The power of productivity: Wealth, poverty, and the threat to global stability*, University of Chicago Press, 2004. Also see MGI country productivity reports at www.mckinsey.com/insights/mgi/research/productivity_competitiveness_and_growth.

more limited influence on the rate of growth in the long term.[25] Others disagree, arguing that the world is in the throes of unprecedented technological change that will have a profound impact on the potential of the global economy. Erik Brynjolfsson and Andrew McAfee posit that the world is now in the "second half of the chessboard" where technological innovation accelerates. The phrase comes from the story told by Ray Kurzweil, futurist and director of engineering at Google, about the inventor of chess and the Chinese emperor.[26]

In the sector case studies undertaken for this report, we identify the potential to boost productivity growth through broader diffusion of existing technologies as well as gains from emerging technologies in the pipeline that are set to be adopted on a significant scale by 2025. We build on MGI's extensive body of research on the economic impact of technology, which by definition includes only technologies and solutions that are already visible on the horizon.[27]

Will insufficient demand be a constraint to future growth?

Another bone of contention is whether demand is, and will be, sufficient to stimulate long-term growth. Some argue that the world is in a period of "secular stagnation," a concept revived recently by Larry Summers and Paul Krugman. Secular stagnation is characterized by permanently depressed demand and lower growth relative to previous years despite the fact that the real interest rate has fallen below zero and the world has a glut of savings because of a lack of investment opportunities. The concept's proponents argue that the best way to emerge from secular stagnation is to spur demand through increased spending, both federal and private. Others dispute this reading of the economic runes, including John B. Taylor, a professor at Stanford University, who sees regulatory barriers as the binding constraint to growth.[28]

In the past, there has been a virtuous cycle as income from productivity gains has created demand for other goods and services. Higher productivity creates economic surplus that is passed on to businesses as higher profits, to consumers as lower prices that raise purchasing power or consumer surplus, or to workers in the form of higher pay. The question is whether this virtuous cycle is breaking down.

There are several reasons why demand might fall short of what would be needed to make full use of an economy's productive potential. One reason is that a greater share of technology-enabled productivity gains creates consumer surplus without raising either profits or consumer purchasing power. In fast-moving and competitive technology industries, a larger share of productivity improvements is passed on to consumers in the form of higher-quality products and services at lower prices, measured through quality-

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[25] Robert J. Gordon, *Is US economic growth over? Faltering innovation confronts the six headwinds*, NBER working paper number 18315, August 2012; Robert J. Gordon, *The demise of US economic growth: Restatement, rebuttal, and reflections*, NBER working paper number 19895, February 2014; and Tyler Cowen, *The great stagnation: How America ate all the low-hanging fruit of modern history, got sick, and will (eventually) feel better*, Penguin, 2011.

[26] The inventor asks for a single grain of rice on the first square, two on the second square, four on the third, and so on. One version of the story has the emperor going bankrupt as the 63 doublings ultimately totaled 18 million trillion grains of rice—enough to cover twice the surface area of the Earth. Erik Brynjolfsson and Andrew McAfee, *Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy*, Digital Frontier Press, 2012.

[27] MGI perspectives on technology and innovation can be downloaded from www.mckinsey.com/insights/mgi/research/technology_and_innovation.

[28] Lawrence Summers, "Why stagnation might prove to be the new normal," *Financial Times*, December 15, 2013; Laurence Ball, Brad DeLong, and Larry Summers, *Fiscal policy and full employment*, Center on Budget and Policy Priorities, April 2014; Paul Krugman, "Bubbles, regulation, and secular stagnation," *The New York Times*, September 24, 2013; John B. Taylor, "The economic hokum of 'secular stagnation,'" *The Wall Street Journal*, January 1, 2014.

adjusted price deflators.[29] Although such innovations generate significant consumer welfare, company profits may not rise, and consumers may not see a boost to their purchasing power if the price decline is simply a higher performing next-generation device at the price of last year's model. The high share of consumer surplus introduces "leakage" from the virtuous cycle of productivity gains creating income and additional demand.

Another possible source of leakage is that a smaller share of productivity gains feeds into wages—an income component that tends to have a high propensity for spending and generating demand elsewhere. The declining share of wages in aggregate income in a number of countries suggests this is a possibility.[30] A third possible—and related—reason that the virtuous cycle may be breaking down is rising income equality. Higher-income individuals tend to save more of their income; therefore a larger share of productivity gains goes to intermediated financing rather than demand for goods and services. Unless there are attractive investment opportunities for the savings of higher-income individuals, and financial intermediation is efficient in reaching the most productive uses, there may be additional barriers to the operation of the virtuous cycle.

2.4x
output per worker today vs. 1964

What is the impact of future productivity growth on employment likely to be?

The critical concern on the minds of many economists is that technology-enabled automation is replacing well-paid, middle-class jobs at a rate never before seen, leading to higher unemployment and increasing a bifurcation in the labor market between a dwindling number of high-skill jobs and many low-wage and low-skill service jobs.[31] In August 2014, the Pew Research Center reported in a survey of a large number of technology professionals and economists that 48 percent of respondents believed that new technologies would displace more jobs than they would create by 2025; 52 percent said they would not.[32] We discuss sector employment trends in Chapter 4 and how to mobilize labor in Chapter 5. Here, we briefly set the context in a discussion of economy-wide patterns of productivity and jobs.

The concern about technology replacing jobs is not new. In 1930, the British economist John Maynard Keynes coined the term "technological unemployment."[33] Since the industrial revolutions that started in Britain, spread to America, and then continued throughout Europe, machines have replaced workers, creating not only a productivity revolution but also a labor market that required new skills.

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29 Erik Brynjolfsson and others generated early assessments of the consumer surplus impact of IT. They estimate that IT generates three times its cost in consumer benefits, yet the resulting lower entry barriers and higher competition can lead to higher productivity and consumer surplus but lower profits. See Erik Brynjolfsson, "The contribution of information technology to consumer welfare," *Information Systems Research*, volume 7, number 3, September 1996, and Lorin M. Hitt and Erik Brynjolfsson, "Productivity, business profitability, and consumer surplus: Three different measures of information technology value," *MIS Quarterly*, volume 20, number 2, June 1996.

30 Loukas Karabarbounis and Brent Neiman, *The global decline of the labor share*, NBER working paper number 19136, June 2013; João Paulo Pessoa and John Van Reenen, *Decoupling of wage growth and productivity growth? Myth and reality,* Centre for Economic Performance discussion paper number 1246, August 2013; Thomas Piketty, *Capital in the twenty-first century*, translated by Arthur Goldhammer, Belknap Press of Harvard University Press, 2014.

31 See David H. Autor and David Dorn, "The growth of low-skill service jobs and the polarization of the US labor market," *American Economic Review*, volume 103, number 5, August 2013; and Lawrence Mishel and Kar-Fai Gee, "Why aren't workers benefiting from labour productivity growth in the United States?" *International Productivity Monitor*, number 23, spring 2012.

32 Aaron Smith and Janna Anderson, *AI, robotics, and the future of jobs*, Pew Research Center, August 6, 2014.

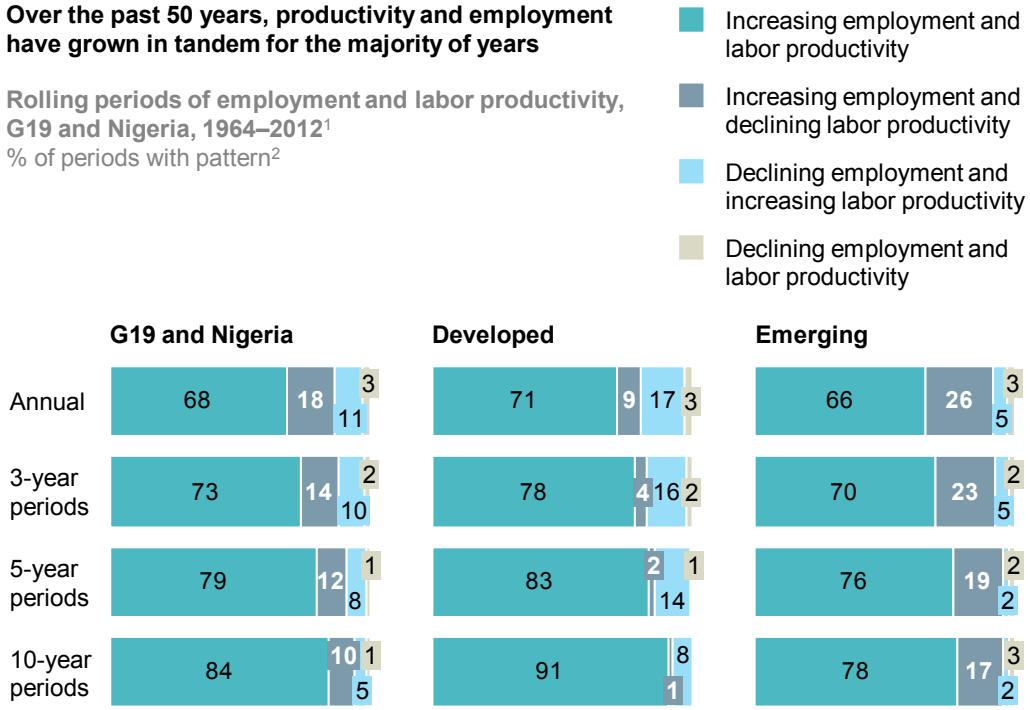
33 In his 1930 essay *Economic possibilities for our grandchildren*, Keynes said, "We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come—namely, technological unemployment. This means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour." The essay is available at www.econ.yale.edu/smith/econ116a/keynes1.pdf.

History shows that technology-driven productivity can be—and was—compatible with rising employment. The question is whether that relationship will continue to hold. In more than 80 percent of rolling ten-year periods over the past half century, labor productivity and employment have increased at the same time (Exhibit 2). Even looking at single years, more than two-thirds of the past 50 years have been ones in which productivity and employment both increased. There is no indication that this relationship between employment and productivity growth has shifted over time. When we conducted the analysis separately for each decade, the periods with most annual declines in either employment or productivity growth were in the 1970s and 1980s, coinciding with the oil crises and Latin America's "lost decade" in the 1980s. Since 2004, the share of periods with growth in both productivity and employment has been above the 50-year average.

Exhibit 2

Over the past 50 years, productivity and employment have grown in tandem for the majority of years

Rolling periods of employment and labor productivity, G19 and Nigeria, 1964–2012[1]
% of periods with pattern[2]



1 Measured by number of employed persons and GDP per employee; includes all countries for which there are data.
2 Taken as a straight average of all individual country trends.
NOTE: Numbers may not sum due to rounding.

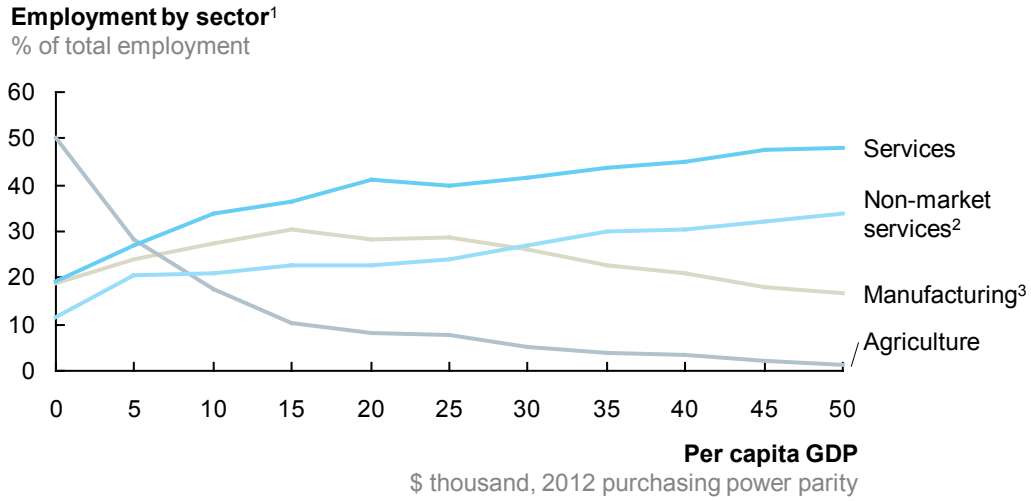
SOURCE: The Conference Board Total Economy Database; McKinsey Global Institute analysis

The correlation between productivity and employment was tighter in developed economies. Both grew in 91 percent of rolling ten-year periods since 1964 compared with 78 percent in the case of emerging economies. On an annual basis, both have risen in 71 percent of cases in developed economies, compared with 66 percent in emerging economies. Some emerging economies (South Africa and Saudi Arabia in particular, but also Mexico and Argentina) have experienced periods of rising employment without an improvement in productivity.

Yet past performance is no guarantee of future results, to quote the oft-used financial disclaimer. Could it be that the experience of the past 50 years was exceptional for the relationship between productivity and job growth, too? One concern is that the capacity of manufacturing to be an engine of job growth for emerging economies has declined over time. As economies develop, the sector mix of employment follows a predictable path. The share of agriculture tends to decline in the early stages of economic development. Then, in the middle-income stage, manufacturing industries typically experience an inverted U-shaped trend in employment share as these sectors peak and then begin to decline. Services grow continuously as a share of employment as nations move along the income and economic development curve, including government and regulated sectors such as education and health care (Exhibit 3).[34]

Exhibit 3

Employment in services rises with income



1 1995–2009 data across 40 countries; average percent of employment taken for each $5,000 per capita GDP increment.
2 Public sector, education, and health and social services.
3 Includes manufacturing sectors and mining.

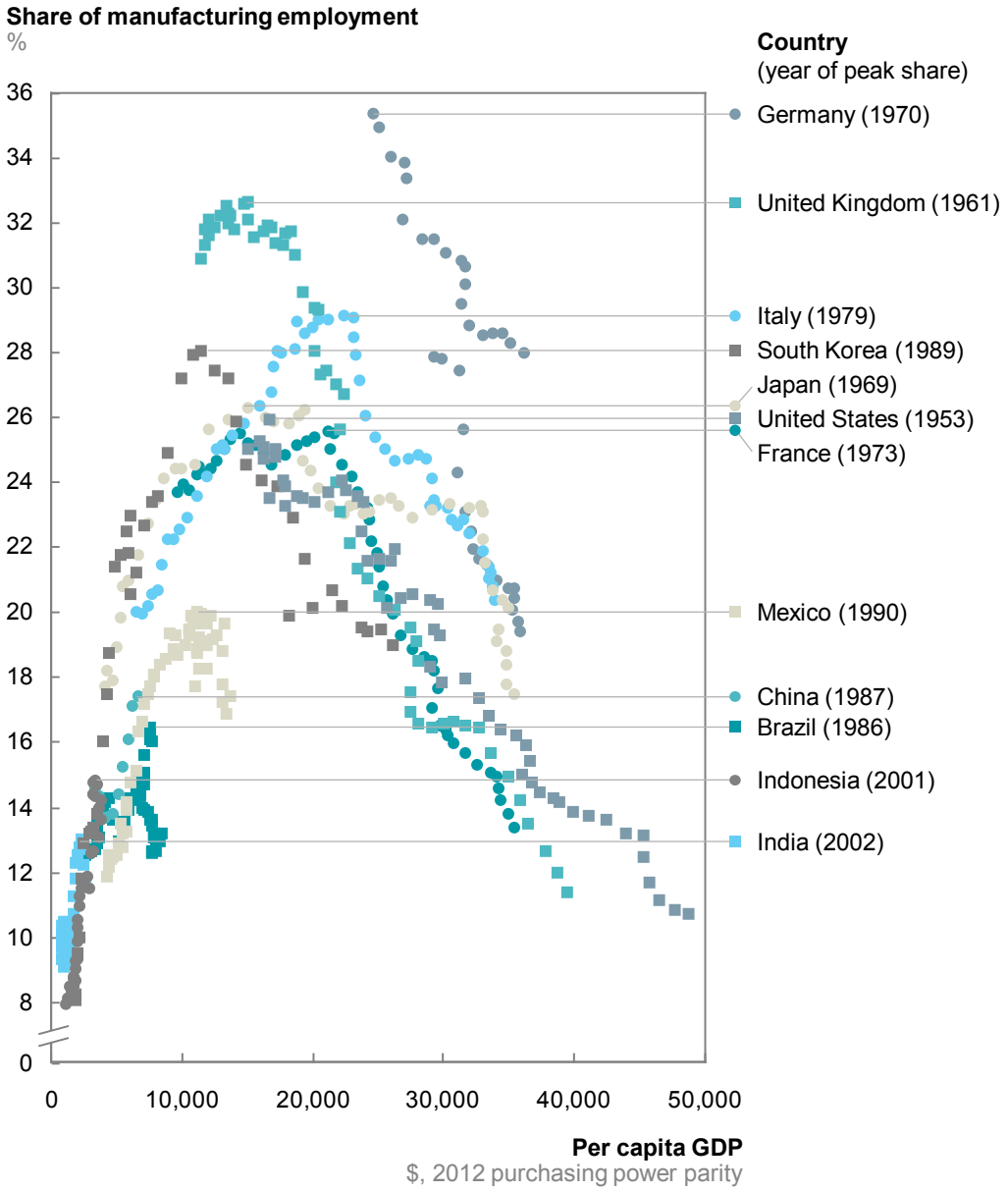
SOURCE: World Input-Output database; The Conference Board Total Economy Database; McKinsey Global Institute analysis

[34] Many early development economists—and more recent ones—have recognized this pattern. See, for instance, Alan G. B. Fisher, *The clash of progress and security*, Macmillan, 1935; Colin Clark, *The conditions of economic progress*, Macmillan, 1940, revised and reprinted in 1951; Simon Kuznets, *Modern economic growth: Rate, structure and spread*, Yale University Press, 1966; V. R. Fuchs, *The service economy*, Columbia University Press, 1968; and Piyabha Kongsamut, Sergio Rebelo, and Danyang Xie, "Beyond balanced growth," *Review of Economic Studies*, volume 68, issue 4, October 2001.

Manufacturing has traditionally played an important enabling role in the early stages of this economic transition.[35] But the peak employment share of manufacturing has declined as technology has evolved. Moreover, the income level at which that share declines is lower than it was in the past (Exhibit 4).

Exhibit 4

Manufacturing's share of total employment first rises and then declines as countries develop and become more prosperous



SOURCE: McKinsey Global Institute analysis

[35] We are not aware of any emerging economy that would have sustained rapid growth without a substantial contribution from its industrial sector. While there has been growing interest in finding more carbon-light growth paths for emerging economies to "leapfrog" over their industrial phase, the past does not provide us with any models to follow. Also see Dani Rodrik, "Industrial development: Some stylized facts and policy directions," in *Industrial development for the 21st century: Sustainable development perspectives*, Department of Economic and Social Affairs, United Nations, 2007.

At its peak in Germany, the manufacturing sector employed one-third of the nation's labor force in 1970. Decades later—in 1986 and 1990—the manufacturing share in Brazil and Mexico, respectively, peaked at less than 20 percent of all jobs. The employment share of manufacturing in the United Kingdom and the United States peaked at an income level close to $10,000 per capita at purchasing power parity. However, China's manufacturing employment share is already plateauing at only two-thirds of the per capita income level at a much lower share of about 17 percent of total employment. The capacity of manufacturing to be the engine of higher-skill, higher-pay jobs may have permanently declined from 50 years ago. If this is the case, then improving service-sector productivity will be central to future productivity performance, a theme to which we will return in Chapter 5.

The changing profile of manufacturing is not the only concern as we look at future employment growth. The positive aggregate relationship between productivity and employment critically depends on the virtuous cycle of income from productivity gains translating into demand for other goods and services, and indirectly into jobs, as we have discussed. This means that any breaks in the virtuous cycle of productivity leading to demand would also lead to changes in the relationship between productivity and job growth. Demand for jobs ultimately depends on demand for the goods and services to which jobs contribute.

For jobs, it is not just overall demand that matters but also the composition of that demand. Shifts in global demand are likely to lead to changes in the kinds of jobs needed in the economy. As incomes rise and populations age, the share of services in household consumption increases. But many consumer service sectors have a high share of low-wage jobs. Retail, personal services, and hospitality industries are examples, as we discuss in Chapter 4. Over the past decade, growth in jobs in developed economies has come largely from lower-productivity, lower-wage sectors. This is likely to have contributed to declining average wages and could put further pressure on the performance of service sectors in the years to come.

Finally, not all productivity improvements have an equal impact on jobs. There are two broad levers for improving productivity: efficiency gains that reduce inputs for a given output, and innovations that increase the volume and value of outputs for any given input. Efficiency is important. Less waste and more efficient operations reduce costs and often lead to price declines, leaving households and businesses with more money to spend elsewhere. But productivity is *not* just about efficiency. It is as much about expanding output through innovations that improve the performance, quality, or value of goods and services. This is true not just of new, high-value tablets or Global Positioning System (GPS) devices, for example. Take the US automotive industry during the 1990s. The diffusion of lean-production methods introduced by Japanese car companies contributed 60 percent of productivity growth, with the rest coming from improved safety and functionality that raised the value of each vehicle produced. The virtuous cycle between productivity and jobs is particularly strong when innovation is a major driver of productivity growth (see Box 1, "US productivity growth in the 1990s vs. the 2000s").[36]

[36] *Increasing global competition and labor productivity: Lessons from the US automotive industry*, McKinsey Global Institute, November 2005.

Box 1. US productivity growth in the 1990s vs. the 2000s

The United States illustrates how relatively similar productivity-growth rates can mean different things for jobs. In the 1990s, US productivity grew at a compound annual rate of 1.8 percent. Between 2000 and 2008—prior to the global recession—productivity growth slowed to 1.6 percent a year. However, the underlying dynamics between the two periods were different.[1]

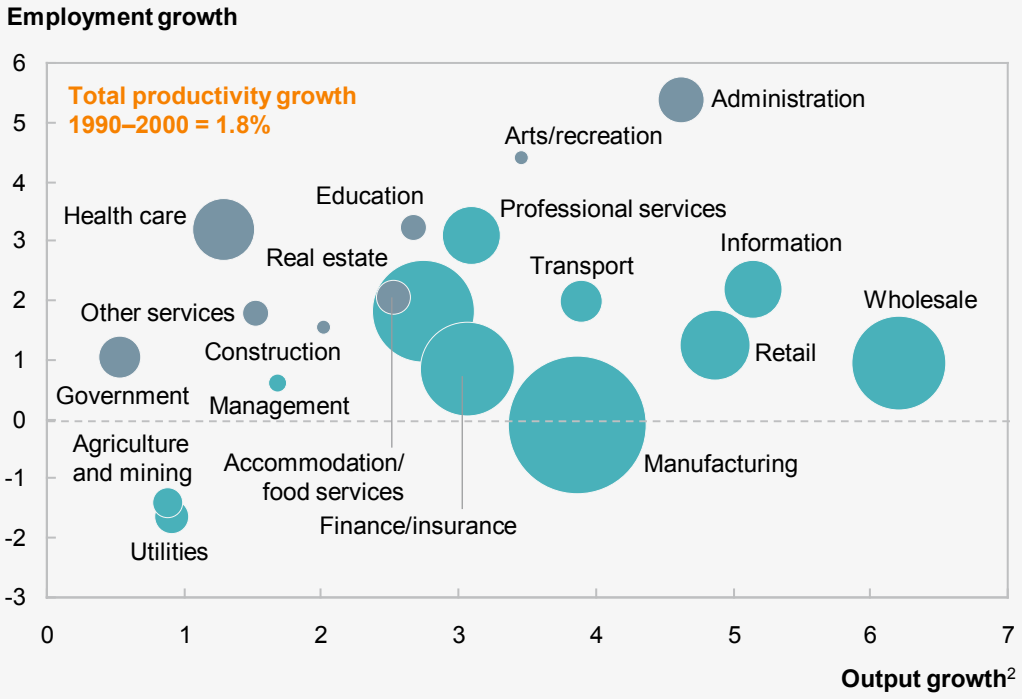
The productivity acceleration and rapid GDP growth that the United States enjoyed in the second half of the 1990s was enabled by solid gains in both efficiency and the value and quality of outputs. Three sectors—large-employment retail and very high-productivity semiconductors and electronics—collectively contributed 45 percent to that period's acceleration in productivity growth. This helped the private sector boost its productivity growth from 1 percent in 1985 to 1995 to 2.4 percent in 1995 to 1999. During this period, these three sectors added more than two million new jobs (Exhibit 5).

Exhibit 5

In the 1990s, US sectors experienced a virtuous cycle of productivity and jobs growth

Compound annual growth rate, 1990–2000
%

Size represents productivity contribution[1]
Positive Negative



1 Productivity contribution calculated using Moody's Economy.com data.
2 Output growth is defined by valued-added growth, which is the contribution of each sector to total GDP growth.

SOURCE: US Bureau of Economic Analysis; Moody's Economy.com; McKinsey Global Institute analysis

[1] *Growth and renewal in the United States: Retooling America's economic engine*, February 2011. Also see *US productivity growth 1995–2000*, McKinsey Global Institute, October 2001, and *How IT enables productivity growth*, McKinsey Global Institute, October 2002.

Box 1. US productivity growth in the 1990s vs. the 2000s (continued)

In contrast, the largest productivity gains since 2000 have come from sectors that have had substantial employment reductions (Exhibit 6). Computers and related electronics, the rest of manufacturing, and information sectors contributed around half of overall productivity growth since the turn of the century but reduced employment by almost 4.5 million jobs. More than 85 percent of this decline in employment occurred before the 2008 recession. The sectors that added the most employment during this period tended to be ones with lower average productivity—notably the health sector.

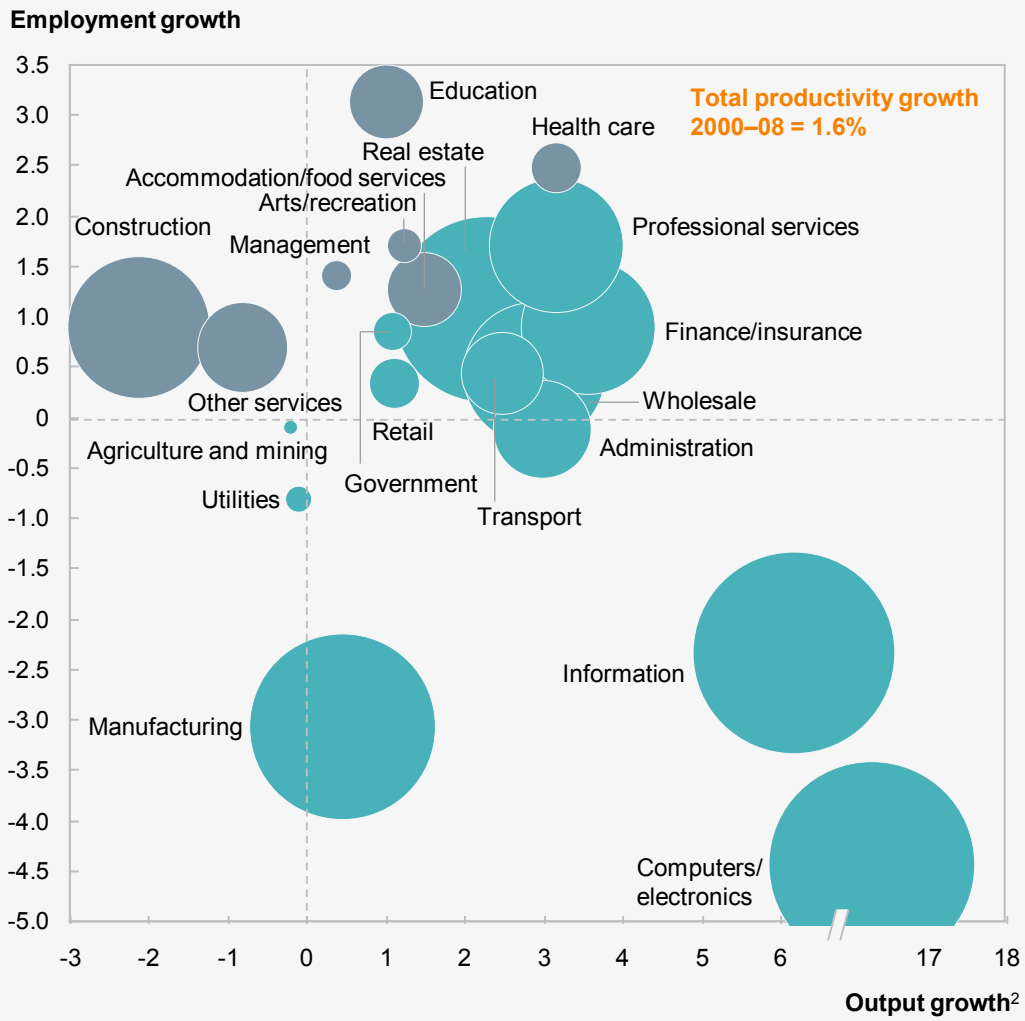
From the perspective of employment, the more that productivity growth comes from expanding output through innovations that improve the performance, quality, or value of goods and services, the better.

Exhibit 6

Since 2000, declining employment has made a larger contribution to US productivity growth

Compound annual growth rate, 2000–08
%

Size represents productivity contribution[1]
Positive Negative



1 Manufacturing sector excluding computers/electronics and other transport equipment sectors.
2 Output growth is defined by valued-added growth, which is the contribution of each sector to total GDP growth.

SOURCE: US Bureau of Economic Analysis; Moody's Economy.com; McKinsey Global Institute analysis

MGI frames long-term growth prospects using changing demographics and productivity opportunities

With all these strands of the long-term growth debate unsettled, it is hard to draw conclusions on prospects for growth. Over 25 years of MGI research on productivity and growth, we have learned that it is impossible to make sweeping generalizations about a country's productivity or prospects for its future economic performance, and that we can arrive at macro-level insights only through a granular examination of individual businesses at the industry, sector, and country levels.

As illustration of the importance of looking through a sector lens, consider the consensus that developed in the United States and Europe in the 1970s and 1980s that Japan was outperforming their economies because of its exporting prowess. MGI tested this thinking using a set of cross-country comparisons at the sector level of each economy. This exercise revealed that although Japan's steel industry, for example, was 45 percent more productive than its US counterpart, its food-processing industry was only one-third as productive. MGI also discovered that, although Japanese productivity was high in the automotive and consumer electronics sectors, it was relatively low in the service sector. This low service-sector productivity became the Achilles' heel of Japan's overall growth because this was where the majority of new jobs were being created. Only by looking at the sector level did MGI debunk the popular notion that the Japanese economy, overall, was outperforming the US economy.

In this report, we aim to contribute to the current growth debate in three ways. First, we suggest an approach to framing the long-term growth prospects of the global economy, as well as individual countries, with a simple GDP-growth decomposition into expanding employment and rising labor productivity. Using this standard approach allows us to identify the impact that demographic trends are likely to have on growth in individual countries and the global economy if productivity continues to rise at the average rate of the past 50 years.

Our second contribution is a microeconomic examination of productivity-improvement opportunities at the sector level. This lens means that we can assess whether it is feasible—and how feasible—to sustain the global productivity growth that accompanied rapid GDP growth in the past, let alone to accelerate productivity growth in coming decades. Drawing on McKinsey's industry expertise globally and more than 120 MGI industry productivity studies, we assess the productivity gaps to best practices across these sectors for a sample of eight or more countries in each sector, as well as prospects for technology and business innovations that are likely to have material impact by 2025. This enables us to measure the productivity-growth potential in our sample sectors and countries in the coming decade and extrapolate to a global perspective based on similarities in sector characteristics and per capita income of countries (see Box 2, "Assessing employment and productivity prospects").

Our third contribution is to identify what needs to change in order for productivity potential to be realized. Companies are crucial to seizing the full range of opportunities, from adopting better business practices to investments in new equipment and R&D. Many of the productivity gains also depend on removing policy barriers that discourage competition or investment in scale, or require better physical or digital infrastructure to reach low-productivity establishments. We synthesize these sector findings into a list of ten priorities for enabling global growth in Chapter 5.

Box 2. Assessing employment and productivity prospects

In this report, we analyze global GDP growth through a decomposition into increases in employment—defined as the number of people working outside the home for someone else or in self-employment (including subsistence farming)—and rising labor productivity (GDP per employed person). In our experience, anchoring the analysis on employment and labor productivity allows for simple decompositions that do not rely on notoriously poor data on capital stock or factor income shares. This is particularly valuable in our cross-country analyses, where we want to assess the direct impact of technology and capital on each worker's productivity without imposing restrictive assumptions on functional form (see the technical appendix for more detail on our approach).

Given limited global data on employment and productivity by industry, we chose to focus our research on 20 countries: the G19 (the 19 member nations of the G20 without the European Union as a composite member) plus Nigeria. These 20 countries include a wide range of economies at different stages of their development with a major impact on global GDP and employment. We chose to include Nigeria, which is not a member of the G20, because it is a representative of sub-Saharan Africa, where demographic trends are very different from those in most other regions. Together, these countries account for 63 percent of the global population and 80 percent of global GDP.[1] For our analysis of productivity at the sector level, we have further narrowed the countries that we analyze in detail. We focus on key economies that have had, and will continue to have, a major impact on the sectors that we analyze and on future GDP. They include the core countries of Brazil, China, France, Germany, India, Japan, Russia, the United Kingdom, and the United States, as well as additional countries with particular weight in specific industries.

While we focus on growth over the next half century, we judged that attempting to measure the potential for productivity growth at the sector level over such a long time frame would be futile because dramatically different outcomes are possible. Instead, we limit our projections to the period to 2025—ten years in the future rather than 50—because that is the period during which understanding today's starting position can help to guide informed projections.

[1] We acknowledge that this sample of countries excludes countries with smaller economies, either because of small populations, low per capita incomes, or both.

•••

The question of how growth will unfold in the long term across the world economy is a contentious one. Opinion differs on virtually every factor that lies behind growth. How will trends in demand, technology, and jobs play out over the next 50 years? What contribution to long-term global growth will emerging economies make? Some of these intense debates will be resolved only over time. This report attempts to provide a set of consistent facts on prospects for GDP growth for those of all opinions to draw on.

We explore the two main drivers of long-term GDP growth, grounding projections to 2064 through past patterns in each. In Chapter 2, we discuss the demographics of an expanding labor force that has powered growth over the past 50 years but is now waning. Peak employment is likely to occur for most economies over the next half century. In Chapter 3, we look at prospects for global productivity and GDP as global demographics shift. In Chapter 4, we explore scope to improve productivity through five sector case studies. In Chapter 5, we describe ten enablers that need to be in place to capture the productivity growth potential that we have identified. Finally, in Chapter 6, we offer some broader thoughts about growth in the years ahead.

Crowd of people, New York City
© Fotolia

Indian farmer sitting at home with laptop
© Alamy

2. EMPLOYMENT IN AN ERA OF CHALLENGING DEMOGRAPHICS

2x
growth in global workforce in past 50 years

The global population more than doubled over the past 50 years to reach 7.2 billion by 2014. Improved hygiene and impressive advances in medicine and access to health care helped to reduce infant mortality and extend life expectancy, and the number of casualties from war declined.[37] Fertility rates declined and the share of the working-age population started to climb, adding fuel to long-term GDP growth through what is often characterized as the demographic dividend.[38] However, this demographic tailwind has started to weaken in most nations, and even, in some cases, to reverse and become a net negative for employment. Fertility rates have declined further, dropping below the population replacement rate of 2.1 children per woman in many countries.

These trends have implications for the future of global growth. Global peak employment is likely to occur within 50 years. In this chapter, we describe the changes expected in coming decades in demographic trends and their likely impact on the number of people working in the global economy. Although the demographic shift now under way is pronounced, there is room for policy to mitigate some of the decline.

Exceptional demographics have expanded the global pool of workers over the past 50 years

48%
GDP growth from employment growth 1964–2014

Between 1964 and 2014, employment—defined as the number of people working outside the home as employees or in self-employment (including subsistence farming)—in the 20 countries we have studied grew by an average of 1.7 percent a year. This more than doubled the total labor pool of these nations and contributed 48 percent of their overall economic expansion.

Three factors were at work. First, rapid population growth contributed more than 80 percent of the total (Exhibit 8). Population growth increased from 1.2 percent in the 50 years prior to 1964 to 1.4 percent between 1964 and 2014. Second, a rising share of working-age people in the population—the demographic dividend—contributed an additional 0.3 percent per year, or 20 percent of employment growth. The share of people of working age—15- to 64-year-olds—in the population climbed dramatically, from 58 percent in 1964 to 68 percent in 2014. The third factor that can change patterns in employment growth is the share of people in each age cohort that works outside the home. Overall, this share was static (see Box 3, "What determines the evolution of employment?").

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[37] Robert S. McNamara and James G. Blight, *Wilson's ghost: Reducing the risk of conflict, killing, and catastrophe in the 21st century*, Public Affairs, 2003.

[38] See Matthias Doepke, *Child mortality and fertility decline: Does the Barro-Becker model fit the facts?* California Center for Population Research, November 2002, and Ronald Lee and Andrew Mason, "What is the demographic dividend?" *Finance and Development*, volume 43, number 3, September 2006.

Box 3. What determines the evolution of employment?

Growth in the number of employed people can be caused by changes in three components: overall population growth, changes in the age structure that shift the share of population that is of prime working age, and the share of each age group that is actually employed.

Population growth. Each of the 20 countries we studied had growing populations in the past 50 years. In emerging economies, rapid population growth reflecting high fertility rates and falling infant-mortality rates contributed 1.6 percent of GDP growth each year. The global infant-mortality rate fell from an average of 116 per 1,000 live births in 1964 to 34 in 2012.[1] In the 1960s, each woman in Brazil, India, Mexico, Nigeria, and South Africa had on average between five and seven children; in all these countries, population grew by more than 2 percent a year. Population growth in developed economies has been only half that of emerging regions at 0.8 percent per annum. Most of these economies already had low fertility rates by the 1960s. Nations that received a large number of immigrants, including Australia, Canada, and the United States, had higher population growth rates than countries that were less open to immigration.

Share of working-age people in the total population. The transition to low fertility rates led to a large expansion in the labor force as large cohorts of children reached adulthood, particularly in emerging markets. In China, the share of the working-age population rose from 56 percent to 74 percent, in Brazil from 54 percent to 68 percent, and in South Africa from 54 percent to 71 percent. This transition happened earlier in developed economies, from 1960 onward. More recently, the share has started to decline (Exhibit 7).

Share of the population by age group employed outside the home. In the 20 countries we studied, this share overall has remained roughly the same in recent decades. However, major shifts have canceled each other out.[2] Rising participation in the labor force among women boosted employment in both developed and emerging economies.[3] However, youth (aged 15 to 24) employment declined as tertiary school enrollment increased, in some cases significantly. In addition, youth unemployment has been high in recent years. Employment among those aged 65 and older has varied among developed and developing economies. In developed economies, it has increased as the baby-boomer generation tended to delay retirement.[4] However, employment of this age group has fallen in most emerging economies.[5]

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1 The infant-mortality rate is expressed as the number of deaths of infants under the age of one per 1,000 live births. See *World development indicators 2014*, World Bank, April 2014.

2 Comparable data for all subsegments in the 20 countries were not available prior to 1990. Although we draw on pre-1990 data for individual countries, the aggregate figures reflect trends from 1990 to 2012.

3 Lin Lean Lim, "Female labor force participation," background paper prepared for UN Population Division Expert Group Meeting on Completing the Fertility Transition, in New York, March 2002.

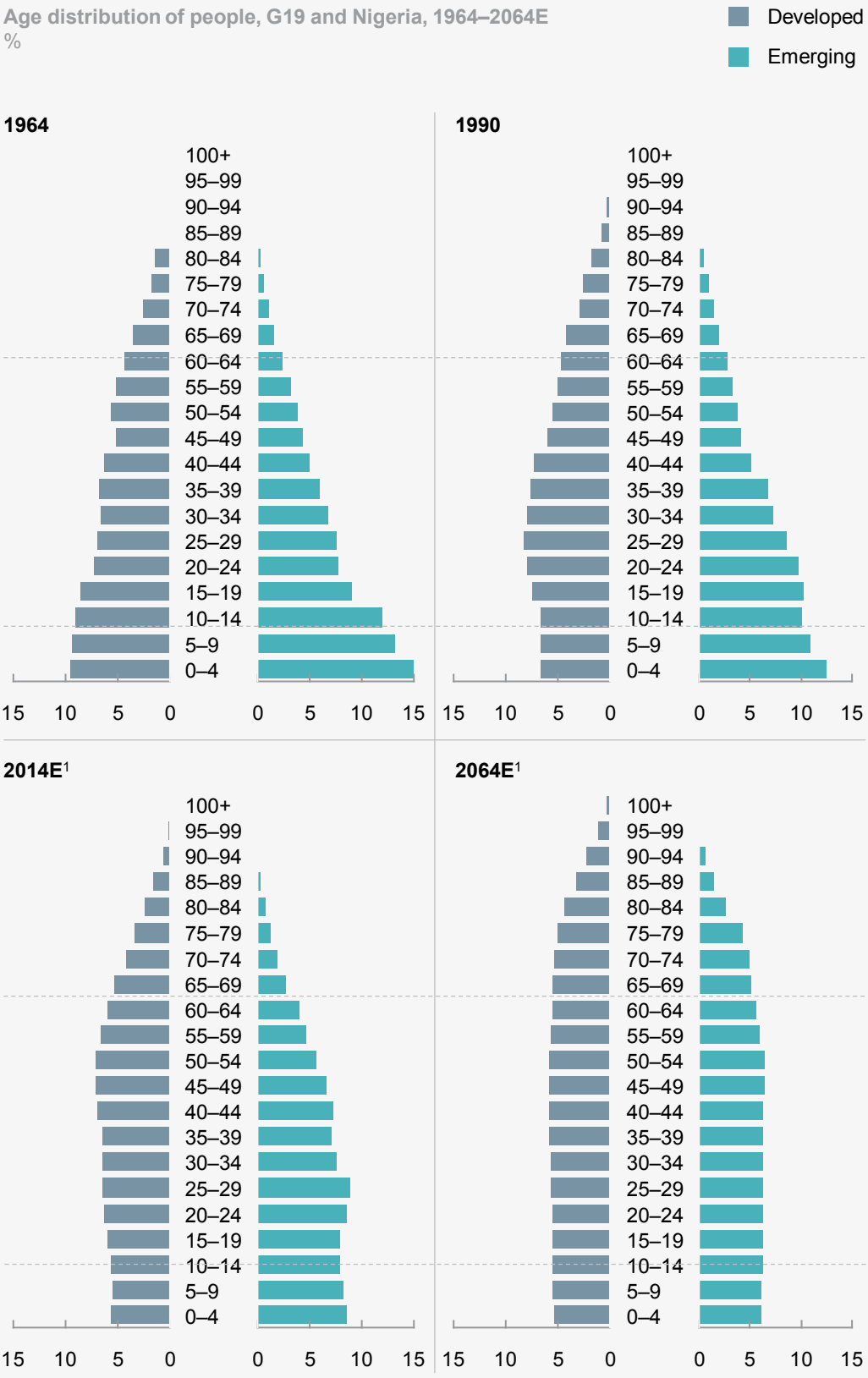
4 *Talkin' 'bout my generation: The economic impact of aging US baby boomers*, McKinsey Global Institute, June 2008.

5 The exception among emerging economies is Nigeria, whose participation rate among those aged 65 and older has increased by 11 percent over this period.

Exhibit 7

Emerging economies lag behind developed economies in the transition of their age structure

Age distribution of people, G19 and Nigeria, 1964–2064E
%



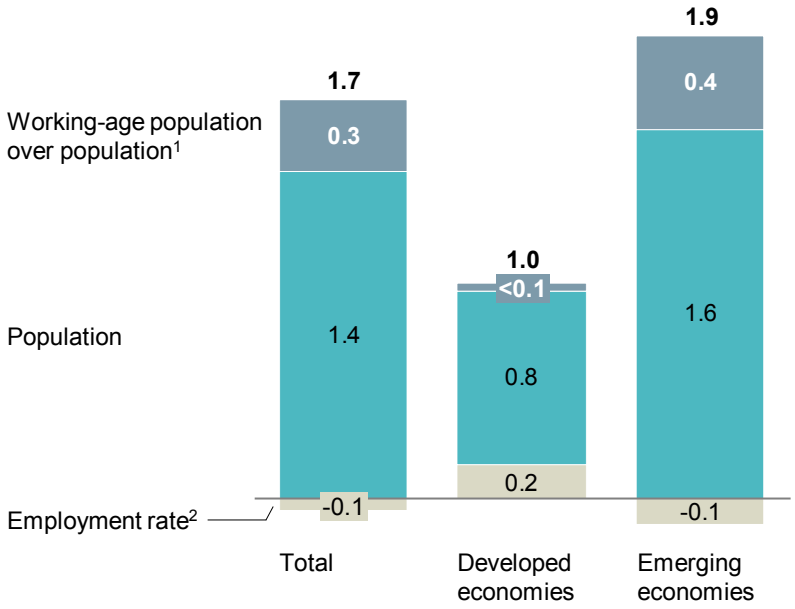
1 Estimates based on medium fertility scenario.

SOURCE: United Nations Population Division; McKinsey Global Institute analysis

Exhibit 8

Population and the share of people of working age in that population have driven employment growth over the past 50 years

G19 and Nigeria compound annual growth rate, 1964–2014
%



1 Working-age population is people aged 15 to 64.
2 Share of each age group employed.
NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; International Labour Organisation; McKinsey Global Institute analysis

Individual countries have experienced very different historical patterns of employment evolution (Exhibit 9). In general, employment moved in the same direction as the size of overall population, which explains why we observe larger employment growth in emerging markets than in developed economies. Yet there are variations within each group, rooted in differences in various demographic elements.

Among emerging markets, Brazil, India, Indonesia, Mexico, Nigeria, and Saudi Arabia at least tripled their employment over the past 50 years. China and other emerging markets more than doubled their employment. South African employment increased almost ninefold between 1964 and 2014. Most of these nations went through a demographic transition that offers a window of opportunity to invest in skills and to enable these economies to grow more rapidly in the future.[39]

The length of that window of opportunity has varied depending on the trajectory of declining fertility. There have been significant declines in fertility in nearly every region of the world, reflecting a growing desire to have smaller families as access to education, particularly among women, has increased and as contraception has become easier to obtain and more affordable. Nevertheless, fertility rates still vary dramatically among regions, among countries within regions, and even among administrative units within some countries. In countries where the fertility rate declined to three live births per woman or less, economies have benefited from an age structure in which a large share of the population is of working

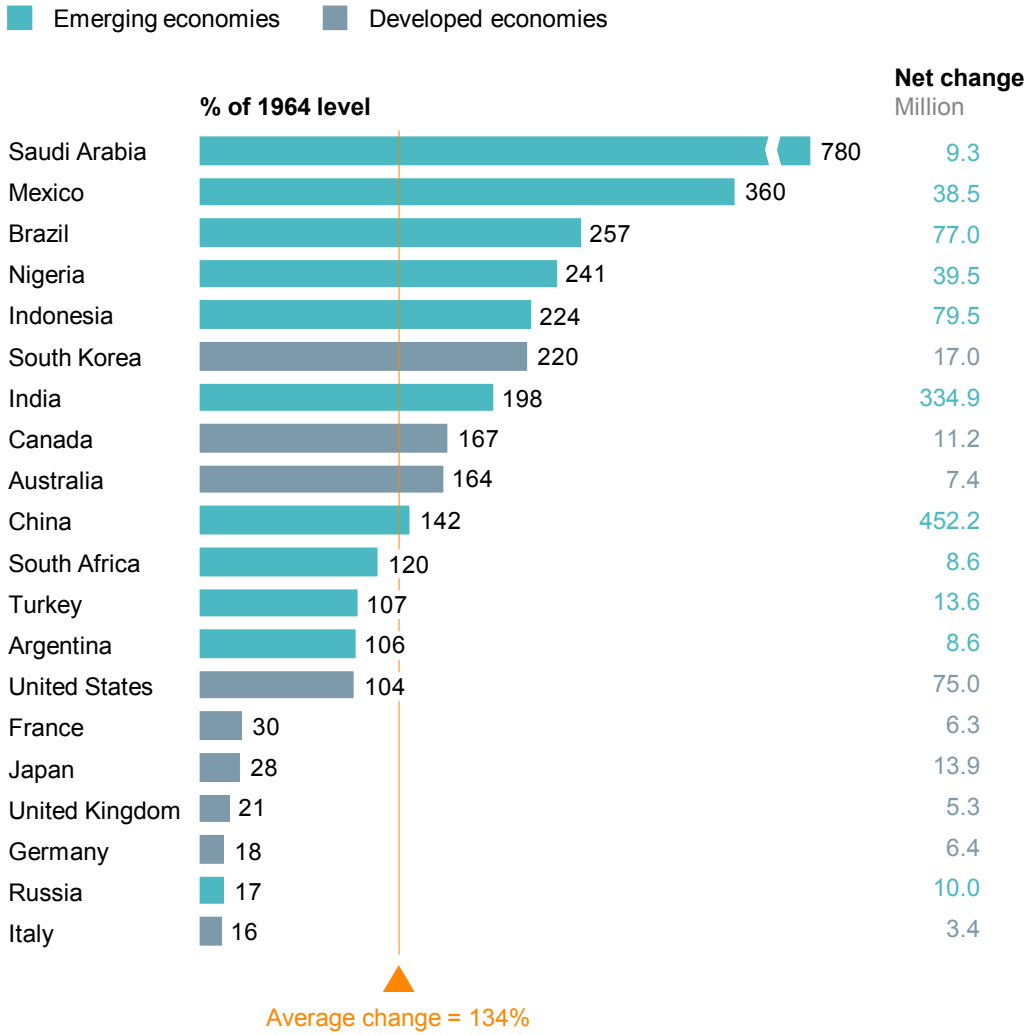
[39] See Ronald Lee and Andrew Mason, "What is the demographic dividend?" *Finance and Development*, volume 43, number 3, September 2006, and David E. Bloom, David Canning, and Jaypee Sevilla, *Economic growth and the demographic transition*, NBER working paper number 8695, December 2001.

age and there is a relatively small share of dependents—either children or those aged 65-plus.[40]

Exhibit 9

Historical employment growth varies across countries

Change in employees, G19 and Nigeria, 1964–2014



SOURCE: The Conference Board Total Economy Database; McKinsey Global Institute analysis

Partly as a result of its one-child policy, China experienced a sharp decline in the fertility rate, from about 5.8 births per woman in 1964 to 1.6 in 2012, and reached a peak share of the working-age population in 2010. India's fertility rate has declined much more gradually, from 5.8 births per woman in 1964 to 2.5 in 2012. India's share of the working-age population is not expected to peak until 2051. In Russia, in contrast to other emerging economies, employment rose by a mere 17 percent in this period, reflecting a relatively low fertility rate in the 1960s and 1970s followed by a sharp further decline after 1989 to only 1.2 births per woman by 1999, and only a slow recovery since then to 1.6 in 2012.[41]

[40] According to the UN Population Division, this window typically occurs when children (through age 14) represent less than 30 percent of the country's population and, simultaneously, when that country's proportion of people aged 65 and over constitutes less than 15 percent of the population. See *World population to 2300*, Department of Economic and Social Affairs, Population Division, United Nations, 2004.

[41] *World development indicators 2014*, World Bank, April 2014.

Among developed economies, employment growth has varied widely. Employment more than tripled in South Korea, where the fertility rate has been dropping since the 1980s but was still above the replacement threshold in the first 20 out of the past 50 years. South Korea's pattern is different from those of Germany and Japan, where fertility was above that threshold in only seven of the past 50 years. Where fertility rates were so low that there was little scope for them to fall further, population growth has stagnated, and rising labor-force participation has not been sufficient to compensate. However, Australia, Canada, and the United States more than doubled their populations between 1964 and 2014, testament to higher fertility than their developed-economy peers as well as strong immigration. The share of foreign born in the US population has more than doubled during this period, from 5.6 percent to 14.3 percent. This contributed to the US population growing at almost twice the pace of Japan's and seven times Germany's. The foreign-born population in Canada grew by half during this period. In Australia, the share of immigrants in the population increased from 16.5 percent in 1964 to 27.7 percent in 2012. Not all migration has been to developed regions—inward migration to Saudi Arabia, largely from South Asia, has been growing at 6 percent a year.

It is evident that the past half century of huge expansion in the labor pool was exceptional.

80%
decline in employment growth from past 50 years in next 50

Employment growth will decelerate, and peak employment is in sight

Over the next 50 years, growth in employment in the 20 countries is expected to decline from 1.7 percent per annum to 0.3 percent. Rapid population growth and the expansion in the working-age population have run their course, and a demographic drag is set to replace the demographic dividend. This is a continuation of a trend. Global employment growth has already been slowing for more than two decades. It is evident that the past half century of huge expansion in the labor pool was exceptional. Slower population growth and a declining working-age-population ratio mean that the peak of employment is in sight.

Again, population growth is the main cause for the dramatic changes in the three major drivers of employment growth. In MGI's 20-country sample, population growth is expected to wane to 0.4 percent over the next 50 years from an annual rate of 1.4 percent between 1964 and 2014. With the exception of Nigeria, where the population is expected to continue to grow rapidly at 2.4 percent, the rate of growth is expected to slow significantly in all other countries in the sample. The decline is set to be more dramatic in emerging economies, which as a group experienced faster population growth in the past. In these economies, growth is seen dropping from 1.6 percent a year to only 0.4 percent (Exhibit 10). Among the developed economies in the sample, the decline in population growth is set to be less dramatic but will still take a toll because their populations are already growing slowly. Both groups of countries are expected to experience population growth at just a quarter of the rate of the past 50 years.

The boost to growth from a favorable shift in age structure has also ended. As large cohorts age, the bulge of working-age people comes to an end. Their share in the overall population in MGI's sample countries is expected to fall to 61 percent from 68 percent today. This decline will be observed in all countries except India and South Africa. This declining share of working-age people will be a drag on employment of an estimated 0.2 percent a year. In developed economies, the impact of aging is large enough to erase all of the annual gains from a slowly growing population.

Among the three drivers of employment, the least predictable is probably the propensity to be employed. It is also a component that is amenable to change from public policy and action by companies, as we discuss in Chapter 5. Our base-case assumption is that the net impact of this driver on employment continues to be minimal, at only about 0.1 percent per annum.[42] This reflects the fact that different trends pull employment in opposite directions. For instance, rising labor-market participation by women in emerging economies, in particular, boosts employment, but larger numbers of young people remaining in education reduces it. Another example of trends pulling in opposite directions is that delayed retirement among baby boomers increases their employment rate, but rising life expectancy has the opposite effect.[43]

Exhibit 10

The growth rate of the global labor force will decline significantly in both developed and developing economies

Compound annual growth rate, G19 and Nigeria, 2014–64E
%

	Total	Developed economies	Emerging economies
Employee compound annual growth rate, 1964–2014 %	1.7	1.0	1.9

1 Share of each age group employed.
2 Working-age population is people whose age is between 15 and 64.
NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; International Labour Organisation; McKinsey Global Institute analysis

[42] Our base case assumes that employment propensity remains at the highest level observed between 2007 and 2012. Therefore, after adjustment for the post-recession recovery, changes in overall employment are due to shifts in the age pyramid and the relative weight of countries in the global total.

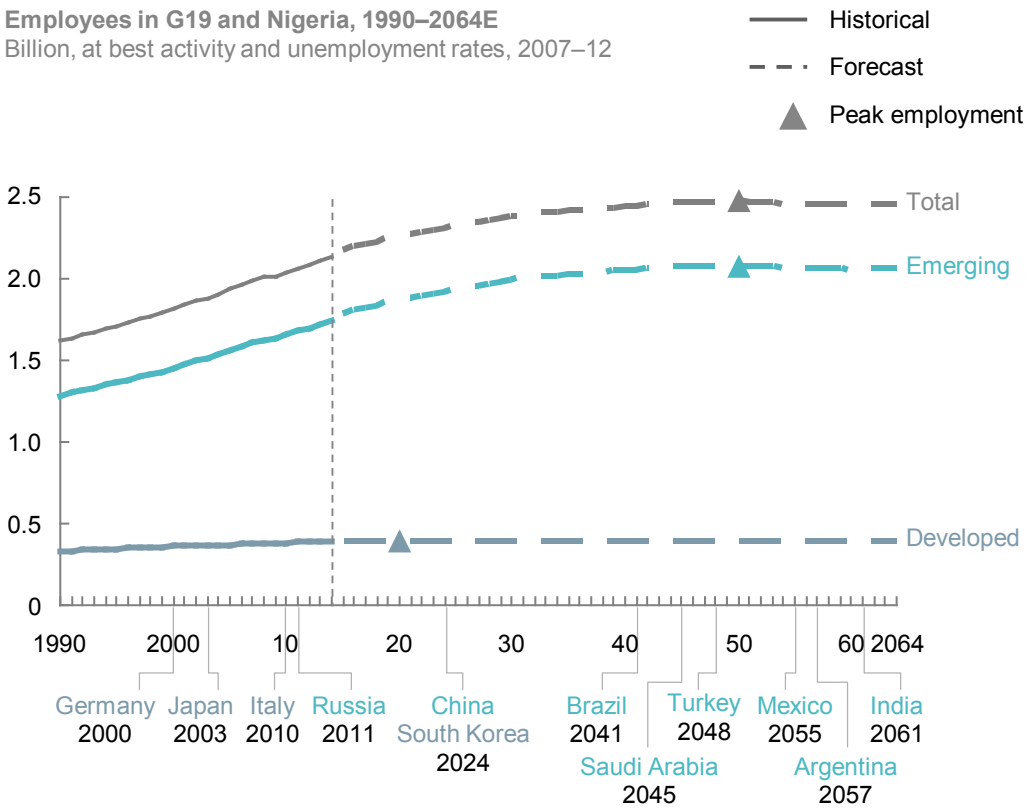
[43] The rising standard of living, better nutrition, and improved hygiene and disease prevention, among many other factors, have significantly improved life expectancy from 30 years to 77 over the past three centuries in OECD countries. In our 20-country sample, life expectancy has risen from 60 to 75 during the past 50 years. See Robert W. Fogel, *New findings about trends in life expectation and chronic diseases: The implications for health costs and pensions*, University of Chicago Graduate School of Business selected paper number 76, 1996, and James C. Riley, *Rising life expectancy: A global history*, Cambridge University Press, 2001.

Taking these factors into account, there is a distinct prospect that employment in the 20 countries overall could peak around 2050 and then settle into a declining path (Exhibit 11).

Exhibit 11

The global number of employees is likely to peak around 2050

Employees in G19 and Nigeria, 1990–2064E
Billion, at best activity and unemployment rates, 2007–12



SOURCE: The Conference Board Total Economy Database; United Nations Population Division; World Bank; International Labour Organisation; McKinsey Global Institute analysis

2024
year employment could peak in China

As in the past, employment prospects vary significantly among the 20 countries we have studied (Exhibit 12). Employment has already peaked and started to decline in Italy, Germany, Japan, and Russia. Their labor pools could shrink by up to one-third by 2064. In other countries, employment is likely to peak within 50 years. In China and South Korea, the peak is expected as early as 2024. China and India, which have the largest and second-largest populations in the world, respectively, are expected to follow very different paths. India's labor pool could expand by just over half over the next 50 years, but China's could shrink by one-fifth. Other nations are likely to continue to experience rising employment, albeit at slower rates. The United States, Indonesia, and South Africa fall into this category. Nigeria is the exception, projected to experience faster growth and a threefold increase in its labor force between 2014 and 2064.

In this context of less helpful demographic trends, automation and other technology that replaces or complements human tasks—today regarded with considerable alarm—could prove to be something of a saving grace. Computers, which historically replaced manual and clerical workers, are now beginning to replace knowledge and skilled workers. It has been estimated that by 2025, computers could do the work of 140 million knowledge workers and robots could do the work of 75 million people.[44] At a meeting with journalists,

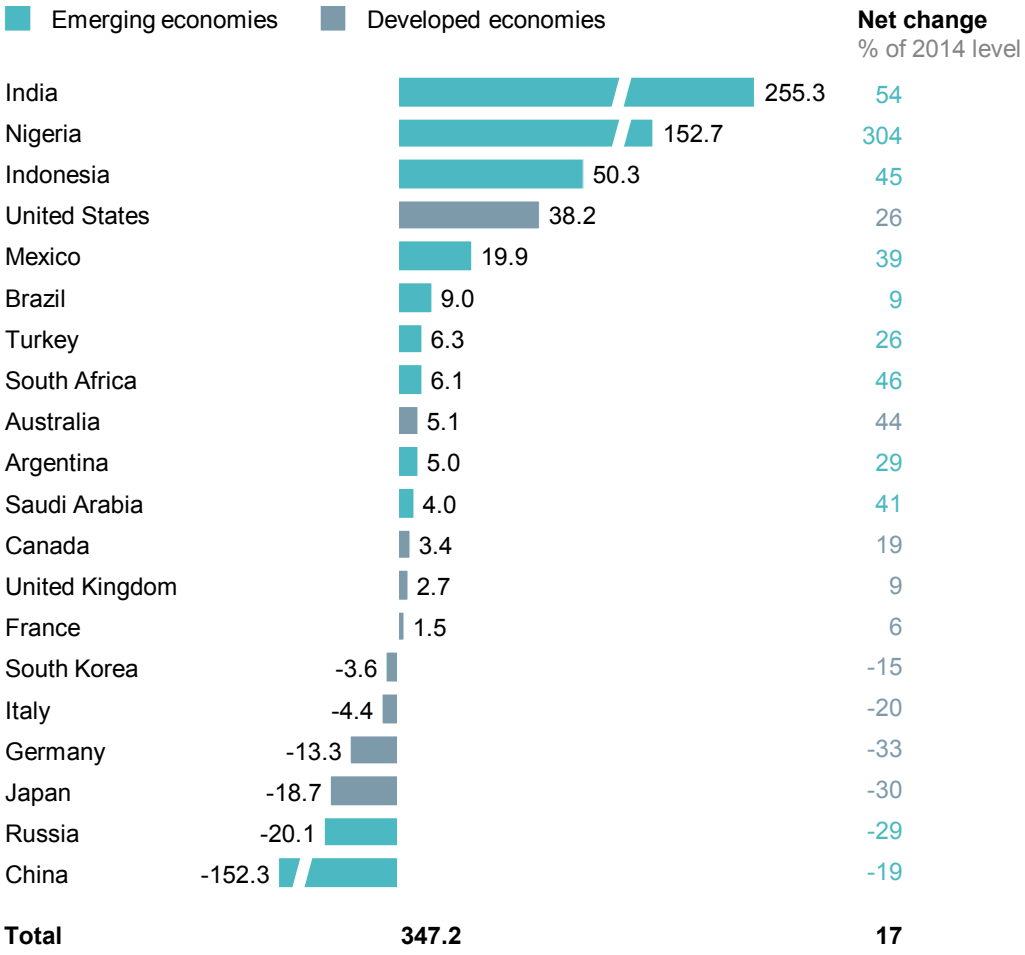
[44] Grigory Milov, "Smart computers, skilled robots, redundant people," *Vedomosti*, May 28, 2013.

an official at Toyota City was asked how the country would cope with its demographic problem. He responded, "Maybe the robots will take care of us."[45]

Exhibit 12

Prospects for growth in employees vary among countries

Projected net change in employees, 2014–64 baseline[1]
Million



1 Baseline scenario takes the highest labor force activity rate and the lowest unemployment rate between 2007 and 2012.
NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; International Labour Organisation; McKinsey Global Institute analysis

Changes in age structure have wide-ranging economic and social effects

The demographic transition and the changing age structure in a population have a far greater economic and social impact than simply determining the share of workers in an economy. One of the major concerns about aging is that, as the share of older people rises, dependency ratios increase (see Box 4, "Rising old-age dependency ratios").

The consumption and saving patterns of youthful populations differ from those of more mature age groups.[46] To illustrate the demographic impact on consumption, consider the

[45] Daniel Gross, "Why Japan isn't rising," *Slate*, July 18, 2009.

[46] For an overview of the academic research on the relationship between the age structure in a country and economics, see Ronald Lee and Andrew Mason, *Population aging and the generational economy: A global perspective*, Edward Elgar Publishing, 2011. On the broader societal and political implications of population age structure, see R. P. Cincotta, "Demography: A development perspective," in *Security and development in global politics: A critical comparison*, J. Spear and P. D. Williams, eds., Georgetown University Press, 2012.

very different examples of France and China. In France, McKinsey research has found that by 2030 well over half of all households will be headed by someone aged 55 years or older. Mature households are set to become the largest and fastest-growing pool of earners and consumers.[47] Citizens aged 65-plus will account for almost half of additional consumption in the period to 2030—but by virtue of their large numbers rather than their purchasing power, which will be under pressure. This has large implications for patterns of consumption. Older households tend to spend less on apparel and accessories, and therefore their share in the average consumption basket will fall. However, older households tend to be heavier consumers of financial services, and the share of this category in the average consumption basket will therefore rise. In China, a new generation is emerging, made up of youthful, middle-class consumers who were born after China started to open up its economy in the mid-1980s. McKinsey research has found that these members of Generation 2, or G2, are much more confident consumers than their parents and are more willing to pay a premium for the best products; indeed, they regard expensive products as better products.[48] They are happy to try new products and eager to experience new technologies. In 2020, 35 percent of total consumption in China is expected to come from these young consumers, who will be major purchasers of leisure, personal services, travel, and high-end hospitality.

The age structure also has an impact on savings. Over an individual's lifetime, savings tend to be low when people are young and have relatively low incomes. Savings accumulate in the peak earning years, typically when people are in their 40s and 50s. Then, during retirement in their 60s and 70s, people draw down their savings.[49] As populations age in many countries in the world, the stock of savings is declining. Japan remains the world's third-largest saver, but aging is eroding that position. Japan's gross national savings rate fell from a peak of 34.8 percent of GDP in 1991 to 28.6 percent in 2008.[50]

•••

The demographic tailwind that powered the world economy over the past 50 years is declining in most countries and even becoming a demographic headwind against growth. Declining fertility and aging populations are eroding growth in the labor force across the globe. Peak employment is now in prospect for many countries over the next half century, and the shifting age structure has far-reaching economic and social consequences. As populations age, this increases dependency ratios and reduces savings. Only a substantial increase in productivity growth is capable of fully counteracting waning demographic tailwinds, the subject of the next chapter.

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47 *Meeting the 2030 French consumer: How European-wide trends will shape the consumer landscape*, McKinsey Consumer and Shopper Insights, May 2010.

48 *Demystify the consumption generation (G2) in China*, McKinsey Insights China, February 2013. This report is based on seven years' consecutive door-to-door consumer research, interviewing around 70,000 Chinese consumers across more than 60 cities and 100 product categories.

49 For a survey of the academic literature on life-cycle savings and consumption patterns, see Orazio P. Attanasio and Guglielmo Weber, "Consumption and saving: Models of intertemporal allocation and their implications for public policy," *Journal of Economic Literature*, volume 48, number 3, September 2010.

50 See *Talkin' 'bout my generation: The economic impact of aging US baby boomers*, McKinsey Global Institute, June 2008, and *Farewell to cheap capital? The implications of long-term shifts in global investment and saving*, McKinsey Global Institute, December 2010.

Box 4. Rising old-age dependency ratios

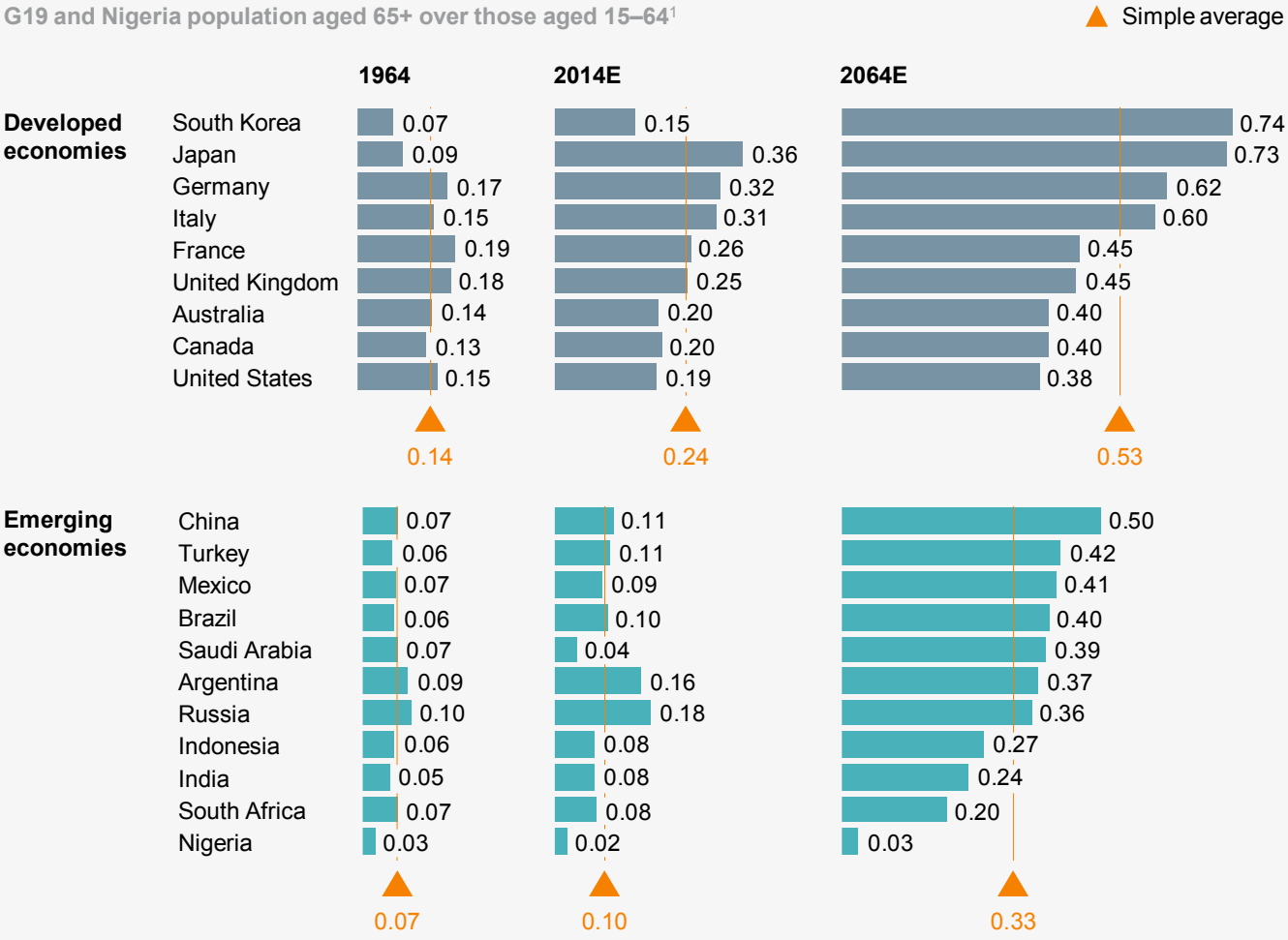
Population trends over the next 50 years could sharply increase the old-age dependency ratio—the ratio of the number of people aged 65 or older to the working-age population. This indicator measures the economic pressure that aging puts on society. It is used as a rough indication of the number of older citizens that society needs to support with the average output of each working-age person.[1] In the G19 and Nigeria sample, the dependency ratio will more than double in developed economies and more than triple among emerging countries (Exhibit 13).

This indicates that a slowly growing supply of labor needs to support much faster growth in the older segment of the population. In the UN's base-case population scenario, some countries could reach old-age dependency ratios of 0.50 or more by 2064, including China (0.50), Germany (0.62), Italy (0.60), Japan (0.73), and South Korea (0.75). In other words, for every four working-age citizens in Japan and South Korea, these societies would have three dependents aged 65 or older. China would have one 65-plus dependent for every two working-age citizens.

Exhibit 13

Aging has imposed more strain on developed countries in the past 50 years but emerging economies will also face a dramatic change in the next 50 years

G19 and Nigeria population aged 65+ over those aged 15–64[1]



1 Old-age dependency ratio is used here rather than the commonly known definition of dependency ratio (non-working-age population over working-age population) to measure the pressure of aging population.

SOURCE: United Nations Population Division; McKinsey Global Institute analysis

[1] This number is only an approximation because not all working-age people are employed, while many people work beyond the retirement age. Therefore, the actual economic pressure can be quite different and can change over time if, for instance, a larger share of women choose to work outside the home, or more people in the 65-plus age bracket work longer. At the same time, a declining share of children in the population may reduce the need for their support and education.

Scientist preparing to measure electromagnetic waves
in anechoic chamber
© Alamy

3. PRODUCTIVITY PROSPECTS

As demographic tailwinds wane, the onus will be on productivity growth to drive the world's continuing economic expansion. If productivity growth continued to rise over the next 50 years at its already rapid average rate between 1964 and 2014, the rate of global GDP growth would decline by 40 percent, from 3.6 percent a year to only 2.1 percent in the G19 and Nigeria. To put this into perspective, for the next 50 years, growth would be slower than in the past five years of recovery from the global recession or the energy-crisis decade of 1974 to 1984. The global economy would expand threefold in the next half century instead of the sixfold growth of the past 50 years.

The impact on growth in per capita income growth would be less dramatic. The declining share of the prime-working-age population implies a 19 percent decline from its growth rate over the past 50 years. Such a decline would mean the standard of living rising by 2.3 times in the next half century compared with an increase of 2.8 times over the previous 50 years.

Rising productivity has not just boosted incomes but has dramatically changed lives.

Changing the long-term global growth trajectory that appears to be in prospect will largely depend on the rate of productivity growth. Princeton University professor Alan Blinder commented in November 2014, "Maybe some of the copious attention now being devoted to assessing labor-market slack should be redeployed to studying productivity growth. It might be more productive."[51]

Faster productivity gains can make up for changing demographic trends. To fully compensate for the impact on global GDP growth of slowing employment, productivity growth over the next 50 years would need to be 80 percent faster than the already high rate of the past 50 years. Productivity would need to accelerate by 22 percent from its historical rate to compensate for the effect of the demographic shift on per capita income. In turn, productivity growth that is below its historical rate would mean even slower GDP and per capita income growth.

In this chapter, we put today's productivity growth into historical context and assess the impact on GDP growth if past productivity-growth rates were to continue.

Historical productivity growth has varied significantly over time and among economies

On average, labor productivity—measured by value added per employee—in the G19 and Nigeria grew at a pace of 1.8 percent a year over the past half century, faster than in any previous period in history.[52] The average employee today generates 2.4 times as much in output as in 1964. Given that the hours worked per employee have declined in all nations, output per hour has risen by even more (see Box 5, "Productivity and declining hours per employee").

[51] Alan S. Blinder, "The unsettling mystery of productivity," *The Wall Street Journal*, November 25, 2014.

[52] Global productivity and growth had been at historic highs since 1950, reflecting the post-World War II boom in the United States, Western Europe, and Japan. Together, these three accounted for 61 percent of the global economy in 1964.

Box 5. Productivity and declining hours per employee

The average amount of time worked in our sample countries declined from 41 hours a week in 1964 to 34 hours in 2012 (Exhibit 14).[1]

In Germany and France, the average total hours worked per employee declined by more than 30 percent, from just over 40 hours per week to 27 and 28 hours, respectively, in less than 50 years. In South Korea, the average number of hours worked has declined by only two hours over the past half century, but behind that modest change lie dramatic shifts through the decades. In 1964, the average South Korean employee worked 44 hours a week. By 1988, that had risen to more than 54 hours, the highest in the world at that time. The increase in working hours during this period can be attributed to rapid industrialization and a high share of manufacturing employment. Even in 2007, the average worker in the manufacturing sector in South Korea worked more than 48 hours per week. Since 1988, however, the average number of weekly hours worked has fallen. It hit 42 hours in 2012, reflecting the introduction of a statutory 40-hour limit in 2004 (although compliance is weak and the extension of hours through overtime remains common practice).[2]

Such declines are not confined to prosperous developed economies. Working hours in emerging markets overall have been declining at around half the pace observed in developed economies. However, Turkey bucks the trend. The average amount of time worked per week in Turkey dropped from 45 hours in 1964 to 36 hours in 2012.

Given this general trend of declining hours per employee, estimates of productivity growth based on value added per employee underestimate real productivity growth per hour worked. In the countries for which we have sufficient data on hours worked, that understatement of productivity is, on average, about 0.3 percentage points each year, and this gap appears to be consistent over time.[3]

The patterns we observe suggest that the average number of working hours declines as economies develop. There are a number of explanations. One relates to demand for leisure, which increases as people's incomes rise and as options expand for how to spend free time. Video gaming and movie streaming at home and yoga or fitness studios close by have made free time more valuable.[4] Changes in labor laws restricting weekly hours or mandating time off have also contributed. Continental Europe has been an early leader in these efforts but is by no means alone.

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1 Of the 20 countries in our sample, only 13 (Argentina, Australia, Brazil, Canada, France, Germany, Italy, Japan, Mexico, South Korea, Turkey, the United Kingdom, and the United States) report data on working hours for the full period. However, data on hours worked are notoriously hard to measure accurately, another reason that we have relied on value added per employee as the metric across all countries. For an assessment of international data on hours worked, see Susan E. Fleck, "International comparisons of hours worked: An assessment of the statistics," *Monthly Labor Review*, US Bureau of Labor Statistics, May 2009.

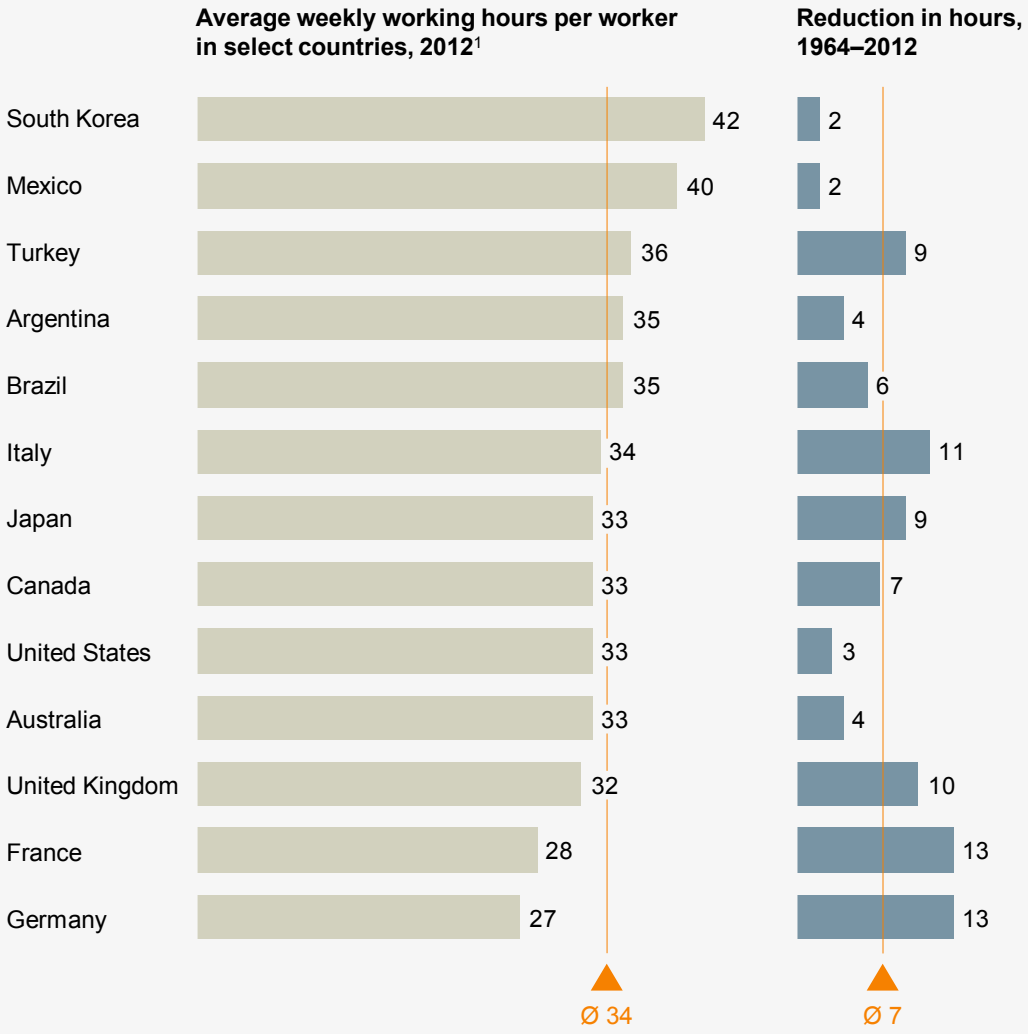
2 Sanghoon Lee, Deirdre McCann, and Jon C. Messenger, *Working time around the world: Trends in working hours, laws and policies in a global comparative perspective*, Routledge, 2007.

3 See Dale W. Jorgenson and Marcel P. Timmer, "Structural change in advanced nations: A new set of stylised facts," *Scandinavian Journal of Economics*, volume 113, issue 1, March 2011, and Bruce Philip and Dan Wheatley, "European work time regulation, surplus-value and underemployment among full-time employees: A cross-sectional analysis using the 2009 EU LFS," *Economic Issues*, volume 18, number 1, March 2013.

4 Cara McDaniel, *Forces shaping hours worked in the OECD 1960–2004*, Kenyon College, March 2011.

Exhibit 14

Employees are working fewer hours across regions and stages of economic development



1 Annual total hours per worker is divided by 52 weeks to take into account that holidays also reduce working hours.

SOURCE: The Conference Board Total Economy Database; McKinsey Global Institute analysis

30%+
GDP growth decline in 75% of sample countries at historical productivity growth

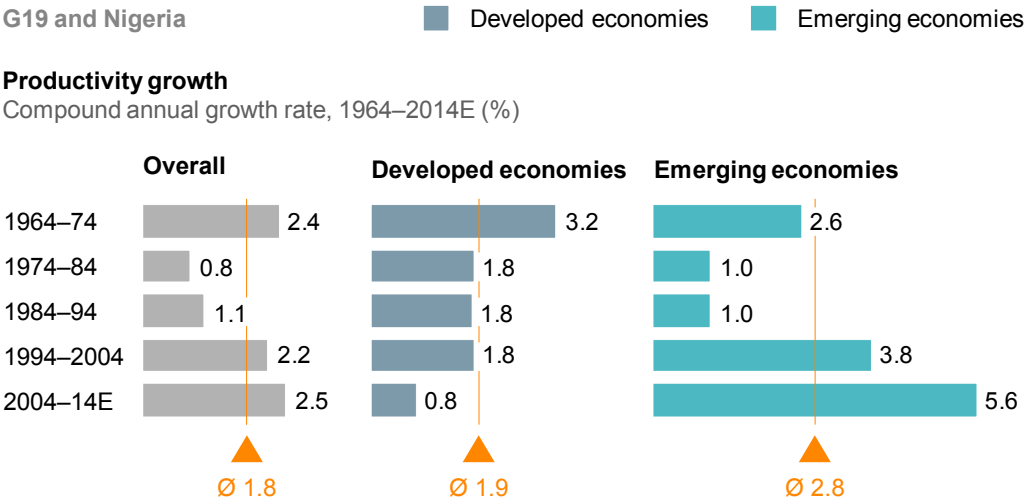
As economies have developed, employment has shifted from low-productivity agriculture to more productive manufacturing and service-sector jobs in cities. Automation and more efficient operations dramatically raised the output produced by the average worker in sectors from auto manufacturing to retail. As nations and regions became increasingly integrated, more productive modern businesses gained share from less productive ones, helping to raise average productivity. Technological advances from semiconductors to software transformed how goods and services are produced and even the very nature of those goods and services. Rising productivity has not just boosted incomes but has dramatically changed lives.

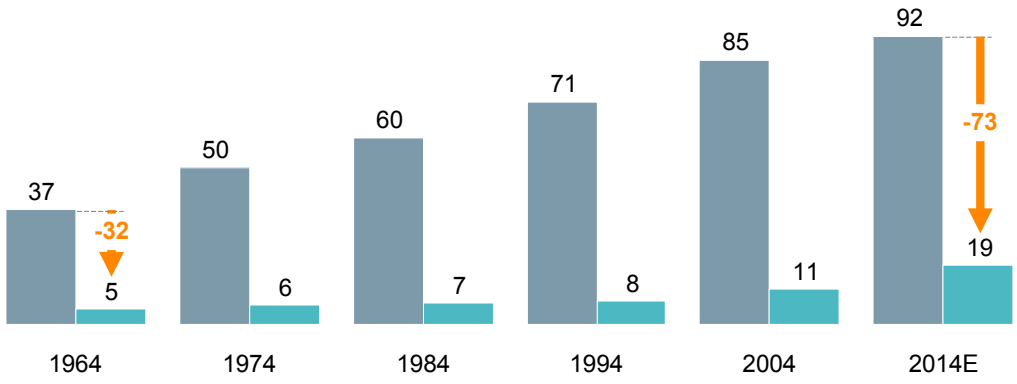
Developed economies have increased their productivity at a rate of 1.9 percent per annum, but emerging economies have achieved 50-percent faster productivity growth of 2.8 percent a year. Since the 1970s, productivity growth in emerging economies has accelerated in every decade, with China's rapid growth over the past two decades contributing much of the total (Exhibit 15).

Exhibit 15

Over the past 50 years, productivity growth has slowed in developed economies and quickened in emerging economies

G19 and Nigeria





SOURCE: The Conference Board Total Economy Database; McKinsey Global Institute analysis

In developed economies, productivity growth was stable at 1.8 percent per annum in three of the five decades, with exceptionally fast productivity gains between 1964 and 1974 but slow growth in productivity since 2004, a period that includes the global recession.[53] However, because the productivity of developed economies in 1964 was already much higher than that of emerging economies, the absolute gap in labor productivity between the two groups of economies more than doubled, from about $32,000 in 1964 to $73,000 in 2014. Today, productivity in developed economies is still almost five times what it is in emerging economies.

No emerging economy in our sample has been able to narrow the absolute productivity gap to the US level, and many have dropped further behind in relative terms.

While the global average pace of productivity growth has been brisk, patterns of productivity growth have varied widely among different economies (Exhibit 16). In Western European nations and the United States, labor productivity grew by between 1.5 percent and 1.9 percent a year—from a relatively high base—over the past 50 years.[54] During this period, South Korea and Japan performed exceptionally strongly on productivity and were able to narrow their aggregate productivity gap with Western Europe and the United States. South Korea has transformed itself from an emerging market with a productivity level that was almost one-third below that of Brazil in 1964 to a developed economy today with labor productivity that is 80 percent of Germany's level—an almost ninefold increase. South Korea achieved this feat by investing in educating its growing population and by identifying and supporting investment in key sectors, notably manufacturing, where global demand was strong.[55]

Among developing economies, the variation in productivity performance over the past 50 years has been much wider. There is no typical rate of productivity growth in these economies. China's productivity has grown at an annual pace of 5.7 percent. In contrast, Mexico and Saudi Arabia have clocked less than 1 percent annual productivity growth over this period. Productivity growth in Argentina, Brazil, Russia, and South Africa ranges between 1.2 percent and 1.5 percent per annum. Nigeria, with 2.0 percent annual productivity growth, and Turkey, India, and Indonesia, all with rates of around 3 percent a year, have improved their productivity growth more rapidly from a relatively low level in 1964.

What is striking is that the gap between productivity in emerging economies and developed economies has not narrowed to a significant degree. For instance, no emerging economy in our sample has been able to narrow the absolute productivity gap to the US level, and many have dropped further behind in relative terms.[56] Narrowing this gap is one of the biggest challenges to global growth today—if not the biggest. MGI has studied the reasons for

[53] *2014 productivity brief—key findings*, The Conference Board, 2014

[54] This range is broadly consistent with the findings of Thomas Piketty as cited in his book *Capital in the twenty-first century*, translated by Arthur Goldhammer, Belknap Press of Harvard University Press, 2014. The author finds that the long-term productivity growth of economies close to the productivity frontier is roughly 1.5 percent per annum.

[55] See John Weiss, *Export growth and industrial policy: Lessons from the East Asian Miracle experience*, Asian Development Bank Institute discussion paper number 26, February 2005; Dani Rodrik, "Getting interventions right: How South Korea and Taiwan grew rich," *Economic Policy*, volume 10, number 20, April 1995; *Productivity-led growth for Korea*, McKinsey Global Institute, March 1998; and *Beyond Korean style: Shaping a new growth formula*, McKinsey Global Institute, April 2013.

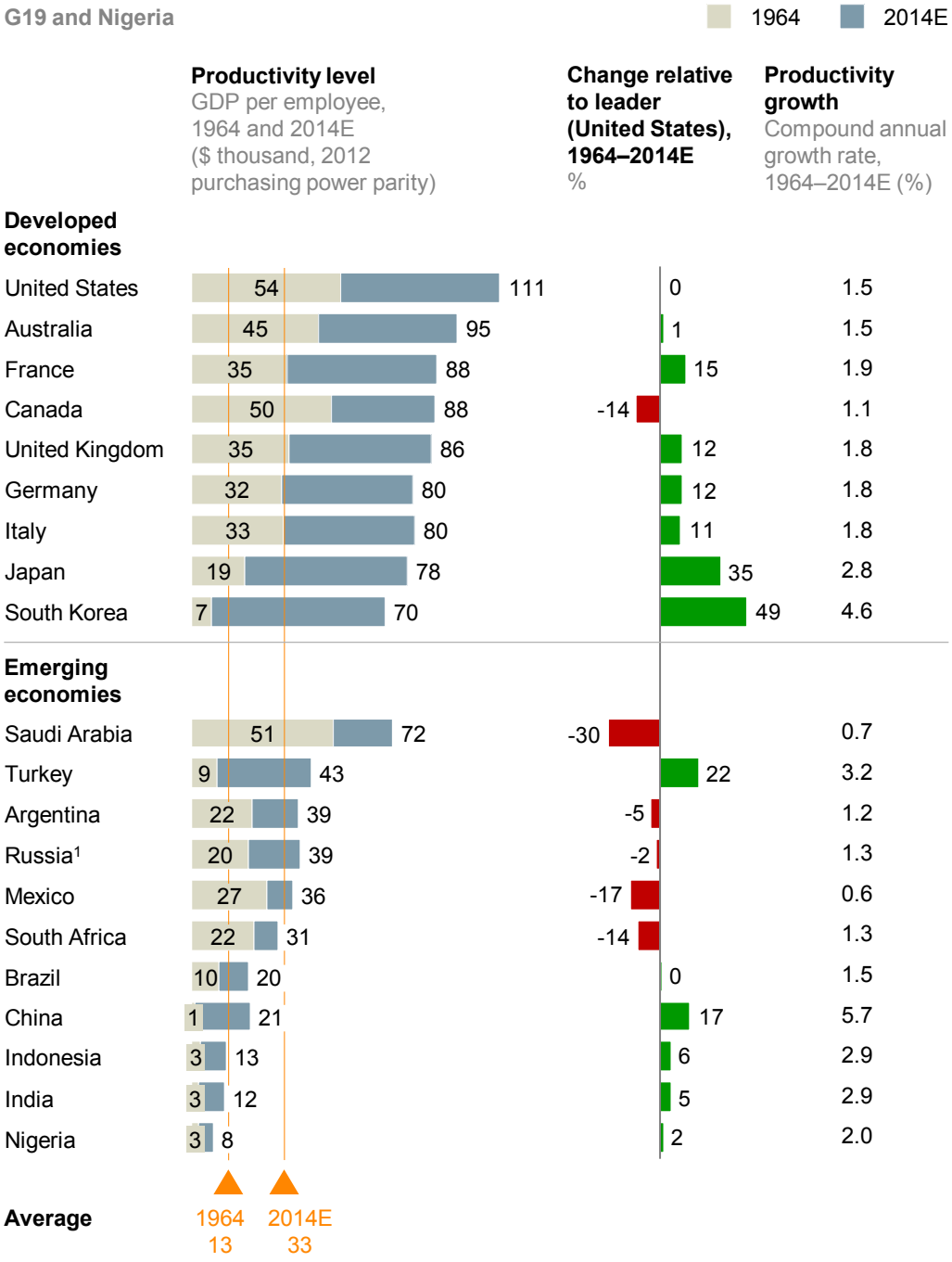
[56] South Korea and Japan are notable exceptions, as we have discussed. In 1964, both had productivity levels comparable with emerging economies but they have rapidly closed the gap with developed economies.

sustained productivity gaps in more than 20 countries over the past 20 years, and we draw on this body of research in the next chapter, where we discuss what it would take to raise productivity-growth rates.[57]

Exhibit 16

Productivity-growth rates vary widely among countries; not all nations have narrowed the productivity gap to the frontier

G19 and Nigeria



1 Russia data before 1989 approximated using the Angus Maddison historical series.

SOURCE: The Conference Board Total Economy Database; McKinsey Global Institute analysis

[57] To read or download MGI reports on productivity, competitiveness, and growth, please visit www.mckinsey.com/insights/mgi/research/productivity_competitiveness_and_growth.

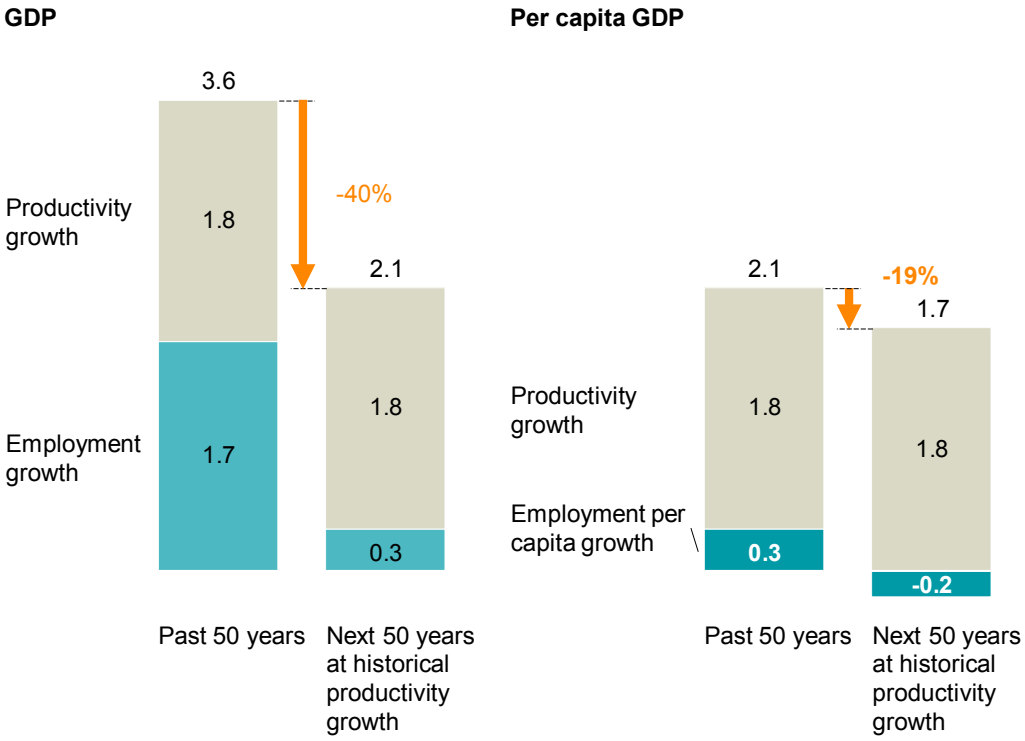
If the past productivity-growth rate continued, long-term GDP growth would be 40 percent below its historical rate

If the global productivity-growth rate of the past 50 years were to continue over the next half century, average GDP growth in the G19 and Nigeria would decrease from a rate of 3.6 percent a year to 2.1 percent (Exhibit 17). That is a decline of more than 40 percent. This reflects demographic trends described in Chapter 2. Over the course of 50 years, this would add up to a significant shift in the world's growth trajectory. While the global economy expanded sixfold in the 50 years from 1964, it would grow only threefold between 2014 and 2064.

Exhibit 17

At past rates of productivity growth, GDP growth would slow down by about 40 percent and per capita GDP growth by about 20 percent

G19 and Nigeria
Compound annual growth rate, %



NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; McKinsey Global Institute analysis

Productivity growth in the G19 and Nigeria would need to increase from 1.8 percent a year in the past half century to 3.3 percent annually to compensate fully for the declining contribution to GDP growth from an expanding pool of workers. This is a sharp acceleration from an already high historical growth rate. A slower long-term GDP-growth trajectory is anticipated in a range of past productivity-growth scenarios (Exhibit 18).

Rather than an overall expansion of GDP, per capita income is the metric that matters for improving global living standards. Therefore, it is worth considering what demographic trends imply for average global growth in per capita income over the next 50 years. The answer is that, if past productivity rates continue, we should expect income per person to decline from 2.1 percent per annum to 1.7 percent as a result of the declining share of

working-age population over the next half century.[58] Income gains have been, and will continue to be, largely the result of gains in productivity. If the average productivity rate of the past 50 years were to continue, global per capita income would increase by 2.3 times by 2064 compared with the increase of 2.8 times between 1964 and 2014. To sustain the past rate of per capita GDP growth, productivity growth would need to accelerate by 22 percent, from 1.8 percent a year to 2.1 percent.

Exhibit 18

Productivity-growth scenarios show a decline in the GDP-growth rate; growth in per capita GDP declines in all but the most optimistic case

G19 and Nigeria

	Productivity-growth scenarios for the next 50 years		
	1.2% per annum[1]	1.8% per annum[2]	2.5% per annum[3]
Change in GDP growth	-57%	-40%	-21%
from 3.6% per annum[4]	to 1.5% per annum	to 2.1% per annum	to 2.8% per annum
Change in per capita GDP growth	-47%	-19%	+16%
from 2.1% per annum[4]	to 1.1% per annum	to 1.7% per annum	to 2.4% per annum

1 Productivity growth from 1914 to 1964 derived by assuming same ratio of productivity growth to per capita GDP growth for 1914 to 1964 as in the period from 1964 to 2014.
2 Assuming sustained average global productivity growth rate from 1964 to 2014.
3 Assuming sustained average global productivity growth rate from 2004 to 2014 (decade with the highest productivity growth in the past 50 years).
4 Compound annual growth rate of the past 50 years.

SOURCE: The Conference Board Total Economy Database; Jutta Bolt and Jan Luiten van Zanden, *The first update of the Maddison Project: Re-estimating growth before 1820*, Maddison Project working paper number 4, University of Groningen, January 2013; United Nations Population Division; McKinsey Global Institute analysis

22%
acceleration in productivity growth to sustain past per capita GDP growth

Perhaps surprisingly, the extent of the demographic challenge to growth is slightly larger among emerging markets than it is in developed ones. The absolute decline in projected employment growth is larger in emerging economies, where population growth has historically been higher. Employment growth in these economies is expected to decline from 1.9 percent per annum to 0.4 percent, compared with a drop among developed economies from 0.9 percent a year to 0.1 percent (Exhibit 19).

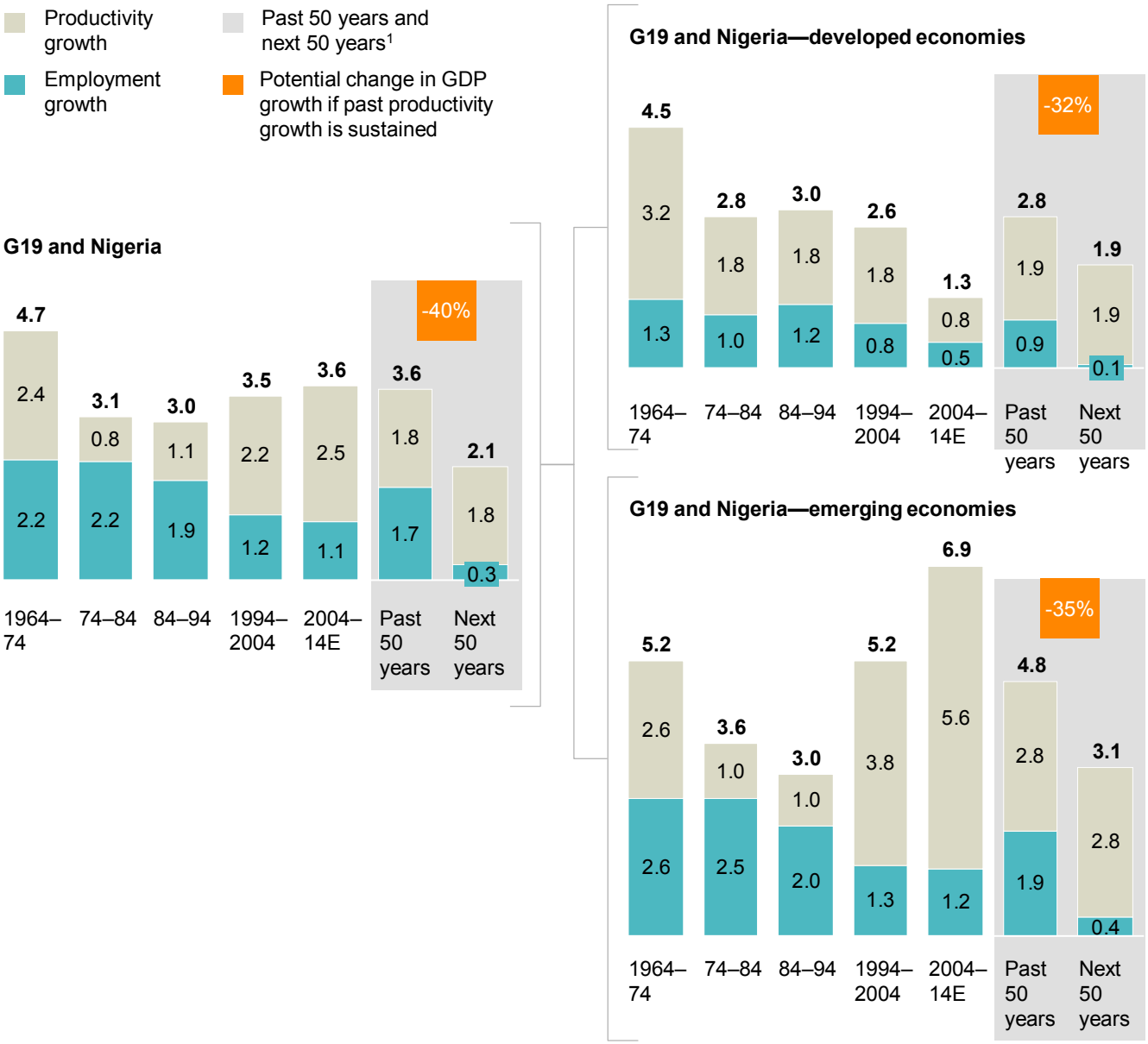
Assuming past productivity-growth rates are sustained in coming decades, emerging regions are poised to experience a one-third decline in their GDP growth rate, from 4.8 percent a year to 3.1 percent, similar to a 32 percent decline in developed economies from 2.8 percent a year to 1.9 percent. In emerging economies, fully compensating for the shift in demographic trends and its impact on overall GDP growth would require a 57 percent increase in the rate of productivity growth, from 2.8 percent a year to 4.4 percent. In developed economies, a 47 percent acceleration in productivity, from 1.9 percent per annum to 2.8 percent, would compensate for the declining contribution to growth from labor (see Box 6, "The demographic challenge to long-term growth varies widely among the world's largest economies").

[58] We assume no change in the share of the working-age population employed in this analysis. Changes in labor-participation rates, discussed in Chapter 2, would change the projections.

Exhibit 19

At historical productivity-growth rates, GDP growth is set to decline in both developed and emerging economies

GDP growth split by employment and productivity growth—historical and future projection[1]
Compound annual growth rate, %



1 Assuming historical productivity growth is sustained for the next 50 years.
NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; International Labour Organisation; McKinsey Global Institute analysis

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A shift in demographic trends threatens to depress the trajectory of long-term global GDP growth by 40 percent. Productivity growth would need to accelerate by 80 percent to fully make up for the waning of demographic tailwinds. To sustain past per capita income growth, productivity would need to accelerate by 22 percent. In the next chapter, we explore opportunities to sustain and raise the rate of productivity growth through five sector case studies.

Box 6. The demographic challenge to long-term growth varies widely among the world's largest economies

If current trends continue, a waning of demographic tailwinds will drag down employment growth in both developed and emerging economies (Exhibit 20). Nigeria is the exception. The demographic transition that boosted employment growth in most other countries in the past 50 years still lies ahead. The share of Nigeria's working-age population is increasing and should accelerate employment growth above historical rates, enabling the economy to grow 0.4 percent faster even with no improvement in productivity growth.

Among developed economies, Canada, Australia, and the United States had the fastest employment growth over the past century, helped by higher fertility rates and immigration. In Canada, for instance, GDP growth over the next 50 years could be 1.5 percent on the basis of unchanged productivity, less than half the 3.1 percent rate of the past half century. Japan, Italy, and Germany have already experienced significantly slower employment growth and are expected to sustain declines in their labor forces over the next half century. Employment growth in France and the United Kingdom is expected to decline at a more modest rate because that growth rate is already low.

The impact of waning employment growth is likely to be felt most strongly in emerging economies such as Saudi Arabia, Mexico, and Brazil, where rapid employment growth accounted for more than 60 percent of GDP growth in the past 50 years. Take Saudi Arabia as an example. Assuming unchanged productivity growth, annual GDP growth could weaken sharply, to 1.4 percent over the next 50 years compared with 5.1 percent over the past 50. Over the past 50 years, South Korea and China together accounted for about 30 percent of GDP growth in the G19 plus Nigeria grouping. In the period ahead, both are expected to experience declining employment.

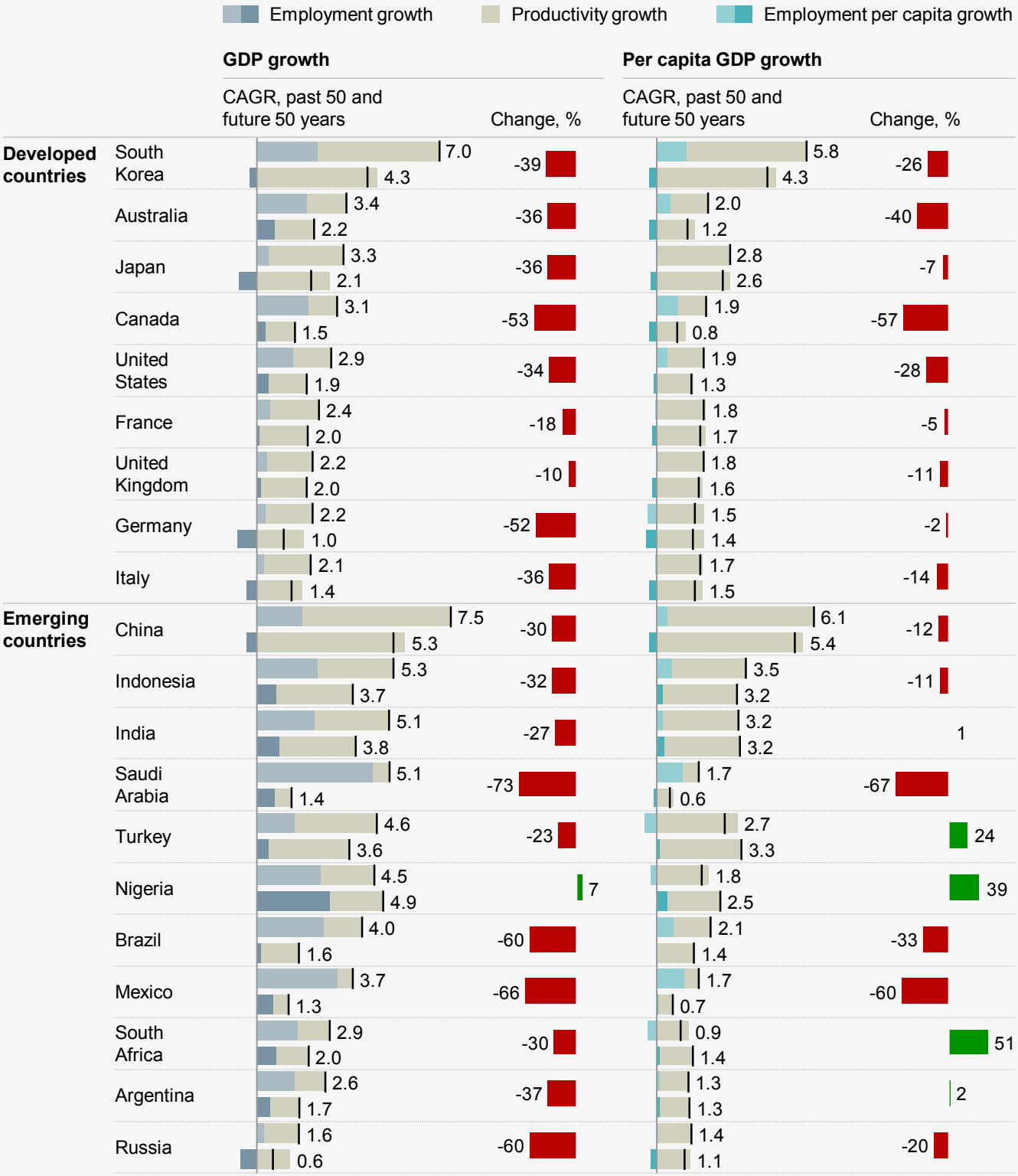
Prospects for growth in per capita GDP also vary among economies—and not always in the same direction as overall GDP prospects. Developed economies such as France, Germany, Italy, Japan, and the United Kingdom that experienced a negligible contribution from per capita employment to per capita GDP over the past 50 years would experience a modest decline in the growth rate of per capita GDP in the future, assuming historical productivity rates continue. In contrast, economies including Australia, Canada, and the United States that experienced a significant contribution to per capita GDP from per capita employment could experience significantly slower per capita GDP growth in the future. In the case of Canada, future per capita GDP growth could drop to half of its historical rate. In the United States, per capita GDP growth could grow one-third slower if productivity-growth rates are unchanged.

There are similar variations among emerging economies. Nigeria, South Africa, and Turkey, for instance, experienced rapid population growth in the three decades after 1960, and per capita employment declined. In fact, the number of people aged below 15 years exceeded the number of people of prime working age (25–64) until 1990. Now, however, population growth in these economies is slowing and the share of those of working age in the population is rising; therefore, per capita employment is expected to increase over the next 50 years. However, other economies, including Argentina, China, India, and Indonesia, are not expected to undergo significant changes in per capita employment and therefore should experience a moderate change in per capita income growth. In Brazil, Mexico, and Saudi Arabia, per capita GDP growth could slow significantly given declining growth in per capita employment from its high rate in the past. The rate of productivity growth in Saudi Arabia over the next 50 years would need to triple to maintain the growth rate of per capita income observed over the past 50 years. In Mexico, the acceleration would need to be by more than 2.5 times.

Exhibit 20

At historical productivity-growth rates, GDP and per capita GDP growth are set to slow in most G19 countries

Employment, productivity, and growth
Medium UN population scenario, best activity and unemployment rates, 2007–12; compound annual growth rate (CAGR), %; future 50 years assumes past productivity growth rates for next 50 years



NOTE: Numbers may not sum due to rounding.

SOURCE: The Conference Board Total Economy Database; United Nations Population Division; International Labour Organisation; McKinsey Global Institute analysis

Women shopping, Shanghai
© Getty Images

4. PRODUCTIVITY OPPORTUNITIES BY SECTOR

At an average rate of 1.7 percent per annum—1.8 percent for the G19 and Nigeria—global productivity growth over the past half century was high by historical standards. How feasible is it to expect global productivity growth to be sustained at the rapid rates of the past, let alone to rise further in the coming decades?

3/4
productivity-growth opportunity from catching up to best practice

1/4
from pushing the productivity frontier

Looking ahead 50 years is extremely challenging. There is no sure way of knowing what technologies, business innovations, or even new industries will emerge. In 1964, we could hardly have foreseen how consumers can now access huge libraries of music and movies and enjoy them anytime and (almost) anywhere; how real-time sales data translates immediately to changes in inventories across the globe; or how satellite data guide agricultural machinery to ever-higher yields. It is likely that even the way we define sectors or value their output and productivity will evolve, as it did in the past 50 years.

While nobody has a crystal ball, it is nevertheless useful to analyze the current state of productivity in different industries and regions and to assess as systematically as possible the improvement opportunities and underlying trends that are likely to determine the path ahead. We limit our projections to the period to 2025—roughly ten years into the future rather than 50—because that is the period during which understanding today's starting position can help to guide informed projections. We judged that we can make an effective assessment only by looking through the next wave of product design and investment cycles and typical implementation times, guided by past examples of changes in industry structure that we have observed across sectors.

To ascertain what opportunities there may be for more rapid productivity growth, MGI has conducted case studies in five sectors: agriculture, food processing, automotive, retail, and health care. We used MGI's micro-to-macro approach to assess productivity-improvement opportunities that are visible and feasible by 2025 (see Box 7, "Five sector case studies: Approach and methodology").

Extrapolating from these case studies, we find sufficient potential to accelerate productivity growth to about 4 percent a year in the G19 and Nigeria. That would be more than enough to compensate for the waning of demographic tailwinds. The persistence of large gaps in the productivity performance of developed economies compared with emerging economies underlines the potential to retool the world's productivity-growth engine.

We estimate that roughly three-quarters of the total global potential for productivity growth would come from the broader adoption of existing best practices—which we can characterize as "catch-up" productivity improvements. The positive message here is that these types of opportunity are all known to us and exist somewhere in the world. Eighty percent of the overall scope to boost productivity in emerging economies comes from catching up. The remaining one-quarter, or about one percentage point a year, could come from technological, operational, or business innovations that go beyond today's best practices and that "push the frontier" of the world's GDP potential. In contrast to some observers, we do not find that a drying up of technological or business innovations will act as a constraint to growth. On the contrary, we see a strong innovation pipeline in both developed and developing economies in the sectors we studied. Our estimate of the potential here is based only on the innovations that we can foresee. It is quite possible that waves of innovation may, in reality, push the frontier far further than we can ascertain based on the current evidence.

Box 7. Five sector case studies: Approach and methodology

MGI's two decades of studying productivity have indicated that we are much more likely to understand the reasons that growth positively surprises or disappoints by looking at individual sectors in as detailed a way as possible. We have already discussed how large the variations are in productivity trends among countries. These variations are even more striking when we look at sectors. Industries have different productivity gaps between countries, indicating large differences in the potential to catch up with productivity levels in leading economies. Furthermore, the evolving size of different industries matters a great deal for overall productivity performance. This means that a sector-level analysis is a critical part of reaching an understanding of the overall global growth puzzle.

MGI chose the five sectors discussed in detail using five criteria. First, each sector needed to be a sufficiently large employer to matter for aggregate productivity growth. Second, we needed representatives from a broad range of sectors. Third, we chose these five because of their variations in productivity performance so that we could paint a diverse picture of productivity-growth opportunities and challenges. Fourth, we needed to have sufficiently broad data across countries. Finally, we chose these sectors because we could draw on extensive experience in these sectors from McKinsey's industry practices as well as past MGI research.

For each sector case, we drew on sector data from the World Input-Output database and dozens of MGI country and industry studies to understand current and historical productivity performance. We then relied on MGI's industry expertise, case studies, and targeted analyses to understand untapped productivity improvement opportunities and estimated how much productivity in each sector could improve if the full feasible productivity potential were realized by 2025.

All the opportunities we include in the analysis have either been adopted by leading companies or regions, or are in an advanced stage of development and expected to become commercially available and adopted by 2025. We also account for the fact that labor costs influence economic incentives for adopting labor-saving technologies. In low-wage countries, it may be cost-effective to maintain some labor-intensive processes instead of shifting to mechanized or automated ones. We include only economically feasible opportunities in our estimates.

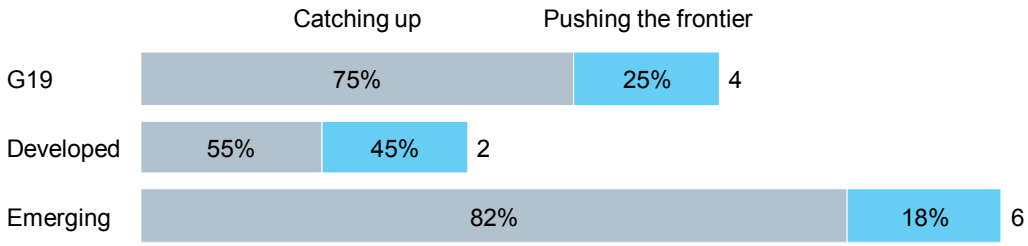
Three-quarters of the opportunity is in catching up to best practices and one-quarter in pushing the productivity frontier

We estimate that roughly three-quarters of the total global productivity-growth potential of 4 percent a year to 2025 comes from the broader adoption of existing best practices—"catch-up" productivity improvements (Exhibit 21). Unsurprisingly, most of the opportunities identified are in developing economies. These opportunities range from raising the share of modern retail formats and increasing the scale and capacity utilization of auto assemblers to improving operational efficiency and reducing waste in health care and food processing and shifting to a greater share of higher-value products or services.

Exhibit 21

Approximately three-quarters of the productivity potential identified comes from catching up, and the rest from pushing the frontier

Potential per annum productivity growth rate
%



SOURCE: McKinsey Global Institute analysis

In developed economies, more than half—55 percent—of the feasible productivity gains could come from closing the gap between low- and high-productivity companies and plants. There are opportunities to continue to incorporate leaner supply-chain operations throughout retail and improve the allocation of the time spent by nurses and doctors in hospitals and other health-care settings (including primary care), for example. Across countries, large differences in average productivity within the same industry often indicate industry-wide opportunities for improvement. Examples include low productivity in the retail and other service sectors of Japan and South Korea that reflects the large share of traditional small-scale retailers, and the high costs of the US health-care system that indicate excessive use of clinically ineffective procedures. Even sectors that have historically made strong contributions to productivity growth, including agriculture and automotive manufacturing, have ample room to continue to diffuse innovations and become more efficient.[59]

One-quarter of the productivity-growth potential identified in our analysis, or about one percentage point a year, comes from technological, operational, or business innovations that go beyond today's best practices—that "push the frontier" of global economic potential. There is a natural limit to what can be achieved through catch-up. Sustained, long-term growth will require a continuous expansion of the production frontier, which, in turn, opens up new opportunities for others to catch up.

In both the case studies in this report and in MGI's past research on technology and manufacturing, we have found a robust pipeline of innovations.[60] Some are simply the continuation of existing industrial-research programs. Agricultural research to tailor and improve seeds and agronomical practices to raise crop yields in new geographies, and automotive industry initiatives to power cars using more efficient fuel technology are two examples. Others rely on technological innovations that have the potential to transform many industries. For example, highly efficient and intelligent robots—or bots—are beginning to boost efficiency in retail warehouses, mobile technology is increasingly being used to deliver health care in remote regions, and automobile manufacturers are installing a broader range of digital features in cars. Advanced materials such as nanolaminates—edible lipids or polysaccharide compounds—can be sprayed on food to provide protection from air or moisture and reduce food spoilage, while carbon-fiber composites can make cars and airplanes both more resilient and lighter.[61] The Internet of Things can cut down time in production processes by detecting potential failures early, increase crop yields by measuring the moisture of fields, and dramatically reduce the cost of monitoring health status.[62]

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[59] For more examples from other countries and sectors, see MGI reports *Growth and renewal in the United States: Retooling America's economic engine*, February 2011; *European growth and renewal: The path from crisis to recovery*, July 2011; *Beyond Korean style: Shaping a new growth formula*, April 2013; and *Why the Japanese economy is not growing: Micro barriers to productivity growth*, July 2000. For further examples of cross-country productivity gaps in different industries based on MGI's productivity research over more than 20 years, see James Manyika, Jaana Remes, and Jonathan Woetzel, "A productivity perspective on the future of growth," *McKinsey Quarterly*, September 2014.

[60] MGI has published extensively on the outlook for technology. See, for example, *Big data: The next frontier for innovation, competition, and productivity*, May 2011; *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, May 2011; *The social economy: Unlocking value and productivity through social technologies*, July 2012; *China's e-tail revolution: Online shopping as a catalyst for growth*, March 2013; *Game changers: Five opportunities for US growth and renewal*, July 2013; *Lions go digital: The Internet's transformative potential in Africa*, November 2013; *Disruptive technologies: Advances that will transform life, business, and the global economy*, May 2013; *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, April 2014; and *China's digital transformation: The Internet's impact on productivity and growth*, July 2014. Also see the discussion of the transformative power of technology in *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

[61] *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

[62] *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013.

Such innovation is not confined to developed economies; it is happening in emerging economies, too. For instance, Aravind Eye Care of India, which has become the largest eye-care facility in the world, performs cataract surgeries at one-sixth of the cost and with fewer infections than the National Health Service in the United Kingdom achieves.[63] In China, marketplace providers such as Alibaba have used novel approaches such as providing microfinance to sellers and creating and promoting local e-tailing brands (called "Tao Brands" in China).[64]

While penetration of new technologies is a powerful enabler of productivity for the future, it is also a way to fuel competition in an increasingly connected global economy. The speed at which new technologies reach broad audiences is accelerating. After the telephone was invented, it took more than 50 years for half of the homes in the United States to have one—yet half of all US households acquired a smartphone in a little more than five years. It took radio 38 years to attract 50 million listeners, but only 12 months for Facebook to do the same and even less time—nine months—for Twitter. WeChat, the mobile text and voice messaging communication service developed by China's Tencent, is not a well-known brand in Europe or the United States. Yet it added 300 million Chinese users in two years, more than the entire adult population of the United States.[65] Still, room remains for further diffusion of technologies and their productivity benefits (see Box 8, "Boosting productivity through broader adoption and diffusion of technologies").

While penetration of new technologies is a powerful enabler of productivity for the future, it is also a way to fuel competition.

MGI has identified a dozen disruptive, or transformational, technologies, which we define as having the potential to change fundamentally how things are done. They disrupt markets and industries. They shift value—often to consumers—and they tend to favor upstarts over incumbents. They represent a tremendous opportunity, with the economic value of selected applications ranging from $14 trillion to $33 trillion a year by 2025.[66] The "disruptive dozen" are changing the way we use information in our daily lives by generating more of it through, for instance, the Internet of Things, which involves the use of sensors and actuators that can be used to monitor and operate physical devices and systems across the Internet, making it more accessible through cloud technology and using it to generate intelligence. The dozen technologies are also changing the building blocks used to make things or improve the quality of life through the use of advanced genomics or synthetic materials. These transformational technologies are changing people's relationship with machines. From 3D printers to autonomous vehicles and flexible robots, machines are becoming more capable, more ubiquitous, and more adaptable. The cross-cutting effects of digitization, including big data, and combinations of these technologies could yield astounding results. Think of the impact of a combination of big data and synthetic biology. The cost of gene sequencing is falling sharply, making a huge amount of genetic data available. Scientists and companies are using these data to develop new techniques to write DNA and insert it into cells and are even designing DNA from scratch to produce desired traits—synthetic biology.[67]

63 "Driving down the cost of high-quality care: Lessons from the Aravind Eye Care System," *Health International*, McKinsey & Company's Health Systems & Services Practice, issue 11, 2012.

64 *China's e-tail revolution: Online shopping as a catalyst for growth*, McKinsey Global Institute, March 2013.

65 Tencent.

66 *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013.

67 Ibid.

Box 8. Boosting productivity through broader adoption and diffusion of technologies

Faster penetration of technologies such as the Internet and mobile phones can be a powerful driver of productivity. It has already proved to be the case in developed economies and now holds significant promise for emerging economies, too. McKinsey research has found that Internet penetration in 30 "aspiring" economies had increased by 25 percent a year in the five years to 2011 compared with 5 percent in developed economies.[1] The Internet contributed $366 billion to the GDP of these 30 economies in 2010. However, the Internet powered 2.3 percent of growth in aspiring economies, only about one-tenth of the contribution in developed economies, indicating considerable scope for a further boost to growth.

Small and medium-sized enterprises (SMEs) in aspiring economies have thus far not taken as much advantage of information and Web technologies as large companies in these economies; they have lower broadband penetration and make limited use of electronic messaging and online marketing. However, SMEs that have deployed these technologies have increased their revenue, lowered their costs, created more jobs, and boosted their productivity. McKinsey found that SMEs that spend more than 30 percent of their budget on Web technologies are increasing revenue nine times as fast as SMEs that spend less than 10 percent. SMEs surveyed by McKinsey in 2011 reported that Web technologies enabled average productivity increases of 11 percent. Within this average was a large variation. SMEs in Vietnam reported productivity gains of 19.3 percent, while those in Morocco reported 5.3 percent gains.[2] Among the many innovative startups in Vietnam that are leveraging the Internet are, for instance, VinaPay, a mobile-payment platform that offers electronic transaction services and prepaid cards so that users can transfer money to other users and other accounts. Vietladders is a social networking platform for senior professionals; companies search Vietladders for job candidates and then pay them to interview for vacant positions. In Morocco, Clicoo.ma is an online auction website that accepts payment by SMS, credit card, or cash on delivery. Marocannonces.com is a platform on which people can post job offers, real estate, travel packages, and news. By 2010, the site already had more than 1.4 million visitors and 19 million page views per month.[3]

Patchy broadband infrastructure means that emerging economies as a group lag significantly behind developed economies in cross-border data and communication flows. They accounted for just 24 percent of cross-border Internet traffic in 2012, and only three of the top 20 countries in broadband penetration—Israel, Slovenia, and the United Arab Emirates—are outside high-income countries. Low penetration has reinforced high bandwidth prices. Internet protocol transit costs in Lagos are 21 times the cost in London. The fact that there is such significant scope for increased penetration is a source of optimism that these technologies could inject new dynamism to growth in many emerging economies.[4]

Mobile and Internet are by their nature platforms for building new ways to offer services to consumers and to organize business operations. They can also reduce regional inequality. In China, for example, the penetration of Internet retailing has been particularly high in mid-size cities where fixed retail offerings are limited. In Africa, mobile phones have increased agricultural price transparency, particularly in rural regions with poor communications. Broader applications and innovations are likely as a result of greater adoption across a diverse social and economic landscape.

Emerging markets today also have low penetration of electronic payments, which are a necessary enabler of growth in e-commerce. Cross-border electronic payments flows are already substantial and growing rapidly, driven in part by a proliferation of digital platforms and electrification in emerging markets. By 2016, electronic payments are expected to account for 81 percent of the value of all global payments flows, up from 65 percent in 2006.[5] In emerging economies, more than 90 percent of total transactions are paid for using cash or checks, compared with almost half of transactions in the United States and Canada being paid for electronically.[6] But penetration of electronic payments is expected to increase rapidly as more people gain access to banking services. Today, only 44 percent of the world's population is banked, but this is increasing.[7] As an example, the Asia-Pacific region is expected to nearly double its share of global credit-card transactions, from 17 percent in 2007 to 33 percent in 2017.

1 *Online and upcoming: The Internet's impact on aspiring countries*, McKinsey High Tech Practice, January 2012. The research analyzed the economic impact of the Internet in 30 "aspiring" economies in the developing world—countries with the economic size and dynamism to be significant players in the global economy and to match the prosperity of developed economies in the near future. Also see *China's digital transformation: The Internet's impact on productivity and growth*, McKinsey Global Institute, July 2014.

2 McKinsey surveyed 2,484 SMEs in Argentina, Hungary, Malaysia, Taiwan, Turkey, and Vietnam.

3 *Online and upcoming: The Internet's impact on aspiring countries*, McKinsey High Tech Practice, January 2012.

4 *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, McKinsey Global Institute, April 2014.

5 McKinsey Global Payments Map.

6 *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, McKinsey Global Institute, April 2014.

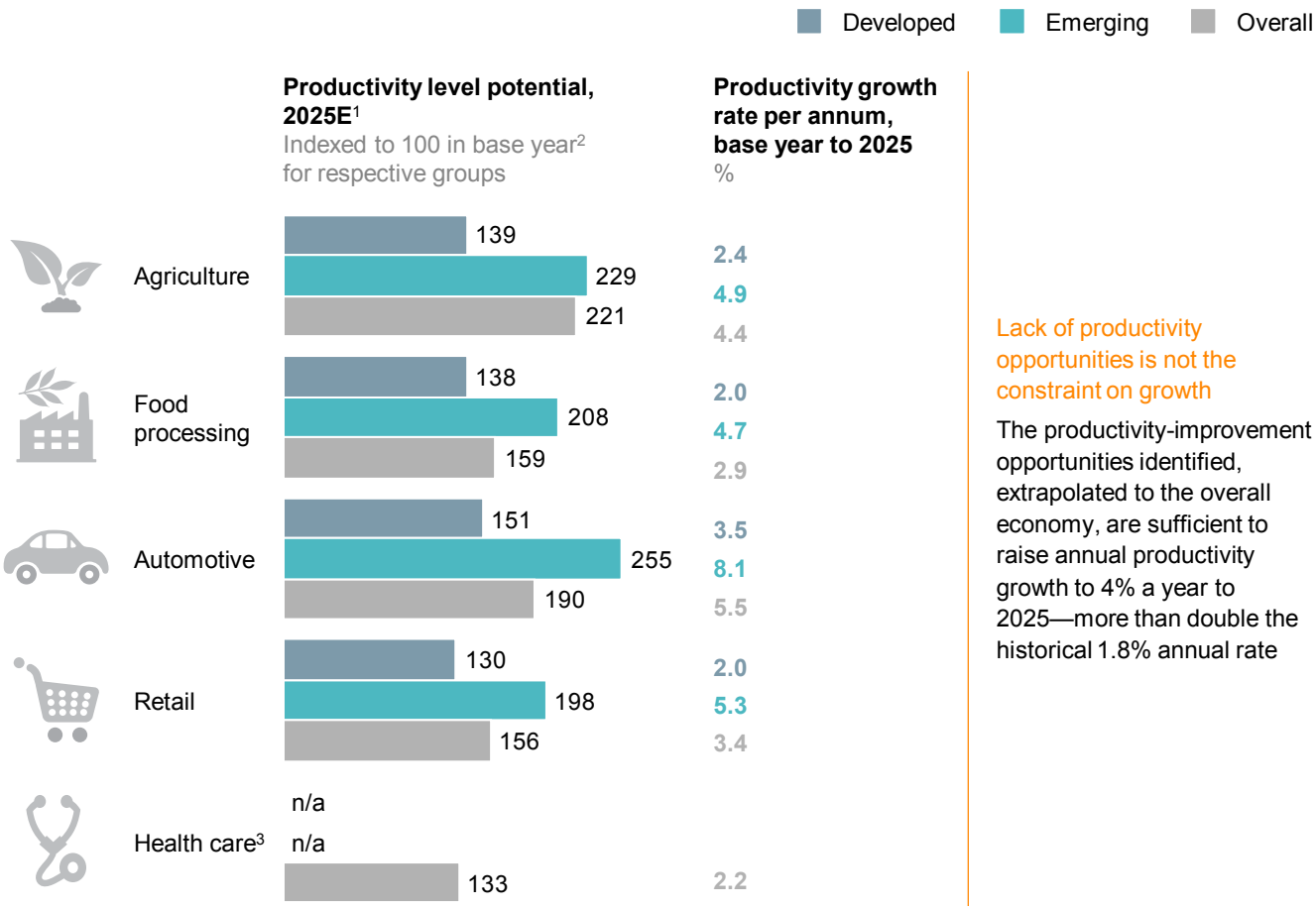
7 Oya Pinar Ardic, Maximilien Heimann, and Nataliya Mylenko, *Access to financial services and the financial inclusion agenda around the world: A cross-country analysis with a new data set*, World Bank Consultative Group to Assist the Poor, January 2011.

Industries have different potential for productivity growth. Drawing on the five sector case studies, we estimated how much productivity could improve in each sector if the full feasible productivity potential to 2025 were to be realized (Exhibit 22). We then translated the opportunity into a relative increase in productivity levels and an average growth rate between now and 2025, extrapolating from the case studies to form an aggregate view incorporating both structural change and the rising weight of emerging economies in global GDP. We found that there are sufficient opportunities to boost annual productivity growth to as high as 4 percent in the G19 and Nigeria, more than needed to counteract demographic trends.

Even if all the opportunities were to be realized, we find that there would still be ample headroom to catch up across all sectors after 2025. For example, agricultural productivity in emerging economies would be only 18 percent of the current productivity level of developed economies in 2025, despite growing productivity at a potential rate of 4.9 percent per annum, more than twice as fast as developed economies.

Exhibit 22

MGI has identified potential to accelerate productivity growth in both developed and emerging economies



Lack of productivity opportunities is not the constraint on growth

The productivity-improvement opportunities identified, extrapolated to the overall economy, are sufficient to raise annual productivity growth to 4% a year to 2025—more than double the historical 1.8% annual rate

1 Based on MGI's bottom-up analysis of potential growth in respective sectors. Countries covered are Brazil, China, Germany, India, Japan, Russia, the United Kingdom, and the United States.
2 Base year for calculation varies across sectors dependent on data sources based on latest available data sets: 2009 for agriculture and food processing, 2013 for automotive, and 2012 for retail and health care. For overall productivity opportunity calculations, we use the 2009 employment structure, which is the latest available at the sector level. See the technical appendix for details.
3 Given the lack of metrics on health-care outcomes, MGI productivity-improvement estimates are based purely on opportunities to reduce costs of delivery with the same quality and access while maintaining or improving health outcomes. By definition, this is an underestimate of the overall health-care productivity potential from increased quality and access.

SOURCE: McKinsey Global Institute analysis

We now look briefly at the opportunities to boost productivity in the five sectors that we have studied for this analysis.

Agricultural productivity could more than double by 2025 by increasing yields and shifting to modern farming

The higher a country's per capita GDP, the lower the share generated by agriculture. Today, this sector accounts for only 4 percent of employment in developed economies but about 40 percent in emerging economies. Globally, agriculture productivity is the lowest of any sector overall, although there are large gaps between developed and emerging economies. There are huge variations in agricultural productivity among countries—productivity in the United States is 20 times that of India, for instance. This suggests considerable scope for improvement.[68]

Our estimates indicate that agricultural productivity could more than double by 2025, with the largest opportunities in emerging regions. There is still considerable scope to boost productivity in agriculture even in developed economies that tend to have larger farms, more mechanization, and more sophisticated inputs such as seeds and fertilizers. Gains can come from a combination of increasing yields, reducing waste, mechanization, and scale (Exhibit 23).

Higher production can come from raising crop and meat yields and reducing waste. Increased crop yields can come from a variety of sources, including improvements in the quality of seeds; enhanced practices in applying fertilizers, herbicides, and pesticides; increased irrigation; the introduction of multicropping; and the use of new technologies including big data and precision tools. Looking at these factors over ten years, we find that the most important are seed quality, fertilizer application, and big data and precision tools.

10 TO 20%
increase in yields possible from using precision agriculture

Innovation plays a significant role. In 2012, the commercialization of genetically modified crops, which we acknowledge are controversial in some quarters, had a direct positive impact on farm incomes of $18.8 billion globally, the equivalent of adding 5.6 percent to the value of global production of soybeans, maize, canola, and cotton.[69] New varieties of genetically modified organisms are being developed that improve hydration and nutrition fixation. There are also concerted efforts to improve the nutritional quality of crops. For instance, Monsanto is developing a soybean enriched with omega-3, and some researchers are working on a variety of cassava, a staple crop in Africa. A new generation of fertilizers is developing, too. On average, only 40 percent of nitrogen fertilizers in China are applied efficiently, the rest evaporating or washing into rivers and lakes (with negative environmental consequences).[70] Examples of innovations in fertilizers include microbial fertilizers, living organisms that enhance a plant's ability to take up the right level of nutrients. Looking further ahead, the economic impact of next-generation gene sequencing could be significant. In agriculture, analyzing plant genomes could lead to more advanced genetically modified

[68] MGI and McKinsey have examined agricultural productivity in detail in both Brazil and India. See *How Brazil can grow*, McKinsey Global Institute, December 2006; *India as an agriculture and high value food powerhouse: A new vision for 2030*, McKinsey & Company and the Confederation of Indian Industry, April 2013; and *India: The growth imperative*, McKinsey Global Institute, October 2001. Agriculture has also been an in-depth case study in a number of MGI reports that assess the role of productivity in meeting projected global demand for food, as well as a key commodity in analyzing market-pricing trends. All this research is available at www.mckinsey.com/mgi.

[69] Graham Brookes and Peter Barfoot, *GM crops: Global socio-economic and environmental impacts 1996–2012,* PG Economics Ltd., May 2014. There is disagreement about the case for genetically modified organisms. Some scientists are concerned about the risk that the transfer of altered genes to other organisms could not only put humans at risk but also cause ecological imbalances. Such concerns require further study. See, for instance, Theresa Phillips, "Genetically Modified Organisms (GMOs): Transgenic crops and recombinant DNA technology," *Nature Education*, volume 1, number 1, 2013. There are also economic risks in that GMO crops can be owned by the developer, which may mean that the productivity gains from the use of this technology could be only narrowly shared.

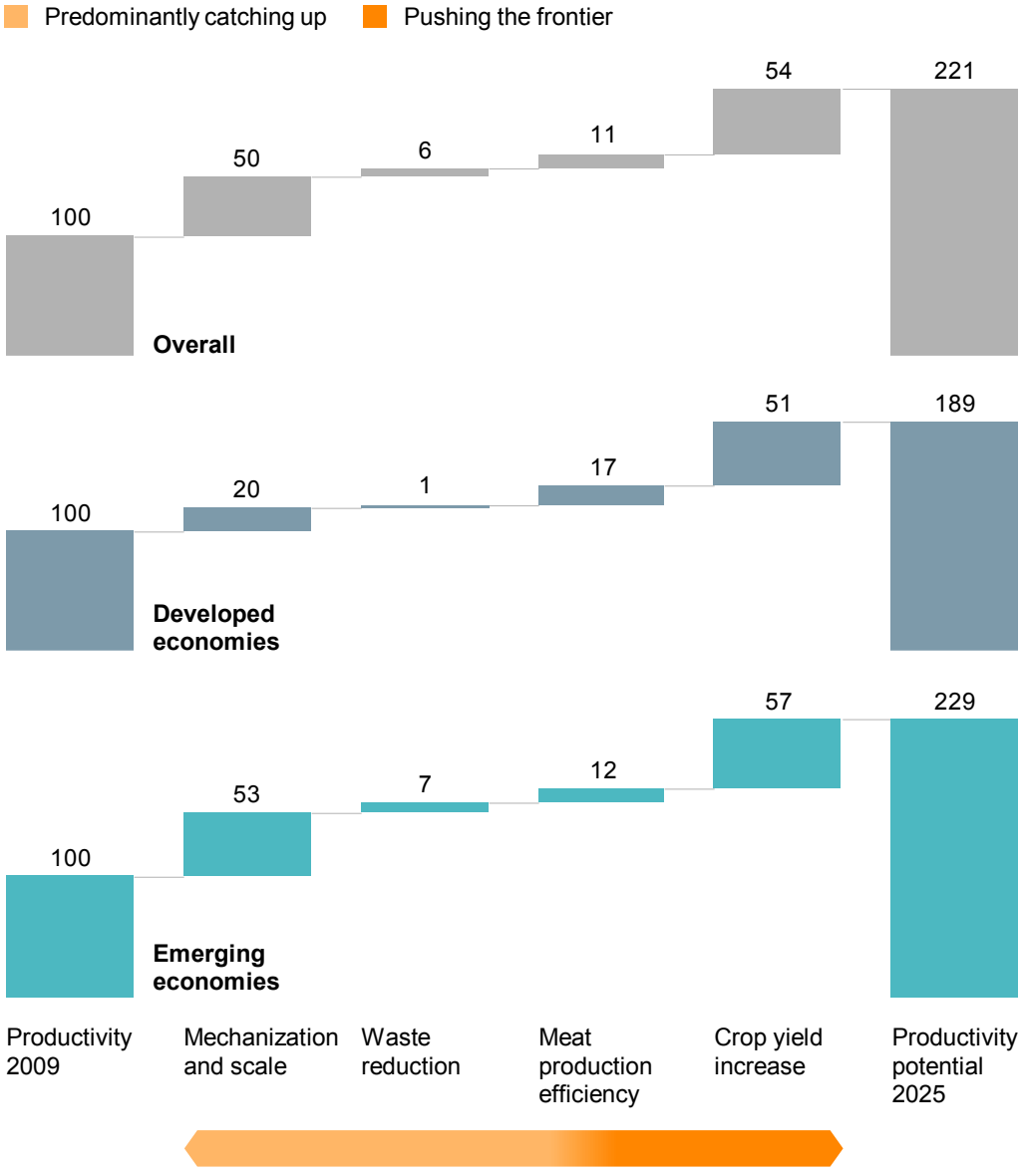
[70] David Powlson, *Overuse of nitrogen: Insights from the Chinese experience*, presented at Planet Under Pressure 2012: New knowledge towards solutions conference in London, March 27, 2012.

crops. It may be possible to create high-value substances such as biofuels by modifying simple organisms such as E. coli bacteria.[71] Norwegian company Yara, the world's largest producer of mineral fertilizers, offers a range of tools to help farmers to fine-tune their management of fertilizers to match local conditions, the aim being to deliver nutrients to crops more effectively while lowering costs and minimizing any adverse effects on the environment.[72]

Exhibit 23

Agriculture productivity levers and their relative impact

Indexed to 100 in 2009



SOURCE: McKinsey Global Institute analysis

[71] *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013.

[72] *China's digital transformation: The Internet's impact on productivity and growth*, McKinsey Global Institute, July 2014.

Digital technologies, too, are playing a role in helping to make farming more efficient. A combination of precision farming and big data could usher in a new era of productivity in agriculture as well as enhancing the quality and resilience of production. Precision agriculture includes advanced automation in harvesting, the measurement of land and products, and soil preparation and weeding. MGI has estimated that using sensor data for precision agriculture could raise yields 10 to 20 percent globally.[73] Big data can help to build a detailed view of a farm's activities, enabling the farmer to judge much more keenly what inputs are needed. Advanced sensors and analytics can enable real-time tracking of production, advanced forecasting, and the micro-optimization of genetics, irrigation, and fertilization.

Building the necessary infrastructure—cold-supply chains and storage facilities, and transportation links from farmers to their markets—in emerging economies could significantly lower the amount of food wasted.

There is significant scope to boost meat yields—increasing the ratio of feed to meat. Among the many promising approaches are advances in breeding technology and the use of genetics so that animals mature faster, are easier to care for, and produce higher-quality meat. Another is developments in disease management and vaccines to lower mortality rates of animals and produce safer meat for consumers. Improving feed through food additives and improving processing and slaughtering practices are two other useful options. Meat could grow in laboratories. Scientists are studying edible insects. Nano food additives could improve taste and smell.

Finally, production can be maximized by minimizing the amount of food wasted, which can be as high as 20 to 30 percent even before allowing for food waste at the point of consumption.[74] The amount of food production wasted is similar in developed and developing economies. However, in developed economies, most food is wasted by consumers, while in developing economies a larger share of waste occurs during handling and storage. Building the necessary infrastructure—cold-supply chains and storage facilities, and transportation links from farmers to their markets—in emerging economies could significantly lower the amount of food wasted. In Brazil, more than half of agricultural production is transported by truck, often across thousands of kilometers, which means large losses. Moreover, because of inefficiencies in Brazilian ports, trucks can wait up to 20 days to unload during peak periods. In addition, the Ministry of Agriculture estimates that Brazil's grain storage gap amounts to 43 million tons. Only 11 percent of that storage capacity is on farms, compared with 80 percent in Canada.

The other major drivers of labor productivity in the sector are shifting from small subsistence farms to cooperatives and larger farms as well as increased mechanization. Large farms can use labor inputs more efficiently, boosting productivity. Mechanization also increases labor productivity (Exhibit 24). Calculations by the Food and Agriculture Organization of the United Nations suggest that the land area cultivated using hand tools in emerging economies is expected to decline from 30 percent in 2012 to 20 percent in 2025.

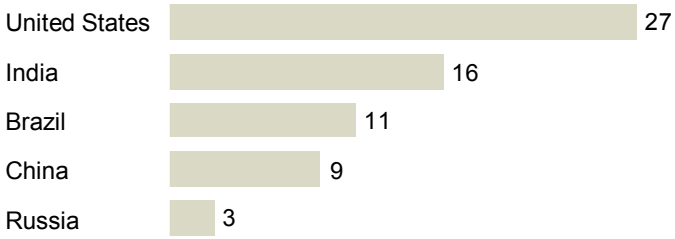
[73] *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013.

[74] *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute, November 2011.

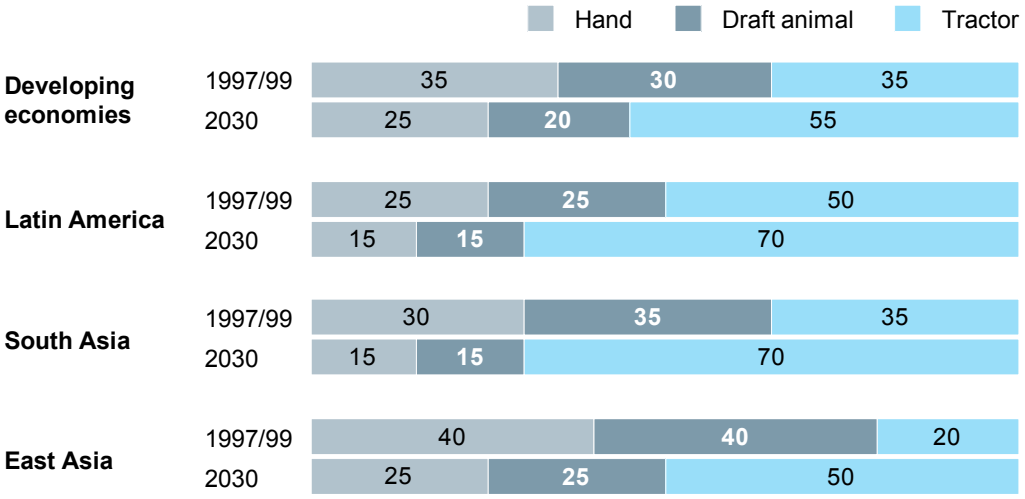
Exhibit 24

Mechanization offers significant opportunities for labor-efficiency improvement in emerging economies

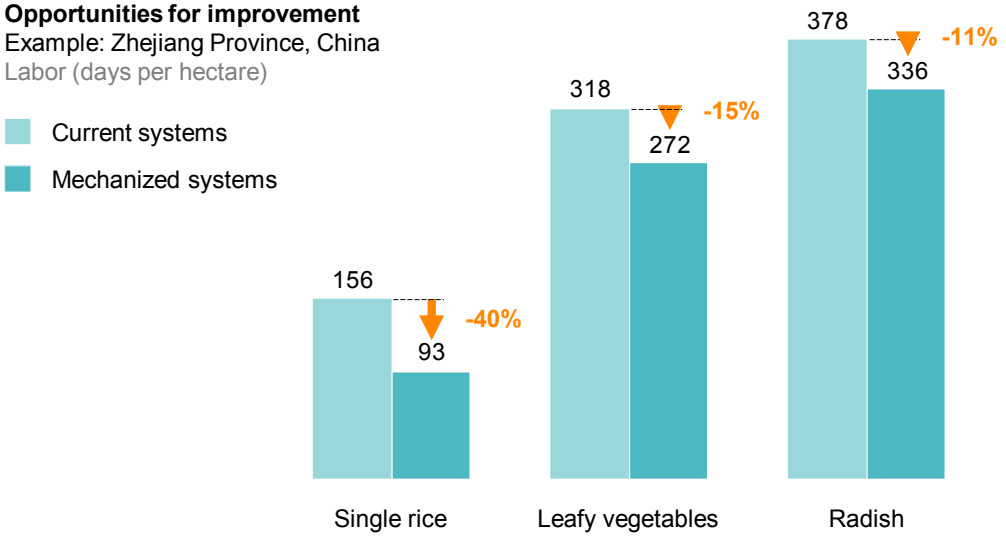
Level of mechanization (latest available data)
Tractors per 1,000 hectares



Proportion of area cultivated by different power sources, 1997/99 and 2030
%



Opportunities for improvement
Example: Zhejiang Province, China
Labor (days per hectare)



NOTE: Numbers may not sum due to rounding.

SOURCE: Food and Agriculture Organization of the United Nations; World Bank; Elsevier; McKinsey Global Institute analysis

To ensure continuing productivity gains in agriculture, governments can support the private sector by putting the right enablers in place. While the private sector in developed economies largely funds investment in R&D in improved seeds and fertilizers, governments in emerging economies will likely need to provide such support. From the Green Revolution in the 1940s to the 1960s, many governments and foundations—such as the Ford Foundation, the International Maize and Wheat Improvement Center, and the International Rice Research Institute—have invested heavily in agricultural research and supported the dissemination of farming technologies and techniques.[75]

Brazil coupled deregulation of agriculture with stepping up R&D, and the results for productivity were highly positive. In 1973, the government created the Brazilian Agriculture Research Corporation, known as Embrapa, to develop new crops and processes suitable to the country's highly varied ecosystems. Embrapa has pioneered more than 9,000 technology projects to develop Brazilian agriculture, including designing a tropical strain of the soybean and other crops that can thrive in Brazil's climate.[76] It started eliminating price controls and reducing export tariffs and import restrictions in the early 1990s. After the initial disruption, farmers and agribusinesses responded by increasing their efficiency. Over the past 30 years, production of tractors and other agricultural equipment has quadrupled, and agricultural exports have increased 24-fold since the 1970s. Brazil's crop yields are on a par with those of developed economies.[77]

Governments can also play a part in supporting farmers in these economies to improve their knowledge of how to apply fertilizers most efficiently. Investment in infrastructure to help reduce waste and telescope the distance between farmer and market will also need to come from government in emerging economies, although the private sector can play a role through contract farming, for instance. Improving information on crop choices and prices can help farmers raise the value of their crops by optimizing the mix of crops.

Governments can also ensure that regulation offers the right incentives for farmers to support productivity gains. Notably, clarity is needed on who owns land; transparency on crop prices is also necessary. Across economies, policy on subsidies, which is highly heterogeneous in agriculture, is important so that the right incentives are in place for greater efficiency through competition. It is unclear what would happen if subsidies were eliminated. New Zealand recently removed all agricultural subsidies without any measurable negative impact on the sector. However, World Bank analysis suggests that removing all subsidies globally would increase prices by up to 20 percent.[78]

In low-income regions, a structural shift from rural agriculture to more productive urban jobs in manufacturing and services can be a very powerful lever for raising aggregate productivity, as MGI research in Southeast Asia and Nigeria has shown.[79] Yet from the perspective of long-term growth, it matters a great deal how well towns and cities are able to absorb and productively employ the new urban dwellers. This means that capable urban

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75 Julian M. Alston et al., "The economic returns to US public agricultural research," *American Journal of Agricultural Economics*, volume 93, issue 5, October 2011.

76 *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute, November 2011.

77 *Connecting Brazil to the world: A path to inclusive growth*, McKinsey Global Institute, May 2014.

78 *World development report 2008: Agriculture for development*, World Bank, October 2007.

79 See, for instance, MGI reports *Sustaining Vietnam's growth: The productivity challenge*, February 2012; *The archipelago economy: Unleashing Indonesia's potential*, September 2012; *Nigeria's renewal: Delivering inclusive growth in Africa's largest economy*, July 2014; and *Southeast Asia at the crossroads: Three paths to prosperity*, November 2014.

planning and management are important complements to efforts to improve agricultural productivity.[80]

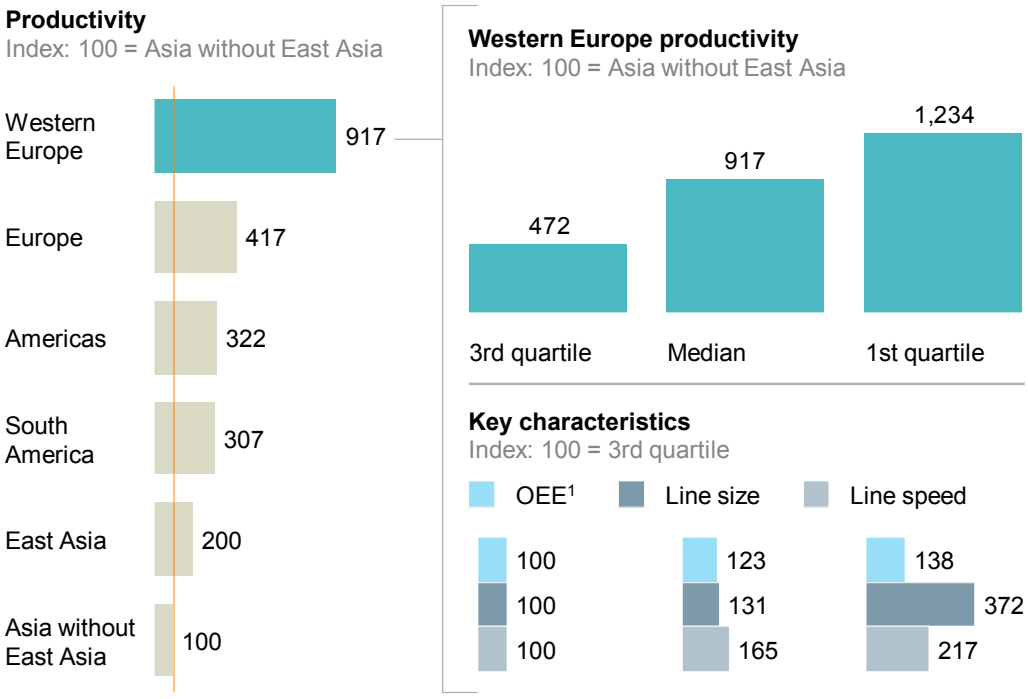
A large share of the productivity acceleration achievable in food processing is in emerging economies

Manufacturing of food and beverages—food processing—accounts for between 1 and 3 percent of GDP in the economies we examine in this report. Globally, the sector's productivity is 20 percent higher than worldwide average productivity.[81] However, there are significant productivity gaps among countries (Exhibit 25). A boost to productivity in the sector by an estimated 60 percent can come from both operational improvements and expanded output, most of that increase being achievable in developing economies (Exhibit 26).

Exhibit 25

There are significant gaps in food processing/manufacturing productivity among countries and among plants within countries

Selected food manufacturing plants



1 Overall equipment effectiveness.

SOURCE: McKinsey Consumer Operations Benchmarking Initiative; McKinsey Global Institute analysis

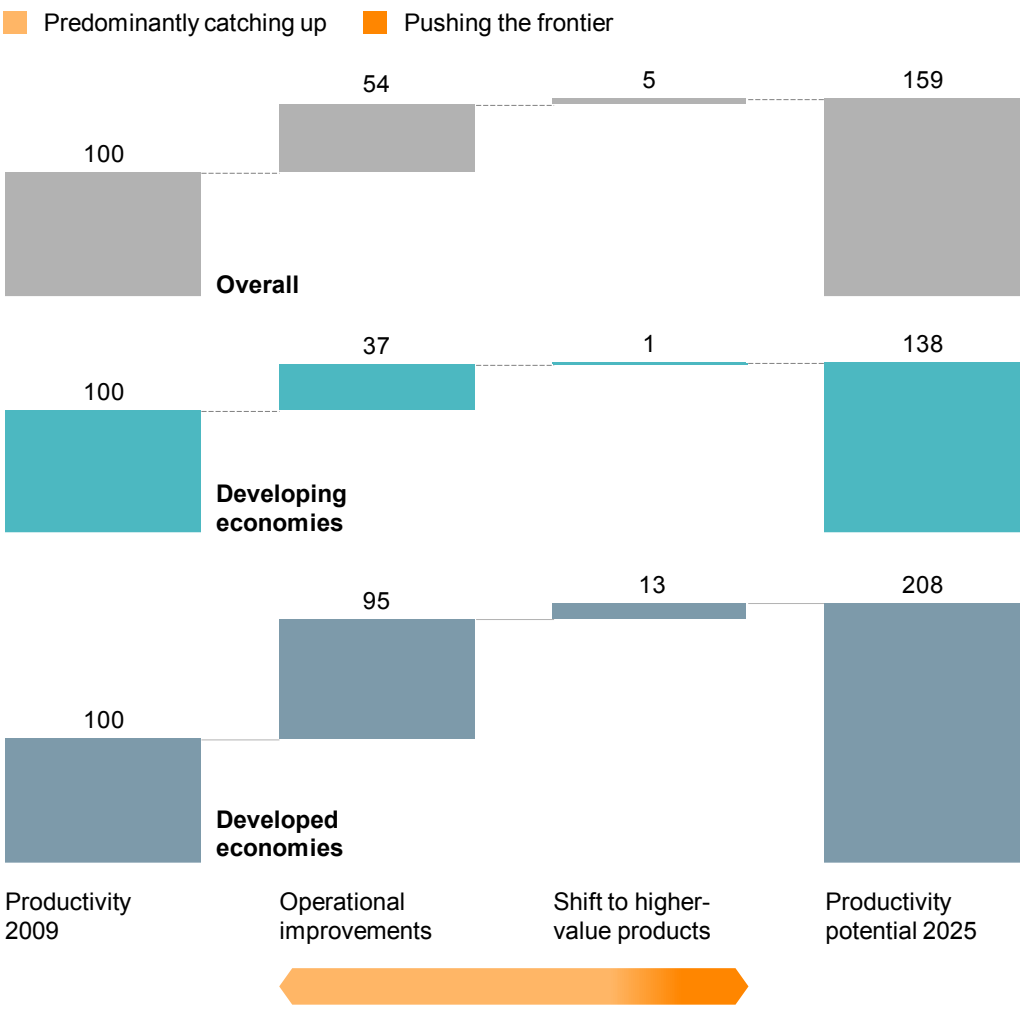
[80] MGI and McKinsey have conducted extensive research on the management of cities, including the need for multilayered professional planning. Growth in Latin America's megacities has started to lose steam because investment in infrastructure and social services lagged behind the needs of their burgeoning populations, leading to a deteriorating quality of life. Although China's huge cities suffer many of the same strains—urban sprawl, traffic congestion, and a shortage of housing—management of their growth has been much more proactive. See MGI reports *Building globally competitive cities: The key to Latin American growth*, August 2011, and *Preparing for China's urban billion*, March 2009. Also see *How to make a city great*, McKinsey & Company, September 2013.

[81] MGI has conducted more than 20 detailed food-processing productivity assessments in both developed and emerging economies. Analyses of productivity in the sector in Australia, Brazil, China, India, Japan, the Netherlands, Russia, South Korea, Sweden, Thailand, Turkey, and the United Kingdom, for instance, are all available at www.mckinsey.com/mgi.

Exhibit 26

Food processing/manufacturing productivity levers and their relative impact

Indexed to 100 in 2009



NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

There is considerable scope to improve operations in food-processing plants by implementing best practices such as lean manufacturing and putting in place faster processing lines. The productivity of Japanese food-processing plants is compromised by high staffing ratios in some production steps, notably in quality-assurance jobs not related to food safety. Mechanization and automation are huge labor savers, as well as productivity enhancers. There is a particularly significant opportunity to make headway on these fronts in emerging economies where food and beverage production is relatively labor-intensive. MGI research has shown that, at the end of 2010, an estimated one million industrial robots were in use. However, they are not nearly as prominent in food processing as they are in other industries. For instance, automotive and electronics manufacturing each accounted for more than 30,000 robot units sold globally that year, while the food and beverage industry bought only about 4,000.[82] Brazil, along with China, is aggressively automating its pork-processing industry.

[82] *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

Another way to boost productivity is to increase the size of processing plants so that they can benefit from economies of scale. Compared with other manufacturing industries, including automotive and high-tech, average food-manufacturing production lines are relatively small. Mexico has a very significant productivity gap between the largest, modern food processors and the many small, traditional companies in the sector. As an illustration, the 0.5 percent of employees who work in the very large, best-in-class companies in the baking sector generates half of the industry's value added.[83] Employees in Mexico's traditional neighborhood *panaderías* (bakeries) and *tortillerías* (small-scale tortilla factories) have, at best, one-fiftieth the productivity of the best-in-class large bakeries and one-twentieth the productivity of the average industrial bakery. Yet many Mexican food-processing plants are globally competitive, some of them exceeding average US productivity levels.[84] Brazilian companies rank on a par with US companies in their aggressive consolidation of the poultry sector. Between 2005 and 2013, Brazil completed 12 mergers and acquisitions in the chicken industry, and is today the world's leading—and most productive—chicken producer.[85]

Another lever for increasing the amount of food processed for a given level of agricultural input is to reduce waste. Today, about 5 percent of food is wasted during processing. Use of preservatives in emerging economies such as India could have beneficial results in this regard. Increased use of bacteriophages could also reduce waste.

Today, about 5 percent of food is wasted during processing.

Historically, in most countries, the size and productivity of the food-processing industry rise with income. As purchasing power increases, consumers tend to shift to more processed, high-value food products. For example, consumption of cheese and yogurt increases relative to consumption of milk. Demand for packaged and convenience food also rises with income. New products and markets can also drive growth in the sector. In Japan, for instance, as the population ages, there are more single households where the householder tends to prefer ready meals. There is also a growing movement toward "functional" food—food that serves a particular purpose such as being healthy for the heart. Examples include the use of ingredients such as omega-3 and coenzyme Q10. Similarly, certain food products are deemed to be good for the bones and protective against arthritis, some food is designed to promote stomach health, and "light" products are increasingly in demand given the trend of rising obesity in developed and emerging economies alike.[86]

Increasing competition by removing restrictions on the sector and opening up to foreign competition, both foreign direct investment and imports, encourages improvements in processes. Food preferences vary by region, and food-processing industries tend to be relatively local.[87] This means that their performance reflects regional competitive dynamics. High tariffs or other import restrictions reduce price pressure on local competitors, helping sustain less productive operations. In the case of South Korea, MGI found that one of the

[83] *A tale of two Mexicos: Growth and prosperity in a two-speed economy*, McKinsey Global Institute, March 2014.

[84] *Packaged food in Mexico*, Euromonitor International, January 2013.

[85] McKinsey analysis using company announcements and press reports. Also see *Productivity: The key to an accelerated development path for Brazil*, McKinsey Global Institute, March 1998.

[86] *Overcoming obesity: An initial economic analysis*, McKinsey Global Institute, November 2014.

[87] Food processing is categorized as a regional processing industry in MGI's manufacturing segmentation, reflecting its relatively low share of imports and exports and high share of within-region production. For more, detail, see Chapter 2 in *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

key levers for boosting the sector's productivity was removing barriers to foreign direct investment in order to expose the sector to best practices and enable the transfer of skills. Another lever was removing protection of small companies, in noodles, corn oil, and rice, for instance. At that time, large companies with more than 300 employees were allowed to participate in these areas only with permission from the government.[88]

Beyond ensuring competitive pressure to improve performance, the enabling role of government in the food-processing industry includes providing enabling transportation infrastructure within and between nations, as well as enacting and enforcing food-safety standards.[89]

The opportunity to boost productivity in the automotive sectors varies among regions

The automotive sector accounts for about 1.6 percent of global GDP and 0.8 percent of employment. It also accounts for about 10 percent of global manufacturing value added. The sector accounts for up to 10 percent of all manufacturing employment in major producer nations such as Germany, Japan, Mexico, and Sweden.

Car production is regionally integrated and tends to expand in regions with growing demand, making emerging economies the location of choice for new operations. Original equipment manufacturers (OEMs) represent roughly 40 percent of industry value added and a smaller share of employment, with parts suppliers representing the majority of the industry. The automotive sector's average productivity is roughly 95 percent higher than that of other industries'. Furthermore, large differences exist among regions that tend to reflect larger variations in the productivity performance of tier two and tier three parts-supplier operations. For example, in aggregate, auto manufacturing in India operates at less than one-quarter of the productivity levels of the United States. Among OEMs, multinational plants typically have similar technologies and management practices across all the regions in which they operate, so that productivity differences across countries arise from differences in the mix of companies and their scale and capacity utilization.[90]

90%
improvement in automotive productivity possible by 2025

Based on an assessment of OEMs' operations, we estimate that there are opportunities to improve automotive industry productivity by 90 percent by 2025.[91] The opportunity varies by region, with the single largest opportunity in China, whose automotive sector today accounts for about 36 percent of worldwide employment in the sector (Exhibit 27).

Despite accounting for a large share of the global market, China's automotive industry has an average productivity that is 67 percent below the average in developed economies. This reflects the fragmented nature of the auto industry in China, where about 170 local OEMs operate often subscale plants with low capacity utilization (Exhibit 28). Consolidation of these operations, a process that dramatically reduced the number of car producers in Western Europe and the United States over the past 50 years, would significantly increase the scale of assembly operations as well as their parts suppliers. Improving the productivity

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88 *Productivity-led growth for Korea*, McKinsey Global Institute, March 1998.

89 Informality is another major issue that governments need to tackle to boost the productivity of food processing. In Mexico, the bread industry is estimated to be 70 percent informal. See *A tale of two Mexicos: Growth and prosperity in a two-speed economy*, McKinsey Global Institute, March 2014.

90 MGI has conducted more than a dozen detailed automotive productivity assessments in both developed and emerging economies. The countries in which MGI has studied the sector include Brazil, France, Germany, India, South Korea, Sweden, Turkey, the United Kingdom, and the United States. Automotive has also been one of our in-depth case studies for assessing the impact of foreign direct investment in emerging markets, as well as a case study for our global manufacturing research. All of the research is available at www.mckinsey.com/mgi.

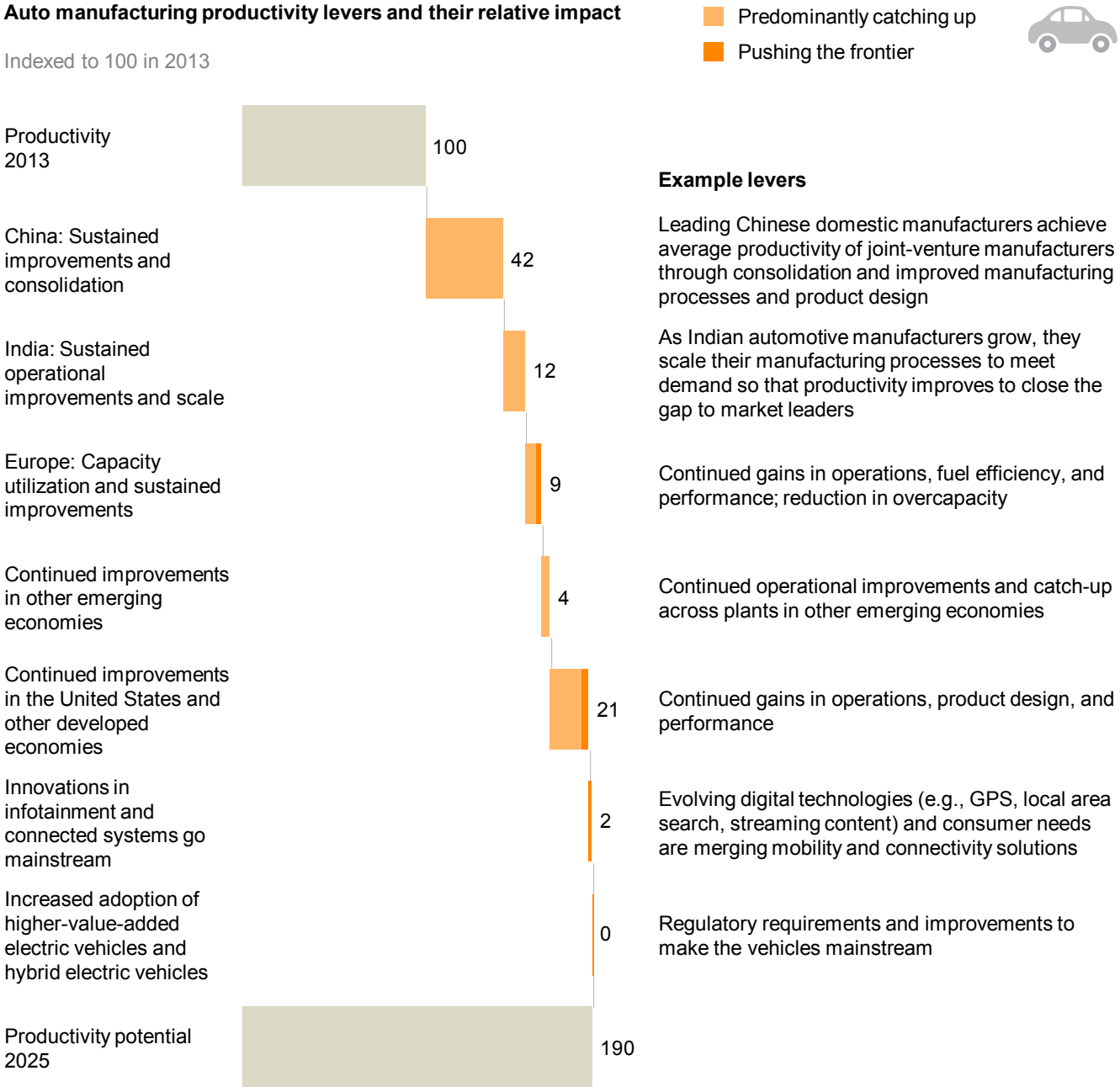
91 In our past research, we have found productivity improvement opportunities to be larger for parts suppliers, particularly in emerging markets where the parts industry is more fragmented. Hence the productivity improvements identified among OEMs are most likely an underestimate of the overall industry productivity-growth opportunity.

of China's auto sector will require the long tail of domestic manufacturers to achieve scale and reduce overcapacity, and to produce vehicles that are recognized to be on a par with those produced by joint-venture companies and therefore more popular with customers. We estimate that if China were to close the productivity gap between domestic manufacturers and their joint-venture manufacturers, the productivity of the entire Chinese auto sector could increase by 25 to 50 percent.[92]

Exhibit 27

Auto manufacturing productivity levers and their relative impact

Indexed to 100 in 2013



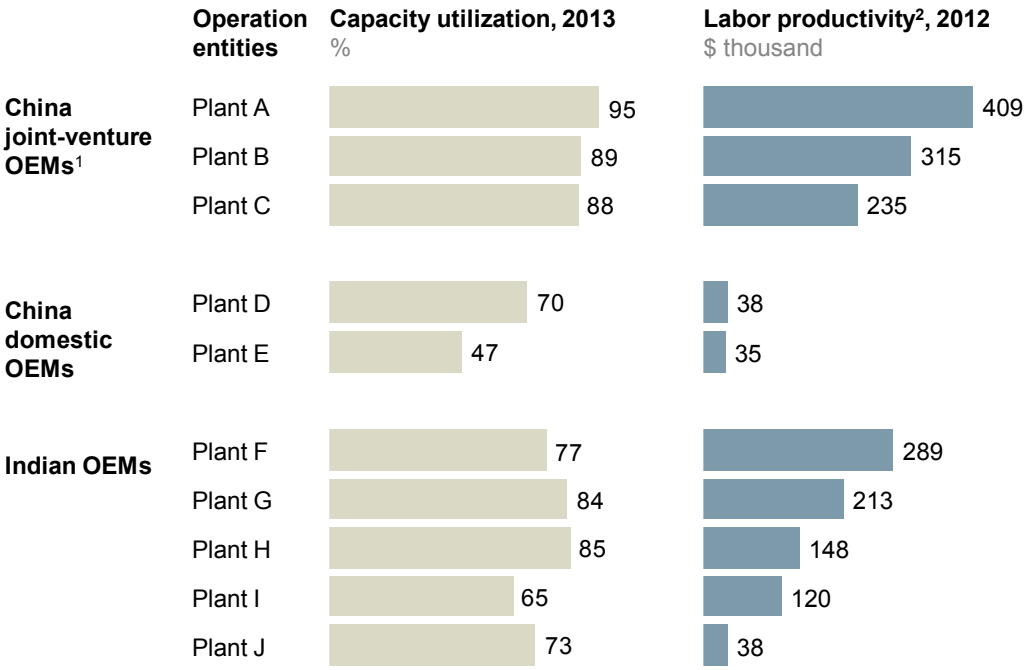
NOTE: Numbers may not sum due to rounding.

SOURCE: Expert interviews; World Input-Output database; IHS; company annual reports; China Association of Automobile Manufacturers; Society of Indian Automobile Manufacturers; McKinsey Global Institute analysis

[92] Chinese regulations require all foreign producers of automobiles to operate within a joint venture with a domestic manufacturer. This has led to two categories of auto manufacturers: dominant high-productivity foreign brands produced by joint-venture manufacturers and a large number of domestic brands with widely varying levels of productivity.

Exhibit 28

Increasing scale is critical to improving labor productivity by raising plant capacity utilization



1 Chinese joint-venture OEMs (original equipment manufacturers) often operate at >100% utilization by increasing shifts to meet demand.
2 Labor productivity measured as value added per employee at 2012 purchasing power parity. Value added is gross margin plus labor costs.

SOURCE: IHS; China Association of Automobile Manufacturers; Society of Indian Automobile Manufacturers; CRIS INFAC; company annual reports; McKinsey Global Institute analysis

Another opportunity is to raise India's automotive-sector productivity closer to the level of market leaders. As in China, there are large productivity differences among India's auto plants. Overall, the productivity of the Indian auto sector lags behind the global average by a significant margin and behind China's auto-sector productivity. This is despite considerable improvements in productivity made by HM and Maruti-Suzuki after the sector was opened up to foreign direct investment in 1993. Nevertheless, seven years later, in 2000, domestic car producers were operating at only 5 percent of the productivity of US plants, while foreign direct investment companies were operating at 38 percent of the US productivity level.[93] The reasons for persistently lagging productivity in India today include hefty import tariffs that have encouraged some premium producers to establish local plants rather than import, even when production remains below efficient scale. Another factor is the low degree of automation as producers have chosen more labor-intensive production methods in a low-wage environment. Labor productivity would also benefit from increasing demand—the penetration of vehicles is still very low given current per capita GDP due to poor road infrastructure (India has one of the largest road networks in the world, but much of it is unpaved, which substantially hinders the efficiency of, and therefore demand for, road transport), limited sources of finance, and large income gaps.

93 *New horizons: Multinational company investment in developing economies*, McKinsey Global Institute, October 2003.

A third opportunity is to continue to improve design, performance, and operations in the United States, Europe, and other developed economies. There are opportunities to continue to raise the fuel efficiency, performance, and quality of cars. There is also scope to improve operational efficiency throughout the process of designing, sourcing, and producing vehicles. In Europe, where demand for vehicles is projected to remain relatively flat, an additional opportunity is to continue efforts to restructure productive capacity that today exceeds demand.

Beyond closing operational performance gaps, there are levers for boosting productivity in the sector that relate to new technologies. As higher valued-added electric and hybrid electric vehicles and infotainment and connected features in vehicles become mainstream, they are expected to give automakers in developed and developing economies a boost to their productivity. Big data is having a significant impact across the value chain, from product design to production. Using big data, a number of OEMs have cut new-model development time by 30 to 50 percent. Toyota says it has eliminated 80 percent of defects prior to building the first physical prototype by using big data. Using real-time data, companies can also manage demand planning across extended enterprises and global supply chains, while reducing defects and rework within production plants.

Governments have traditionally been proactive in the automotive sector, implementing policies that aim to develop and bolster local production. Worldwide, incentives amounting to more (sometimes much more) than $100,000 per assembly job have contributed to global overcapacity. In the case of China, local-government support reduces incentives for consolidation. The cost of closing plants is a factor in industry restructuring in Europe.

Mexico is an example of an economy that has thrived subsequent to its opening up of manufacturing, including its automotive sector, to foreign direct investment and foreign competition. Since ratification of NAFTA (the North American Free Trade Agreement) in 1994, which accelerated market reforms that began in the 1980s, Mexico has attracted or created global world-class performers across many industries, particularly manufacturing. Mexico has become one of the top 15 global manufacturing economies by gross value added, and the manufacturing sector is the largest recipient of foreign direct investment in Mexico, capturing about 39 percent of total foreign direct investment inflows in 2012. According to IHS's automotive forecasts, Mexico could be producing roughly five million vehicles a year in 2025—almost double the 2.6 million vehicles produced in 2011. MGI research finds that the sector is set to increase its productivity by 4.6 percent a year in the period to 2025.[94]

Retail productivity could rise by one-third in developed economies and double in emerging markets

2x
productivity increase in developing-economy retail possible by 2025

Retail matters for national economic performance because the sector is large. In most economies, between 5 and 12 percent of all employees work in retail, and an even higher share when wholesale is included. Globally, productivity in the retail sector is about 30 percent lower than global average productivity across all sectors. It is also an industry with large, sustained productivity differences between developed and emerging economies as well as among countries at similar income levels. For example, MGI has found that average retail-sector labor productivity in Japan is only about 40 percent of the US level. While Mexico has a higher per capita GDP than Turkey ($15,200 vs. $13,800 at purchasing power), retail-sector productivity in Turkey is almost 50 percent higher than that of Mexico. Beyond its large direct impact, retail is important because it can be a catalyst for productivity

[94] *A tale of two Mexicos: Growth and prosperity in a two-speed economy*, McKinsey Global Institute, March 2014.

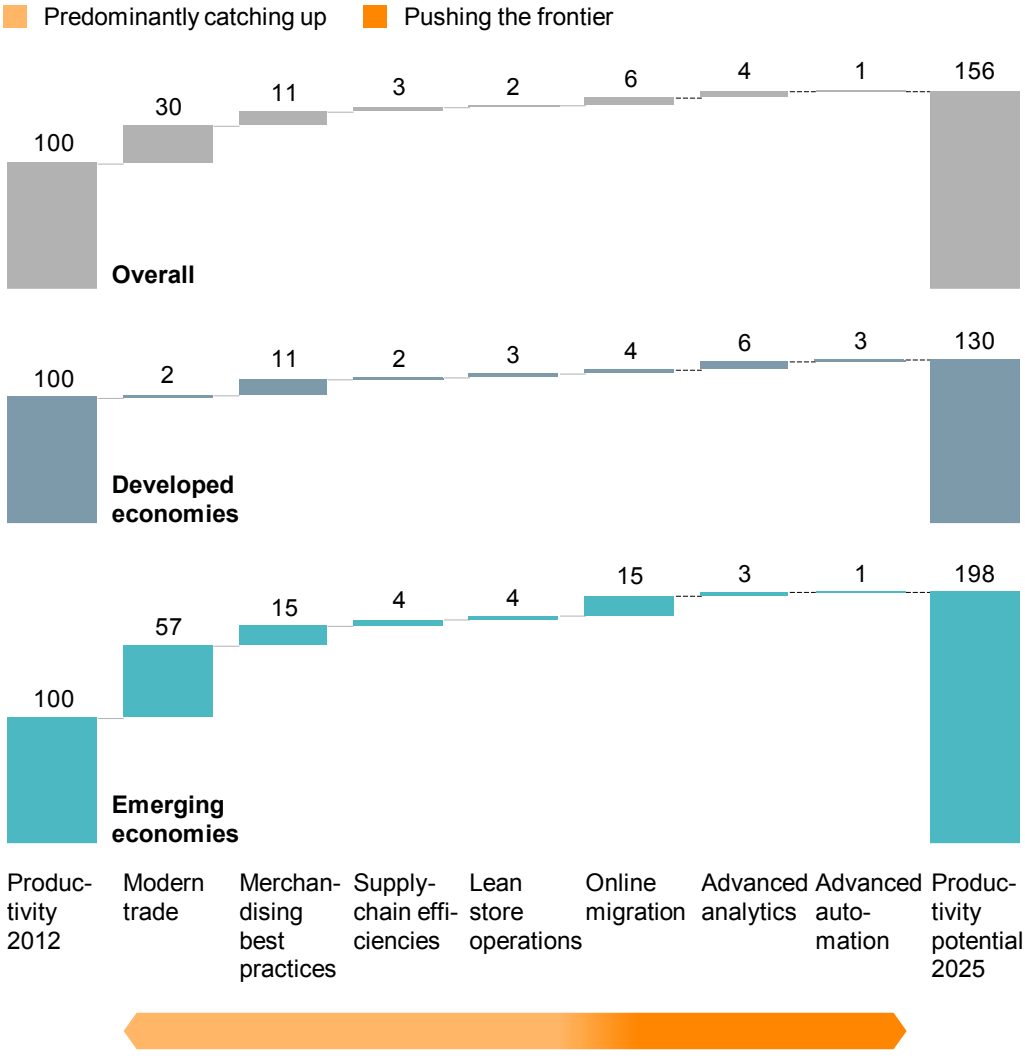
gains in consumer-goods industries in its extensive supply chain and an enabler for raising consumer welfare through lower prices and improved quality and selection of products.[95]

Our analysis indicates that retail productivity could increase by a further one-third in developed economies by 2025 from the 2012 level and could double in the same period in developing economies. Overall, retail productivity could climb by more than half. The opportunities to improve productivity fall into three broad areas—increasing the share of more productive formats, narrowing the gap between the least and the most productive outlets in a particular format, and improving even the best performers' productivity by using new technologies and processes (Exhibit 29).

Exhibit 29

Retail-trade productivity levers and their relative impact

Indexed to 100 in 2012



NOTE: Numbers may not sum due to rounding.

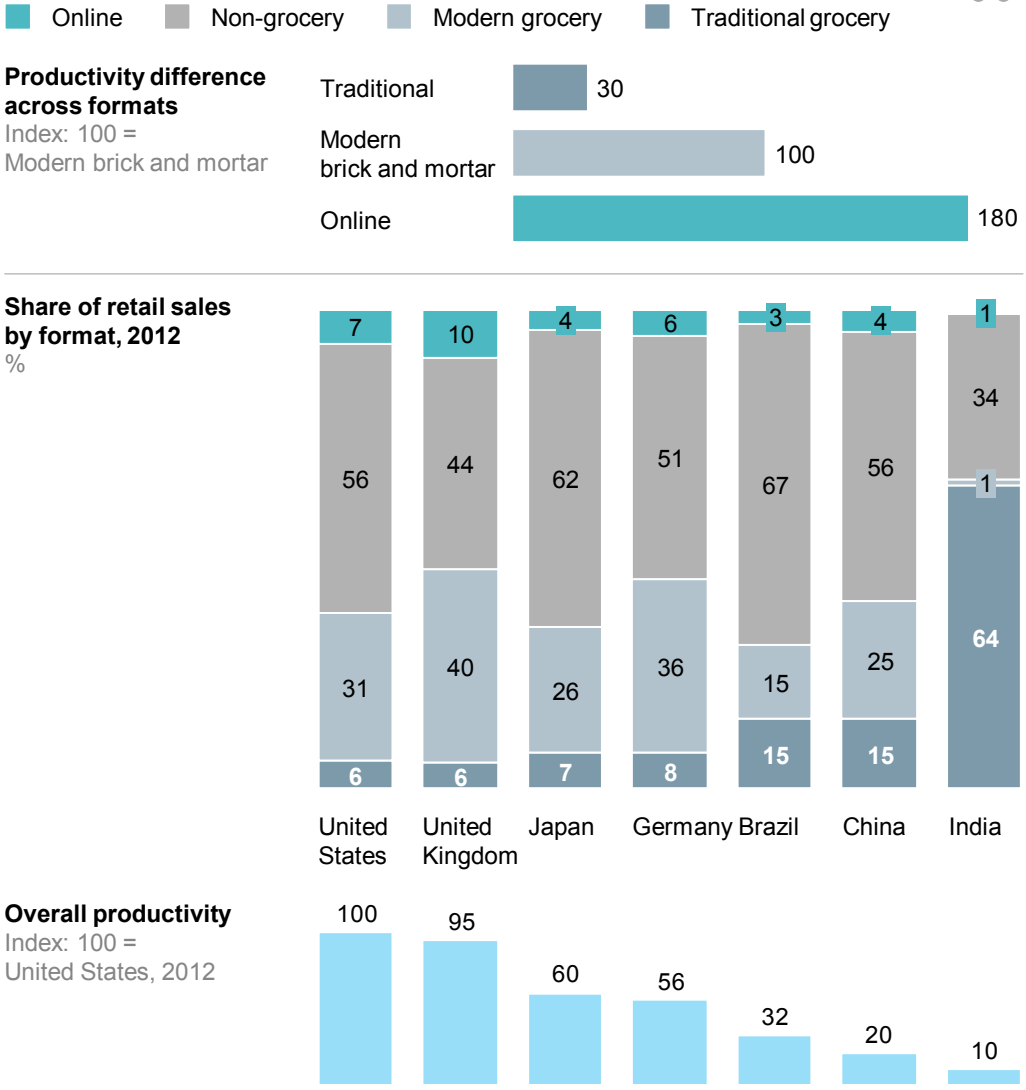
SOURCE: McKinsey Global Institute analysis

[95] MGI has conducted more than 20 detailed assessments of retail-sector productivity in both developed and emerging economies including Australia, Brazil, China, France, Germany, India, Japan, Mexico, the Netherlands, Poland, Russia, South Korea, Sweden, Thailand, Turkey, the United Kingdom, and the United States. Retail has also been one of our in-depth case studies for assessing the impact of information technology and big data on productivity, and the focus of our China e-tailing reports. All of the research is available at www.mckinsey.com/mgi.

The biggest lever is increasing share of more productive formats in overall retail, particularly in emerging economies (Exhibit 30). Modern formats are typically at least three times as productive as small-scale, traditional stores, yet their share in retail employment is often 25 percent or less, compared with 70 percent or more in most developed economies. Our analysis suggests that, in groceries alone, a shift toward modern formats could improve retail productivity in developing economies by around 55 percent. In Mexico, for instance, we estimate that raising the share of modern retailers by 10 percent in overall retail sales would increase overall industry labor productivity by 25 percent.[96]

Exhibit 30

Format mix is one of the most important drivers of productivity differences among countries



NOTE: Numbers may not sum due to rounding.

SOURCE: Euromonitor; World Input-Output database; company financial statements and annual reports; expert interviews; McKinsey Global Institute analysis

[96] *A tale of two Mexicos: Growth and prosperity in a two-speed economy*, McKinsey Global Institute, March 2014.

An additional opportunity is shifting to online retail, where labor productivity even in developed economies can be more than 80 percent higher than modern bricks-and-mortar retailers. The opportunity is particularly large in emerging economies. Today, labor productivity in China's online retail sector is two-thirds of the US level, a much narrower gap than the 75 to 80 percent gap in retailing overall. Furthermore, MGI research estimated that if China's e-tailers were to catch up with their counterparts in other major markets, retail-sector productivity overall could be boosted by 14 percent by 2020.[97]

Online retail productivity, even in developed economies, can be more than 80 percent higher than modern brick-and-mortar retailers.

There are large opportunities both among and within countries to improve the productivity of individual businesses through the adoption of best practices. MGI analysis finds that roughly one-third of the identified potential is in catching up to best practices in purchasing, supply-chain management, and in-store operations in both developed and emerging economies. Retail best practices include "assortment optimization," using analysis of demand and rationalizing stock across stores based on geographic patterns. This boosts sales as stock is tailored more closely to likely consumer preferences and therefore fewer products are out of stock. Some retailers manage their supplier relationships better than others—by rationalizing the number of suppliers, taking a strategic approach to choosing them, conducting data-driven negotiations that encourage productivity among their suppliers, and putting in place systematic performance-management systems. Best-practice retailers reduce the amount of waste—or "shrink"—through improving product specifications, stringent inspections and operating procedures during transport and storage, reduced transport time, and optimized allocation of shelf space. Another source of productivity in best-practice retail is lean store operations. Most of these opportunities come from managerial innovations to improve the efficiency of stores, including cross-training employees so that they can function effectively in more than one department.

Another significant opportunity is continuing to improve the performance of the best-performing retailers in each category by leveraging new technology and innovations in business models. In the United States, MGI research finds that the continued adoption and analysis of big data could increase even the leading establishments' productivity by at least 0.5 percent a year through 2020. Amazon, for instance, has leveraged big data to analyze ordering and shipping patterns. Advanced automation in its warehouse has enabled Amazon to reach 91 percent of US consumers within a day while reducing inventory by three to five days compared with the company's peers. Leveraging big data and advanced analytics, an individual firm could increase its operating margins by more than 60 percent—a boon in an industry with notoriously tight margins.

Technology has already created an Internet-based retail revolution, but this is putting pressure on offline retail to improve its productivity and competitiveness, too. One such example is the rise of "dark stores"—highly automated stores dedicated to online purchases enabling consumers to order online and pick up the order. UK-based retailer Tesco says it fulfills more than 80 percent of its London online orders from dark stores.[98] Among other emerging innovations that could have a significant impact on retail productivity

[97] *China's e-tail revolution: Online shopping as a catalyst for growth*, McKinsey Global Institute, March 2013.
[98] Tesco PLC Annual Report 2013.

are automated ordering of frequently bought products enabled by big data and artificial intelligence, and increased customization enabled by new technologies such as 3D printing.

Government regulation has a profound influence on retail-sector productivity, which can explain why large productivity differences remain. Regulation that allows the expansion of more productive modern supermarkets and convenience stores raises productivity because larger chains can profit from scale benefits in distribution, merchandising, and store operations. Regulation that restricts modernization can hold back productivity. As illustration of the power of regulatory change, retail-sector productivity in Russia more than doubled in a decade when the government eased restrictions on foreign retail players who brought modern formats with them.[99] In Sweden, focused efforts to liberalize zoning regulation and combat local anti-competitive behavior unleashed a greater degree of competition in retail, boosting its productivity by an average of 4.6 percent, double the rate achieved by the average European economy.[100] In China, for instance, the share of traditional grocery stores fell from 31 percent of overall grocery sales in 2000 to 15 percent in 2009. One regulatory change that contributed to this trend was legislation inhibiting the use of traditional "wet" markets for fish and fruit and vegetables in favor of a move toward larger, consolidated wet-market centers.

In other countries, the penetration of modern retail outlets has been much more muted. Many countries have chosen to protect small-scale stores through barriers to foreign direct investment, zoning laws, or restrictions on the size of stores. Such regulatory barriers exist in India in the form of differential tax payments for larger chains, a ban on foreign direct investment in multi-brand retailing, taxes on the movement of goods across state borders (the Octroi tax), regulations enabling middlemen in the food-supply chain (APMC Act), and differential enforcement of labor laws. In Japan, laws limiting the entry of large supermarkets and providing incentives for small retailers to stay in business explain the high share of family retailers and low productivity.[101] Similarly, in 1990s France, the introduction of more restrictive regulation over the size of retail outlets halted the sector's productivity growth.[102]

Informality remains another major barrier to productivity in retail. Take the case of Brazil, where taxes and other social payment are very high by international standards. Total taxes paid as a percentage of GDP stood at 36 percent in Brazil in 2013 compared with 27 percent in Russia, 18 percent in China, and 7 percent in India. Because enforcement is weak, there is a strong economic case for companies to underreport their obligations or operate in the informal economy. MGI has estimated that an informal player in Brazil that underreports sales and employee costs by 30 percent thereby improves net margins more than twofold. And it is not just traditional corner stores that evade taxes and put larger, more productive players at a competitive disadvantage. A number of informal regional retail chains, in some cases, run very sophisticated software that enables them to keep double accounts to facilitate tax evasion.[103] This slows productivity growth, as smaller, less productive establishments remain competitive and even gain share from modern ones.

Higher efficiency in health care could cut spending by one-quarter

Health care is an increasingly important sector around the world. Health-care spending currently accounts for 10 percent of GDP in Organisation for Economic Co-operation and Development (OECD) countries and an average of 6 percent of GDP in the four leading

[99] *Lean Russia: Sustaining economic growth through improved productivity*, McKinsey Global Institute, April 2009.

[100] *Sweden's economic performance*, McKinsey Global Institute, September 1995; *Sweden's economic performance: Recent development, current priorities*, McKinsey Global Institute, May 2006.

[101] *Why the Japanese economy is not growing: Micro barriers to productivity growth*, McKinsey Global Institute, July 2000

[102] *Reaching higher productivity growth in France and Germany*, McKinsey Global Institute, October 2002, and *Productivity: The key to an accelerated development path for Brazil*, McKinsey Global Institute, March 1998.

[103] *Connecting Brazil to the world: A path to inclusive growth*, McKinsey Global Institute, May 2014.

emerging economies of Brazil, China, India, and Russia. China's health-care spending has almost tripled over the past five years and is projected to reach $1 trillion by 2020. Over the next four years, global health-care spending is projected to grow at 5.3 percent a year.[104] This is almost two percentage points higher than projected global GDP. Rising demand for health care is putting increasing pressure on government budgets, boosting public-debt levels, and constraining the ability to spend on education and other areas. A global shortage of health-care workers is expected to worsen. The World Health Organization estimates that, with current models of care, developing economies will need 12.9 million additional health workers by 2035.[105]

2%
faster growth in global health-care spending than global GDP

If health-care spending continues to outpace GDP growth at the current rate, it would exceed 10 percent of GDP in nearly all developed (OECD) economies by 2030, exceeding 20 percent of GDP in many of them. This trend is clearly unsustainable. The imperative is therefore to ensure that health care is delivered as efficiently as possible.

Although it is difficult to measure productivity in health care and other public-service sectors, our research indicates substantial room for improvement from a low base (see Box 9, "Measuring health-care productivity").[106] Our analysis finds that there is potential to save nearly 25 percent of health-care spending by 2025 without compromising health outcomes (Exhibit 31). To achieve such savings, health-care systems would need to pull a number of levers. They include achieving best practices in operations and procurement, reducing clinically ineffective procedures, training lower-skilled workers to take over less complex work from doctors and nurses, shifting care outside the expensive setting of hospitals, and using new digital technologies, for instance, to let patients submit their own information. Our findings are broadly in line with those of the OECD.[107]

1/3
share of nurses' time spent directly caring for patients

The lever that potentially has the most near-term impact—a 9 percent saving on overall health-care spending—is adopting best practices in operations and in procurement. Typically, only one-third of a nurse's time is spent directly caring for patients: non-core activities account for roughly 66 percent of nurses' scheduled time (Exhibit 32). Shifting time spent from non-core to direct care activities can raise productivity significantly. Hospitals can streamline processes and reduce non-essential activities, defining standards and expectations through standardized order sets. For example, if a physician sees specific sets of symptoms and reaches a diagnosis, there is a defined set of tests to order and next steps to take that draw on best practices and help to ensure that no tests or procedures are missed and that no unnecessary action is taken. A big opportunity is reducing the time spent gathering certain information from patients who can submit their own personal information and any health concerns digitally. Information thus provided can then be made available to all care providers to avoid duplicate entries. Hospitals need to ensure that health-care workers are engaged in activities that match their skills, with less complex work being performed by those with lower skills. Procurement needs to target goods and services that offer the lowest costs without compromising quality, and order and stocks need to be managed efficiently to minimize inventory and operational costs. Lean operations principles and management best practices, similar to those in other industries, are the key.

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[104] *World healthcare outlook*, Economist Intelligence Unit, August 2013.

[105] *A universal truth: No health without a workforce*, Third Global Forum on Human Resources for Health Report, Global Health Workforce Alliance, November 2013.

[106] McKinsey and the McKinsey Global Institute have conducted a number of health-care productivity assessments. See, for instance, *Accounting for the cost of health care in the United States*, January 2007, and *The challenge of funding Japan's future health care needs*, March 2008. See also *Health care productivity*, McKinsey Global Institute and McKinsey Health Care Practice, October 1996. Health care has also been one of MGI's in-depth case studies for assessing the impact that information technology and big data have on productivity. All of the research is available at www.mckinsey.com/mgi.

[107] *Health care systems: Getting more value for money*, OECD Economics Department policy note number 2, 2010.

Box 9. Measuring health-care productivity

Growth in health-care productivity essentially means improved health outcomes—which includes access to health care and the quality of care—for less cost. Over the past 50 years, there have been tremendous improvements in access to and quality of health care. At the same time, health-care expenditure has grown at a rate that will soon be unsustainable. As demand for health care continues to increase, improving productivity in the sector will be crucial.

However, the impact of health-care productivity on GDP as measured is different from that of most other sectors. In private sectors such as manufacturing, GDP is measured as the value added produced or revenue minus the cost of inputs. In most countries, the GDP of the health-care sector, however, is based on the amount of spending—not the value of output. When sector spending is used as the baseline, it follows that any productivity-driven cost reductions will reduce spending in the sector, and hence the measured GDP of the sector. Furthermore, the measurement of GDP in public sectors ignores the impact of productivity gains from raising the quality of services provided. For example, a hospital may use labor-optimization techniques to free up time for its nursing staff, but then opt to reallocate nurses to activities that increase patient comfort. This would be a clear improvement, but one that is not typically captured by GDP statistics. The secondary economic benefits of improved health outcomes—which include more productive workers who can stay longer in the labor force—are likewise not measured in health-care GDP.

In our analysis, we have quantified measures to reduce costs that maintain or improve health outcomes. Health outcomes are difficult to measure. Disability-adjusted life years (DALYs), which measure the number of years lost or rendered economically unproductive due to illness, are one proxy of the gap between optimal and current health status, but are incomplete. DALYs miss many aspects of mental and emotional health, as well as inequalities in health access and trade-offs between quality and access. Fortunately, in health care, quality and efficiency often go hand in hand, and efficient care can also be higher-quality care. For instance, ensuring that a person with diabetes has the appropriate foot checks can help avoid a traumatic and costly amputation in the future. Keeping patients at home with their friends and family also keeps hospital costs down.

As we have discussed, cost savings in health care do not directly increase GDP, but providing the same care at a lower cost does mean freeing up resources that can be used elsewhere. We should note that, by quantifying potential cost reductions, we are not arguing that countries should cut health-care spending by this amount. The savings can be reinvested in increased health care and in meeting growing demand for care while containing growing costs.

Exhibit 31

Health-care productivity levers and their relative impact

Potential savings without reducing quality of care
% of health-care expenditure

NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

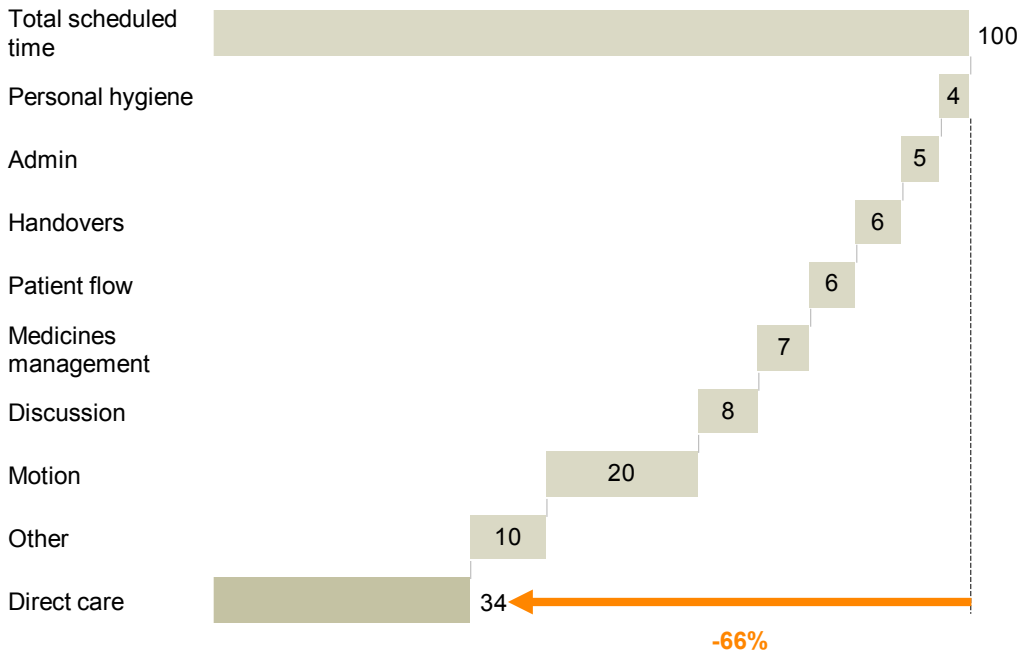
Exhibit 32

Operational and procurement best practices offer immediate efficiency gains in health care

Key levers

Worker efficiency	▪ Streamline processes and reduce non-essential activities (e.g., reduction in repetitive and redundant processes capturing patient information) ▪ Define standards and expectations (e.g., standardized order sets)
Skill mix	▪ Ensure that health-care workers are "operating at the top of their license" (i.e., offload less complex work to lower-skilled workers)
Real estate utilization	▪ Streamline patient throughput— better processes enable patients to be treated quickly, thus requiring fewer beds
Procurement	▪ Ensure lowest cost of ownership (balancing cost and quality) ▪ Order, stock, warehouse, and manage goods efficiently to minimize inventory and operational costs

Scope to improve nursing productivity by decreasing non-core activities
Developed economy example
% of nurse time spent



NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

It is important that health-care infrastructure is used wisely by streamlining the throughput of patients to reduce the length of stay in expensive hospital beds. In Japan, for instance, the average patient stays nearly a full week less now than in 2000. Some of the changes that have enabled this shift include a move toward minimally invasive procedures (for example, laparoscopic surgery has much shorter recovery times than traditional procedures) and remote monitoring and support that allow patients to receive follow-up care at home. Increasing utilization of operating rooms, specialized machinery, and other hospital assets is another opportunity.

Shifting health care to more cost-effective settings can reap large savings. In the United Kingdom, for instance, McKinsey research has estimated that this can bring net gains of between £1.3 billion and £2.0 billion ($2.1 billion and $3.2 billion). The biggest savings can be achieved from shifting inpatient care to outpatient care, shifting from outpatient care in hospitals to primary-care and other settings outside hospitals, empowering patients to treat themselves to a greater degree, and integrating care settings in which different providers that a patient might see are in the same organization. ClickMedix uses mobile phones and digital cameras to capture images, transmit patient information, and deliver remote consultations, resulting in a 25 percent reduction in administrative costs and a four- to tenfold increase in the number of patients seen by doctors and specialists. Another model that offers significant savings is "borrowing" assets from another organization. For instance, MinuteClinic in the United States opens primary-care clinics in retail stores to benefit from their foot traffic with lower overhead, recording savings of between 45 and 65 percent.[108] Another useful approach is targeting particular locations and behaviors.

It is possible to cut the number of elective procedures that have low clinical effectiveness through improved education and awareness for clinical staff and patients. Similarly, large savings can be made by stopping the use of drugs and other interventions deemed to be ineffective or too costly for their level of effectiveness. In the United Kingdom, a review by the London Health Observatory found that the use of some procedures could be reduced by up to 95 percent.[109] There are a number of barriers to reducing the use of ineffective drugs and procedures. Data on effectiveness are fairly limited and not easily accessible when they are available. Cost-effectiveness analysis is widely used for drugs in the UK National Health Service, but its use could be extended further. Clinical staff may reject the use of cost-effectiveness criteria and tend to give in to pressure from patients who want a particular treatment.

There are many examples of innovative delivery models that can help to boost productivity. One is Aravind Eye Care of India, which today is the largest eye-care facility in the world, providing high-quality, low-cost eye care to Indians at all income levels. The organization has applied principles of mass marketing and industrial engineering to its business and has streamlined its work flow and made its use of staff super efficient—paramedics undertake 70 percent of the work performed in the operating room. Aravind does two-thirds of the total operations performed by the entire National Health Service in the United Kingdom at one-sixth of the cost and with a lower infection rate.[110]

Yet another innovation is developing less expensive versions of drugs and technology. For instance, Biosense Technologies of India creates low-cost, easy-to-use medical devices, including a non-invasive device to measure hemoglobin, a low-cost glucometer, and a smartphone-based portable diagnostic system. The company's testing devices are between 50 and 70 percent cheaper than traditional ones.

Empowering patients to look after themselves reaps considerable savings. For instance, Jonkoping Support Self Care of Sweden teaches patients with kidney failure to manage their own dialyses; this costs between 50 percent and 75 percent less per patient, with a reduction in side effects and infection rates. People who use this network report improved outcomes. MGI's research on how to tackle obesity has found that a key lever is health insurers and/or employers supporting healthy eating and physical activity by providing

[108] Peter Albro et al., *MinuteClinic: Bringing change to healthcare delivery*, The Tuck School at Dartmouth, November 2008.

[109] *Save to invest: Developing criteria-based commissioning for planned health care in London*, London Health Observatory, June 2007, and *Effective commissioning initiative*, South West London Public Health Network, November 2006.

[110] "Driving down the cost of high-quality care: Lessons from the Aravind Eye Care System," *Health International*, McKinsey & Company's Health Systems & Services Practice, issue 11, 2012.

personal technology such as fitness wristbands so that individuals can set goals and measure their behavior against them.[111] In general, behavioral "nudges" can be a useful tool in the anti-obesity arsenal. Nike's "The Grid" in London has turned running into a game. Phone boxes have been labeled as visual markers for runners, who type a personal ID number as they reach each one; the competition winner is the person who is fastest at finding all the phone boxes, with scores uploaded to the Grid website so that runners can compare their scores.[112]

Disease-management programs are critical because typically a small number of chronic diseases in a moderate number of patients accounts for a disproportionate amount of total spending. A reduction in mortality rates by more than 70 percent has been recorded in some settings, and operating costs have been reduced by up to one-third by using such programs.[113]

Using large pools of data—big data—in health care can offer innovation and cost savings on a potentially huge scale.[114] The opportunity is largest in economies that already have large volumes of data. In the United States, MGI research has found that the effective use of big data could reduce national health-care spending by more than $300 billion, or 12 percent of US health-care costs. By mining data, researchers of all kinds can see what treatments are most effective for particular conditions, identify patterns related to drug side effects or hospital readmissions, and gain other important insights that can help patients and reduce costs. In the United Kingdom, the National Institute for Health and Care Excellence has begun examining large data sets to investigate the clinical and cost effectiveness of new drugs and expensive existing treatments. Similarly, the Italian Medicines Agency collects and analyzes clinical data on expensive new drugs as part of a national cost-effectiveness program.

In emerging economies, electronic health records have begun to be adopted, leading to demonstrable health-care benefits. At India's Bhorugram Rural Dispensary, immunizations nearly doubled in four years after records went digital. The potential for savings in emerging economies will rise as they embrace mobile technology, digitize health records, and begin to build up a body of data. Some of these economies have started to digitize health records with considerable health-care benefits. At the Mosoriot Rural Health Center in western Kenya, clerks spent two-thirds less time interacting with other staff on administrative tasks and almost doubled their time registering patients. Big data is also helping to create innovative new health-care products and services. In the United States, Propeller Health has created a GPS-enabled tracker that monitors inhaler usage by asthmatics. The information is sent to a central database and merged with Centers for Disease Control and Prevention information about known triggers of asthma, such as pollen counts in the Northeast and volcanic fog in Hawaii, to determine trends. By collecting, aggregating, and analyzing data, doctors can develop personalized treatment plans and help spot how to prevent asthma attacks.

In most health-care systems, the government plays a central role. The challenge is that many, if not most, government operations are not subject to market pressure on their performance and therefore need other incentives and metrics to power efforts to boost productivity. One option would be to identify performance metrics that mimic market performance. Another option would be to increase the transparency of performance metrics that can help expose low-performing departments or cells and identify strong performers, helping spread better practices. Germany's employment agency and state departments

[111] *Overcoming obesity: An initial economic analysis*, McKinsey Global Institute, November 2014.

[112] *Applying behavioural insight to health*, Behavioural Insights Team, UK Cabinet Office, December 2010.

[113] Mary Naylor et al., "Transitional care of older adults hospitalized with heart failure: A randomized clinical trial," *Journal of the American Geriatrics Society*, volume 52, number 5, May 2004.

[114] *Big data: The next frontier for innovation, competition, and productivity*, McKinsey Global Institute, May 2011.

of motor vehicles in the United States are examples of public-service providers that have achieved higher productivity by increasing transparency about service outcomes and customer waiting times.

Even more fundamentally, governments need to ensure that incentives are in place to promote productivity. In competitive market sectors, companies survive and grow if they have higher value added for a certain level of inputs. Health services are sought not because they are inherently desirable but because of the health outcomes they produce. Yet it is difficult to pay for health outcomes, and therefore hospitals are often reimbursed for the activities in which they engage. This runs the risk of rewarding hospitals for high-cost, clinically ineffective procedures when more cost-effective treatments of equal or higher efficacy exist. High-value—and highly productive—services such as a follow-up telephone call once a patient has left the hospital or an informal consultation by phone that precludes the patient's having to meet the doctor face-to-face are not reimbursed. Moreover, because patients do not usually bear the cost of treatment—and often have limited knowledge about their health-care needs, the treatment options available, and indeed treatment outcomes—they do not shop around for the best value.

There is movement toward incentive structures that are better aligned, and evidence that productivity increases when the right incentives are in place. One promising model is case-mix-based reimbursement, an example being the diagnosis-related groups pioneered by the federal Medicare program in the United States and now adapted for many other countries. Hospitals are paid a fixed amount for, say, a hip replacement (with some adjustment for risk and difficulty), but do not receive additional reimbursement if the surgery takes longer or the patient requires a lengthier recuperation. Health systems are also now pushing the frontier with innovative payment schemes that include quality-based financial incentives and risk-sharing models.

The case studies suggest that productivity growth will require adjustments in the mix of jobs

Extrapolating from the sector case studies to aggregate growth, we have grouped industries into similar categories and adjusted employment weights to reflect productivity and output growth in each sector. This allows us to ensure that overall productivity growth reflects sector-specific improvement opportunities and changes in the relative weights of industries in each country, as well as weights of countries in the global economy.

82%
jobs from services in developed economies

44%
in emerging economies

It is clear that continued healthy productivity growth will require adjustments in the mix of jobs, notably a continuing rise in the share of services. The current composition of employment shows that the onus for boosting productivity and creating jobs is on service sectors. Service sectors account for 82 percent of jobs in developed economies and 44 percent in emerging ones, and their share is growing in all but the lowest-income nations.[115] In developed economies, services and non-market sectors such as health care and the public sector generated 170 percent of all net job growth between 1995 and 2009, compensating for the decline in jobs in agriculture and manufacturing. In middle-income emerging economies, service sectors have generated the overwhelming majority of net new jobs. Even in China and India, manufacturing has contributed roughly one-third of net new job creation, with services contributing the rest (see Box 10, "Patterns of employment growth by industry").[116]

[115] Includes construction and utilities; excludes non-market sectors.

[116] Analyses based on the World Input-Output Database between 1995 and 2009, available at www.wiod.org. Also see *How to compete and grow: A sector guide to policy*, McKinsey Global Institute, March 2010.

Box 10. Patterns of employment growth by industry

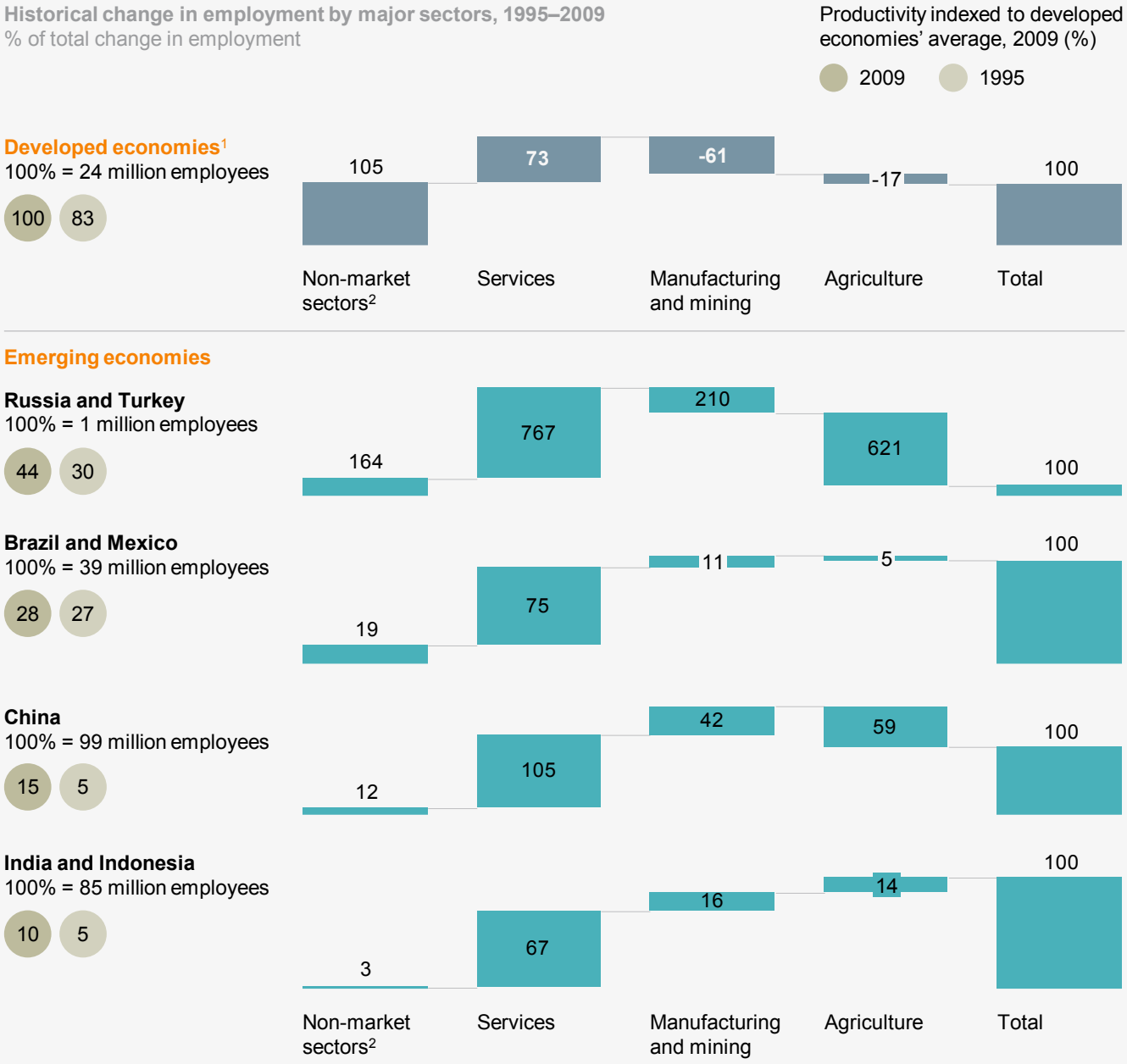
MGI analyzed industry sector-level employment patterns from 1995 to 2009 in five groups of countries by income level—developed economies; Russia and Turkey; Brazil and Mexico; China; and India and Indonesia (Exhibit 33). Taking these groups together, services have accounted for more than 80 percent of total employment growth.[1]

Even in emerging economies, services have created more net employment than manufacturing sectors. In developed economies, non-market services, including health care and public administration, have been the largest source of employment increase.

Exhibit 33

Services have been the biggest driver of employment growth in both developed and emerging economies

Historical change in employment by major sectors, 1995–2009
% of total change in employment



1 Australia, Canada, France, Germany, Italy, Japan, South Korea, the United Kingdom, and the United States.
2 Includes education, public administration and defense, and health and social work.
NOTE: Not to scale. Numbers may not sum due to rounding.

SOURCE: World Input-Output database; McKinsey Global Institute analysis

[1] Developed economies in these groupings are Australia, Canada, France, Germany, Italy, Japan, South Korea, the United Kingdom, and the United States.

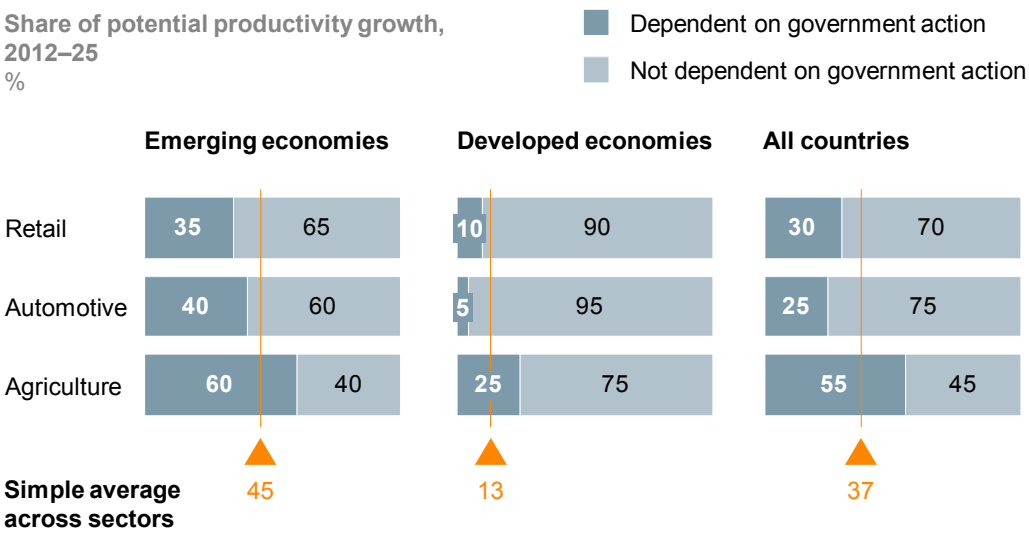
Yet on the whole, service-sector jobs have lower average productivity, and most service sectors have also experienced below-average growth in productivity.[117] Because these sectors employ such large numbers of people, even moderate increases in productivity growth can move the needle of aggregate performance, similar to the way the acceleration in US retail productivity did in the late 1990s.[118] What is needed is a concerted effort to catalyze a transformation in services so that the jobs they generate are more productive and attractive and can take the place of the coveted manufacturing jobs of past decades whose share continues to decline as countries reach higher incomes.

Governments have a pivotal role to play across sectors

Across all sectors, the choices that governments make to foster productivity will be pivotal over the next half century. In the five sectors that we have studied, we find that capturing around one-quarter to half of the global potential for productivity growth over the next decade will be heavily dependent on policy or other government actions (Exhibit 34).

Exhibit 34

About one-third of the productivity potential depends on changes in government policy and approaches



SOURCE: McKinsey Global Institute analysis

The role of government in helping boost productivity is likely to be even more significant in developing economies than in developed ones. Our analysis suggests that about 60 percent of productivity growth in agriculture, 40 percent in the automotive sector, and 35 percent in retail will be tied to policy change in developing economies. The policy barrier is lower in developed economies, but even here we still see around 25 percent of the opportunity in agriculture and 10 percent of the retail opportunity being dependent on policy changes. These findings are in line with previous MGI research that has identified policy as a critical barrier to (or critical enabler of) productivity growth, accounting for over half of

[117] There is wide variance among all service industries, with telecommunications and financial sector being examples of industries with above-average productivity level and growth, and non-market sectors that have generated over one-third of net job expansion yet in most countries have below-average productivity performance.

[118] See *US productivity growth, 1995–2000*, McKinsey Global Institute, October 2001, and *How IT enables productivity growth*, McKinsey Global Institute, October 2002.

the productivity gap between Brazil, India, Japan, and South Korea and the productivity frontier.[119]

Overcoming policy barriers will require a clear understanding of the role that government policy and actions have on productivity, employment, and other goals in the specific context of each country. The most effective role of government also depends on the characteristics of the sector, including exposure to global competition, capital intensity, speed of innovation, and industry structure. One-size-fits-all solutions are rare. Instead, governments need to tailor their interventions and approaches to the sector. Ultimately, success depends at least as much on the capacity to execute across legislative and executive branches as on the specific choice of policy.[120]

•••

Sufficient opportunities exist to boost productivity growth to 4 percent a year, but capturing them will require aggressive action on a broad front to bring management and operational efficiency up to best practices and to leverage technology to its full potential. Companies have a major role to play in delivering higher productivity across sectors through improved and more efficient processes and leveraging technology to the fullest. Governments would need to ensure that the full range of enablers of higher productivity is in place, from competitive intensity to the availability of skills and capital, as well as regulation that promotes flexible labor markets that help mitigate the employment impact of change and ensure that companies have the workers they need to thrive. We now turn to a discussion of ten key enablers that need to be in place to capture the world's full growth potential.

[119] Scott C. Beardsley and Diana Farrell, "Regulation that's good for competition," *McKinsey Quarterly*, number 2, 2005.

[120] For a synthesis of MGI's lessons learned on effective pro-growth policies, see *How to compete and grow: A sector guide to policy*, McKinsey Global Institute, March 2010. We find it useful to think of the roles that governments can play in four broad categories: setting the ground rules and direction, building enablers, tilting the playing field, and playing the role of principal actor.

Farm machinery (thresher)
© Getty Images

Business meeting
© Getty Images

5. TEN KEY ENABLERS TO UNLOCK LONG-TERM GROWTH POTENTIAL

Having ample opportunities to improve productivity does not guarantee that they will be realized. MGI first identified some of the productivity gaps that persist today more than ten years ago. Achieving a step change in productivity growth would necessitate strenuous efforts by business owners, managers, and workers to change established ways of doing things and to adopt new approaches that improve how they operate. To incentivize broad-based change, companies need competitive pressure to perform better, a business environment and institutions that enable change and creative destruction, and access to infrastructure and talent. Productivity is likely to rise faster in those economies that reward companies for outperforming their peers.

Drawing on many years of analysis of productivity and growth as well as the new sector case studies in this report, we detail ten key enablers that need to be in place to retool the world's productivity engine and help to lift the world economy's long-term growth rate closer to its potential. These enablers broadly fall into four groups.

- **Enabling catch-up by creating transparency and competition.** The first group of three reflects the barriers to catch-up that we found in our sector case studies, as well as what we have learned from past MGI productivity studies: remove barriers to competition in service sectors, focus on efficiency and performance management in public and regulated sectors, and invest in physical and digital infrastructure, especially in emerging markets.

- **Helping to push the frontier by incentivizing innovation.** The next four enablers reflect the case studies in this report and MGI's research on the economic impact of technology: craft a regulatory environment that incentivizes productivity and supports innovation, foster demand for and R&D investment in innovative products and services, exploit existing and new data to identify transformational improvement opportunities, and harness the power of new actors in the productivity landscape through digital platforms and open data.

- **Mobilizing labor to counter the waning of demographic tailwinds.** The third group of enablers draws on the demographic analysis in Chapter 2 as well as MGI's body of analysis on global labor markets: put in place regulation and social support to boost labor-market participation among women, young people, and older people; and improve education and matching skills to jobs, and make labor markets more flexible.

- **Opening up economies to cross-border economic flows, from trade in goods and services to flows of people.** Being open to global economic activity allows companies and economies to benefit from competition, the flow of ideas, and better practices and personal connections. This enabler draws on our sector case studies and previous MGI analysis of global flows.[121]

Identifying the barriers to and enablers of productivity growth is the easy part. We do not underestimate the extent of the changes that would be needed to raise the rate of global productivity growth by a significant margin. To achieve a sharp acceleration would require modifying longstanding political, judicial, and regulatory practices, and this will not happen overnight. Importantly, governments should avoid new protectionism that would reduce

[121] *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, April 2014.

the pressure to improve productivity and likely slow global growth further. The incentive for concerted efforts to overcome barriers and embrace change is clear. Without a substantial, broad-based pro-productivity agenda, global growth is likely to decline substantially from rates enjoyed over the past half century.

Companies are crucial to seizing the full range of opportunities to boost productivity growth. Much of the scope to improve productivity can be achieved independently from government policy, whether this involves mechanization in agriculture in emerging countries or the adoption of best practices in merchandising and online retailing. Businesses need to play a full part as investors in upgrading capital and technology. They need to take risks by investing in R&D and unproven technologies and processes. They are central to efforts to mitigate the erosion of the labor pool by providing a more flexible working environment for women and older workers, and training and mentorship for young people. In an environment of potentially weaker global economic growth, and certainly evolving growth dynamics, executives need to be adaptable and informed. They need to anticipate where market opportunities are coming from, and the competitors they will meet in those markets. Above all, companies need to be competitive in a world where productivity increasingly will be the arbiter of success or failure.

Without a substantial, broad-based pro-productivity agenda, global growth is likely to decline substantially from rates enjoyed over the past half century.

Enabling catch-up by creating transparency and competition

1. Remove barriers to competition in service sectors

75%+
non-agricultural workers employed in services

Liberalized and competitive service sectors could provide a major boost to productivity growth over the next 50 years, just as the liberalization of goods trade did over the past 50 years. The sheer economic weight of services makes their productivity critical for global growth. Today, service sectors employ more than 75 percent of all non-agricultural workers, and that share is growing. Yet many service industries have not benefited from the declining trade barriers and increasing global competition that have helped raise manufacturing productivity in the past 50 years.

About 30 percent of the potential to boost productivity in service sectors such as retail is heavily dependent on favorable policy changes. Today, increased penetration of more productive modern retail formats in India, Japan, South Korea, and many other countries continues to be hindered by regulation that limits the entry of global retailers and by land and zoning regulations that prevent domestic retail players from achieving benefits of scale.[122] In South Korea, for instance, municipal governments are allowed to limit the operating hours of large retailers through two pieces of legislation that went into effect in 2012: the Distribution Industry Development Act and the Act on the Promotion of Collaborative Cooperation between Large and Small-Medium Enterprises. Professional services from law and accounting firms to notaries and pharmacies in Western Europe and elsewhere continue to be highly regulated, limiting competition and productivity.[123] For example, regulation grants exclusive rights to businesses both geographically (most European countries limit the number of pharmacies) and in terms of business scope (in most European countries, only

[122] See MGI reports *Why the Japanese economy is not growing: Micro barriers to productivity growth*, July 2000; *India: The growth imperative*, October 2001; *Beyond Korean style: Shaping a new growth formula*, April 2013; and *From poverty to empowerment: India's imperative for jobs, growth, and effective basic services*, February 2014.

[123] *Beyond austerity: A path to economic growth and renewal in Europe*, McKinsey Global Institute, October 2010.

notaries can approve a change in title in real estate, and pharmacies have the monopoly on retail sales of medicinal products). There is price fixing, too. There are price ceilings and floors for architects and lawyers in Italy and Germany, for instance. To introduce more competition and therefore greater efficiency, adjusting such regulation while maintaining high professional standards will be important.[124]

History suggests that, without changes in the regulatory environment, it is unlikely that potential productivity gains will be realized. Reducing regulatory barriers to market integration, consolidation, and competition will continue to be a vital enabler for growth over the next 50 years, as it was over the past 50. Any temptation in the aftermath of the global recession to return to more mercantilist policies would come at the cost of higher productivity and growth.

2. Focus on efficiency and performance management in public and regulated sectors

Public and regulated sectors including health care and education have been important drivers of new jobs over the past decade, particularly in developed economies where these sectors employ one-quarter of the workforce and have created more jobs than the net increase across all sectors. Aging is increasing demand for health and other social services, but the evidence from the limited data that are available suggests that the productivity level and growth rates of public and regulated sectors are below the national average.[125] It is therefore imperative that countries focus on improving the efficiency of their performance and their measurement of that performance so that they can track progress. For instance, the G20 could consider including standard measures of public-sector efficiency as one of the key pillars of its open-government initiative.

$12B
savings in 3 years from French public policy review

There is no shortage of ways in which countries could potentially improve the performance of these sectors, as we discussed in our health-care case study. These include lean techniques that improve the quality of services and reduce waste, better fraud detection, and more effective financial management. In health care, for instance, Kaiser Permanente, the integrated-care provider, offers easy access to appropriate care through multiple channels including call centers. Online features have produced higher satisfaction rates among patients and led to 10 percent fewer primary or urgent health-care visits. France instituted a General Review of Public Policies (RGPP) in 2007; its target was to make significant cuts in public spending and boost the effectiveness of existing spending. Since the launch, accident and emergency waiting times have fallen by 28 percent, the civil service has 100,000 fewer employees, and, in a three-year period, the government saved €10 billion ($12.5 billion).[126]

Transitioning to digital and mobile platforms is a powerful tool for improving public services in developed and emerging economies alike. In health care, mobile technology is enabling a plethora of relatively quick and cost-effective ways of reaching patients in remote areas. Malawi, for instance, is using mobile phones to gather information on child malnutrition. There are clear parallels in other sectors. The Swedish Tax Agency initiated a program in 2006 to increase trust among citizens and boost compliance, the key strategy being to invest in faster, more accurate, and more user-friendly electronic services. The agency set up e-filing of value-added tax returns and income statements, and, in 2011, launched an app so that citizens could access prefilled tax returns on a smartphone or tablet. The app gained more than 120,000 users in the first year and also helped to drive broader use of e-filing in

[124] Ibid.

[125] See *The public-sector productivity imperative*, McKinsey Public Sector Practice, March 2011, and *How can American government meet its productivity challenge?* McKinsey & Company, July 2006.

[126] Central to this effort was a "barometer" that tracked indicators based on customer expectations developed through focus groups. RGPP publishes an annual report that follows progress on 450 initiatives across all 18 ministries. See "Better for less: Improving public sector performance on a tight budget," McKinsey & Company discussion paper for the 11th Rencontres Economiques d'Aix-en-Provence, July 8–10, 2011.

general. As a result of these efforts, citizens' trust in the Swedish Tax Agency increased from 68 percent in 2006 to 83 percent in 2012.[127]

Another example is the way that the Afghan police force used digital technologies to combat corruption. In 2009, the police force started paying salaries via mobile phones rather than using cash. The result was that most police officers assumed that they had received a raise, when in fact they were receiving full pay for the first time. Before this method was introduced, at least 10 percent of their pay went to ghost police officers and middlemen.[128] Another example of using digitization to increase efficiency and cut down on corruption is reform under way in India's paper-based land-records system. In the state of Karnataka's Bhoomi Project, 20 million Records of Rights, Tenancy, and Cultivation (RTC) held by some 6.7 million farmers were digitized and a network of computerized land-records kiosks was set up. Since 2012, these kiosks have provided 100 million RTC, cutting processing times and instances when bribes have had to be paid for a farmer to obtain the document.[129] The success of this project inspired the Indian government to invest $1.5 billion in the National Land Records Modernization Program, launched in 2008.[130]

Transitioning to digital and mobile platforms is a powerful tool for improving public services in developed and emerging economies alike.

Continuing to improve ways to track performance on efficiency and productivity is vital to reinforce change—what gets measured, gets done, the saying goes. In health care, this tracking can even be done by patients themselves. In the United Kingdom, PatientsLikeMe is an online network organized by disease group that allows patients to track their progress and compare it with that of others with similar conditions. In the United States, Baltimore started collecting information about absenteeism and overtime in 2000. It then used these data to design programs that cut overtime and absenteeism by 40 percent and 50 percent, respectively, in just three years. After broadening this data-driven approach to other areas of city services, the city saved more than $350 million in seven years, even while improving the quality and quantity of the services it delivered to its citizens.[131] New York City pioneered the use of data to tackle "illegal conversions" in which dwellings are carved into smaller units that can house many more people, risking fire hazards and pest infestation, among other ills. The results were stunning. Before this data bank was put in place, only 13 percent of inspections turned out to be serious enough to warrant a vacate order. With the new system, that rose to more than 70 percent. [132] Throughout the public sector, adopting management

[127] Skatteverket Rapport, www.skatteverket.se, and *Future of government smart toolbox*, World Economic Forum, June 2014.

[128] *Future of government smart toolbox*, World Economic Forum, June 2014.

[129] Under the previous manual system, requests for these documents took between five and 30 days to process and only 5 percent of people received the RTC on their first visit. Now 79 percent of people using the kiosks wait fewer than ten minutes, and 72 percent get the RTC on their first visit. The new system also virtually eliminated bribery. Under the manual system, 66 percent of people said they had had to pay a bribe to get the document; only 3 percent have paid bribes under the new system. Moreover, the digital system saves the state government 66 million rupees ($1.04 million) a year. See Subhash Bhatnagar and Rajeev Chawla, "Bhoomi: Online delivery of Record of Rights, Tenancy and Cultivation to farmers in Karnataka," in *Land Reforms in India: Computerization of land records*, Manoj Ahuja and Wajahat Habibullah, eds., Sage Publications, 2005.

[130] *Future of government smart toolbox*, World Economic Forum, June 2014.

[131] Teresita Perez and Reece Rushing, *The CitiStat model: How data-driven government can increase efficiency and effectiveness*, Center for American Progress, April 2007.

[132] Viktor Mayer-Schönberger and Kenneth Cukier, *Big data: A revolution that will transform how we live, work and think*, Eamon Dolan/Houghton Mifflin Harcourt, 2013.

metrics to benchmark not just costs but also customer waiting times, satisfaction, or the amount of rework needed can shift the focus to improving quality of services.

3. Invest in physical and digital infrastructure, especially in emerging markets

A significant share of the global catch-up productivity growth that we find is possible depends on the provision of basic public infrastructure, especially in developing economies. A very high 40 percent of firms in South Asia cited electricity supply as a major barrier to their operations and growth in a survey conducted by the World Bank.[133] Productivity gains from reducing waste in the food supply chain depend directly on improved public infrastructure such as roads, rail networks, and storage facilities. According to a study by the Department of Commerce in China, up to 25 percent of fruit and vegetables are wasted as a result of inefficient transportation. Communications and digital infrastructure is an increasingly important source of productivity gains across connected supply chains and is vital for the growth of online retail.

Our analysis suggests that availability of capital in the world is unlikely to be a constraint on meeting the infrastructure imperative. A more binding constraint is the limited capacity of financial systems, particularly in many emerging economies, to allocate savings efficiently to the most productive investments (see Box 11, "Global savings should not be a constraint on investment"). Nevertheless, finding willing investors for such large amounts is not easy at a time of constrained public finances, shortages in lending capacity, and tighter regulations on banks in the aftermath of the 2008 financial crisis. The private sector is likely to be able to meet only a small portion of the infrastructure investment needed. If institutional investors were to increase their allocations for infrastructure financing to their target levels, this would result in an additional $2.5 trillion in infrastructure investment capital through 2030—only a fraction of the $57 trillion needed.

Governments therefore need to be smarter about financing infrastructure.[134] But just as important as finding ways to finance infrastructure more effectively is how that money is spent.[135] The $57 trillion infrastructure-investment need that MGI has identified could be reduced by 40 percent, or $1 trillion a year, through three approaches. First, governments need to make better choices about which infrastructure projects to pursue by evaluating the costs and benefits of every project systematically. South Korea's Public and Private Infrastructure Investment Management Center has saved 35 percent of the infrastructure budget by rejecting 46 percent of projects that it reviews, compared with only 3 percent previously.

Second, governments and the private sector need to streamline the delivery of projects. There is huge scope to speed delivery by fast-tracking approvals and land acquisitions. The Australian state of New South Wales cut approval times by 11 percent in just one year. One Scandinavian road authority reduced overall spending by 15 percent by changing standards of road design, using lean construction techniques, and using bundled and international sourcing.

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[133] The World Bank's World Enterprise Survey covers more than 130,000 firms in 135 countries.

[134] In the developed world where many economies still have output gaps and interest rates remain ultra-low, there is a good argument for using traditional government funding, However, many emerging economies, including India and some of the Latin American economies, may need to develop complementary private financing because of the size of their infrastructure gap. See Nicklas Garemo, Jan Mischke, and Jonathan Woetzel, "A dose of innovation to ease infrastructure strains?" *McKinsey Quarterly*, September 2014.

[135] Research by MGI and the McKinsey Infrastructure Practice has identified practical ways of boosting infrastructure productivity that can save 40 percent on the cost of delivering the needed infrastructure. See *Infrastructure productivity: How to save $1 trillion a year*, January 2013.

Box 11. Global savings should not be a constraint on investment

Fixed capital investment—constructing buildings, infrastructure, and machinery and equipment that expand productive capacity—is a critical part of the productivity improvements that enable long-term growth. Businesses will require capital investment in productive assets for both catch-up and pushing the frontier on productivity. Investment is needed, for instance, for expanding modern retail store and warehousing floor space (including cold storage), as well as other office buildings, hospitals, and commercial buildings; for greater mechanization of farms and automation of factories and warehouses; and for IT hardware and software. We estimate that investing 16.5 percent of GDP is necessary to upgrade productive assets for higher productivity. Necessary infrastructure investment would require investing another 3.5 percent. The rest of the fixed investment needed—an estimated 4.1 percent—would be on residential buildings.[1]

Our analysis of future fixed capital investment finds that global savings should be sufficient to meet the overall investment required to achieve the productivity growth we have identified across sectors. To accelerate the productivity-growth rate by 80 percent, the global investment rate would need to increase from about 22 percent of global GDP today to about 24 percent by 2025 (Exhibit 35). This is an increase of less than two percentage points from the historical investment rate. Developed economies today have a high investment rate of 32 percent, largely reflecting booming investment in China and India.[2] We estimate that developing economies would need to account for almost half of the total investment required, compared with about one-third historically.[3]

Overall, a two-percentage-point increase in the global investment rate is achievable. Indeed, some countries, including India and Colombia, have achieved an increase of about 10 percent within a decade. However, there are clearly challenges, particularly in many emerging economies, in ensuring that financial systems are sufficiently developed to act as an effective mechanism for allocating savings to those who want to use them to invest them productively.

Even today, roughly half of the world's adult population, mostly in developing economies, has no bank account or access to any form of formal credit. About 200 million small and medium-sized enterprises (SMEs) in developing economies lack access to affordable financial services and credit.[4] According to the World Bank's enterprise survey, about 30 percent of SMEs in developing economies identify access to finance as a major barrier to growth and operations. In Mexico, for example, access to, and the cost of, funding varies dramatically according to the size of a company. Large corporations have access to global capital markets at costs comparable with their peers in developed markets, while small and particularly informal businesses have to pay up to 20 times as much—if they have access to external funding at all.[5] About one-quarter of larger firms with more than 100 employees in developing economies also cite access to finance as a major barrier to growth.

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1 Residential real estate investments were estimated based on the correlation of real estate stock per capita with per capita GDP using forward-looking GDP and population estimates. For more details on the correlation between real estate stock and per capita GDP, see *Farewell to cheap capital? The implications of long-term shifts in global investment and saving*, McKinsey Global Institute, December 2010. Public infrastructure investment was calculated using the infrastructure stock "rule-of-thumb" methodology. See *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute and the McKinsey Infrastructure Practice, January 2013. Investment in other productive assets is calculated using historical sector capital-output ratios. See the appendix for more details.

2 *Capital for the future: Saving and investment in an interdependent world*, Global Development Horizons, World Bank, 2013.

3 *Farewell to cheap capital? The implications of long-term shifts in global investment and saving*, McKinsey Global Institute, December 2010.

4 *Global financial development report: Final inclusion*, World Bank, 2014.

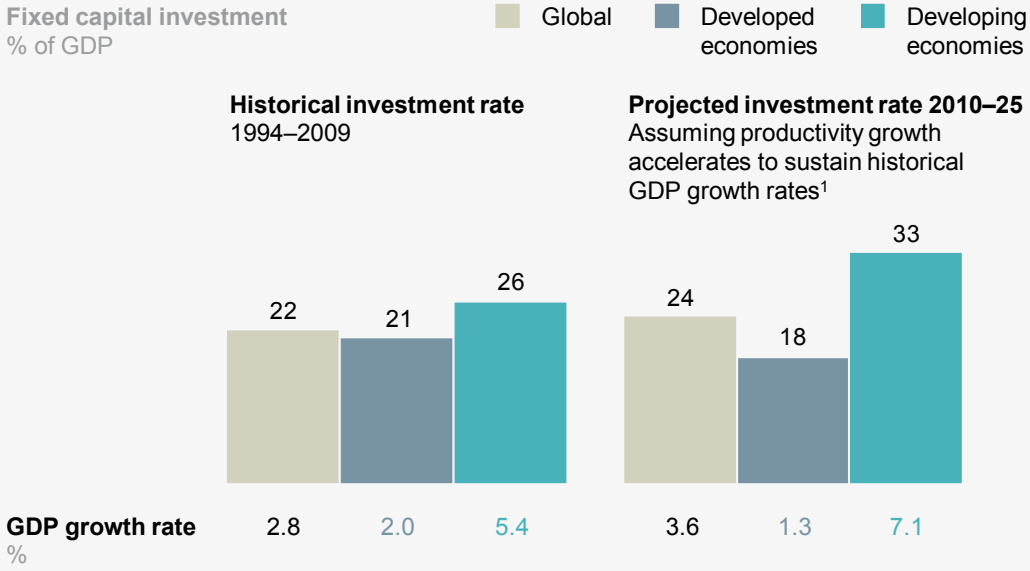
5 *A tale of two Mexicos: Growth and prosperity in a two-speed economy*, McKinsey Global Institute, March 2014. Also see *Long-term finance and economic growth*, Group of Thirty, Working Group on Long-term Finance, 2013.

Box 11. Global savings should not be a constraint on investment (continued)

Moreover, long-term financing in most countries except the United States relies on a narrow range of instruments. Banks provide a majority of the lending in most emerging economies, accounting for about 75 percent of financing in China despite having significantly shorter maturity periods than bond-market financing. Bank finance has an average maturity of 2.8 years compared with more than six years in the case of high-yield bonds and investment-grade bonds in emerging economies.[6] Long-term instruments are better suited for investments targeted at long-term economic growth such as in infrastructure, given longer gestation periods on returns and therefore longer timelines for debt repayment or return on equity. Continuing to strengthen financial institutions is a critical enabler for sustained productivity growth in most emerging economies.

Exhibit 35

Insufficient savings are unlikely to constrain productivity and GDP growth



1 Future investment projections based on long-term capital stock to GDP ratio and trend, adjusted for projected productivity growth.

SOURCE: McKinsey Global Economic Growth database; MGI Capital Supply and Demand Model; McKinsey Global Institute analysis

6 *Long-term finance and economic growth*, Group of Thirty, Working Group on Long-term Finance, 2013.

Third, governments need to make the most of existing infrastructure, a potential savings of $400 billion a year. For instance, intelligent transport systems can double or triple the use of a road, and these systems typically cost a fraction of what would be required to build a new road. In the United Kingdom, the intelligent transport system on the M42 motorway has reduced journey times by 25 percent, accidents by 50 percent, pollution by 10 percent, and fuel consumption by 4 percent.

Investment in infrastructure is important not only to remove bottlenecks to higher productivity, but also to mitigate some of the consequences of rapid growth in the past, such as traffic congestion and pollution, and to make future growth more sustainable. In emerging economies such as China where a large amount of the capital stock is yet to be built, there is a huge opportunity to leapfrog to efficiently planned, dense cities and high-productivity, energy-efficient buildings and plants.[136]

Helping to push the frontier by incentivizing innovation

4. Craft a regulatory environment that incentivizes productivity and supports innovation

50%+
Mexican non-agricultural workers employed informally

Countries vary in the way their business environments facilitate creative destruction—innovation and change in their industries. Past MGI research in developed economies found that one of the main reasons that productivity growth has been faster in the United States than in continental Europe or Japan is the difference in the rate at which more productive businesses gain market share and create jobs, obliging the less productive to either improve or go out of business.[137] In the US retail industry, for example, virtually all of the rapid productivity growth in the 1990s was caused by more productive new establishments displacing much less productive ones.[138] To catalyze productivity through competition, the regulatory environment should avoid unnecessary red tape governing labor and the use of land, set low barriers to entry for new businesses, and put in place transparent and efficient bankruptcy procedures.

Enforcement of regulation is critical to avoid creating disincentives to improve productivity and growth. Informality is a pervasive problem that is holding down productivity growth in many countries. MGI research indicates that informal players operate at just half the average productivity level of formal companies in the same sectors and at a fraction of the productivity of the best companies.[139] In Mexico, for instance, one reason for the nation's weak productivity growth overall is that more than half of non-agricultural workers are employed in the informal sector; indeed, informality is growing due to the high regulatory cost of establishing a formal business and lax enforcement.[140] The cost advantage that informal companies gain by avoiding taxes and regulations more than offsets their low productivity and small scale in many countries. This is an unhealthy situation because inefficient informal players stay in business and prevent more productive, formal companies from gaining market share; the long-term impact on productivity and modern job creation is negative.

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[136] MGI research has found that China could reduce its total energy demand in 2020 by as much as 23 percent by investing in capacity with higher energy efficiency. See *Leapfrogging to higher energy productivity in China*, July 2007, and *Preparing for China's urban billion*, March 2009.

[137] See Martin N. Baily and Diana Farrell, "Breaking down barriers to growth," *Finance & Development*, volume 43, number 1, March 2006, and *Reaching higher productivity growth in France and Germany*, McKinsey Global Institute, October 2002.

[138] Overall industry turnover includes within-company evolution of establishments, reflecting within-company reallocation of resources across regions. See Lucia Foster, John Haltiwanger, and C. J. Krizan, *The link between aggregate and micro productivity growth: Evidence from retail trade*, NBER working paper number 9120, August 2002.

[139] See Diana Farrell, "The hidden dangers of the informal economy," *McKinsey Quarterly*, July 2004, and *New horizons: Multinational company investment in developing economies*, McKinsey Global Institute, October 2003.

[140] *A tale of two Mexicos: Growth and prospects in a two-speed economy*, McKinsey Global Institute, March 2014.

Government standards and incentives are an effective tool for obliging companies to innovate because they help to shape consumer demand. Fuel-efficiency standards and incentive schemes such the Car Allowance Rebate System in the United States are examples of policies that have created a wave of innovation in the automotive sector. Governments can also set direction and incentives that lead to widespread adoption of new technologies and therefore reduce prices by achieving scale benefits in production. China, for instance, instituted an aggressive drive to convert to compact fluorescent lamps (CFL) by setting business standards and putting in place a certification system for high-quality CFL bulbs and offering financial support for conversion to them, including bulk purchasing.[141]

We should note that not all innovation that expands productive capacity depends on research and innovation: both business innovations (for example, emergence of "fabless" semiconductor producers) and incremental operational improvements (such as Toyota's achievements through its *Kaizen* continuous improvement efforts) will continue to matter. As in the case of adopting better practices, competitive pressure and industry structures that reward more productive players are important enablers for encouraging efforts to find new and better approaches and processes.

5. Foster demand for and R&D investment in innovative products and services

27%
R&D investment coming from emerging regions

We do not see the global economy running low on new technological opportunities to push out the productivity frontier over the next decade, as we have noted. However, ensuring that we continue to have a rich technology pipeline in the decades to come will require continued investment in fundamental research. Fortunately, the available evidence suggests that overall investment in R&D shows no signs of slowing. Between 1995 and 2010, global R&D investment grew at a compound rate of 4 percent. Developed economies have held their R&D investment as a share of GDP steady at around 2.5 percent of GDP in this period, while emerging economies have increased their investment share of GDP from 0.5 percent to 1.3 percent (Exhibit 36).[142]

The share of R&D investment coming from emerging regions has more than doubled, reaching 27 percent of the global total. China's $150 billion spending on R&D in 2010 alone accounted for 17 percent of the global total. An example of China's rapidly rising profile in R&D investment is the fact that the leading filer of patents over the past two to three years has been ZTE, the Chinese telecom equipment manufacturer. ZTE and Huawei, one of the world's most prolific filers of patents, together now command more than one-quarter of the global telecom equipment market.[143] The Beijing Genomics Institute already has the world's largest DNA sequencing capacity, accounting for up to 20 percent of all DNA data produced in the world.[144] China's role in the commercializing end of research has also grown. Its 2009 outlay of $34.6 billion on clean technology for the first time surpassed that of the United States ($18.6 billion).[145]

The role of emerging markets in global R&D may become even more important in the years ahead as demand shifts to the south and east, where millions of people are joining the world's consumer class. These new consumers have lower average incomes and diverse needs. They may prefer less advanced technological features offered at lower cost, or they may look for features tailored for their specific needs (such as resistance to dust or humidity in their mobile phones rather than processing speed). To be competitive in this environment, companies are likely to need to expand their R&D spending to reduce the cost of existing

[141] See *Preparing for China's urban billion*, McKinsey Global Institute, March 2009, and Nicolas Lefèvre, Philippine de T'Serclaes, and Paul Waide, *Barriers to technology diffusion: The case of compact fluorescent lamps*, OECD and the International Energy Agency, October 2006.

[142] OECD data.

[143] Morgan Stanley Research Europe, 2012.

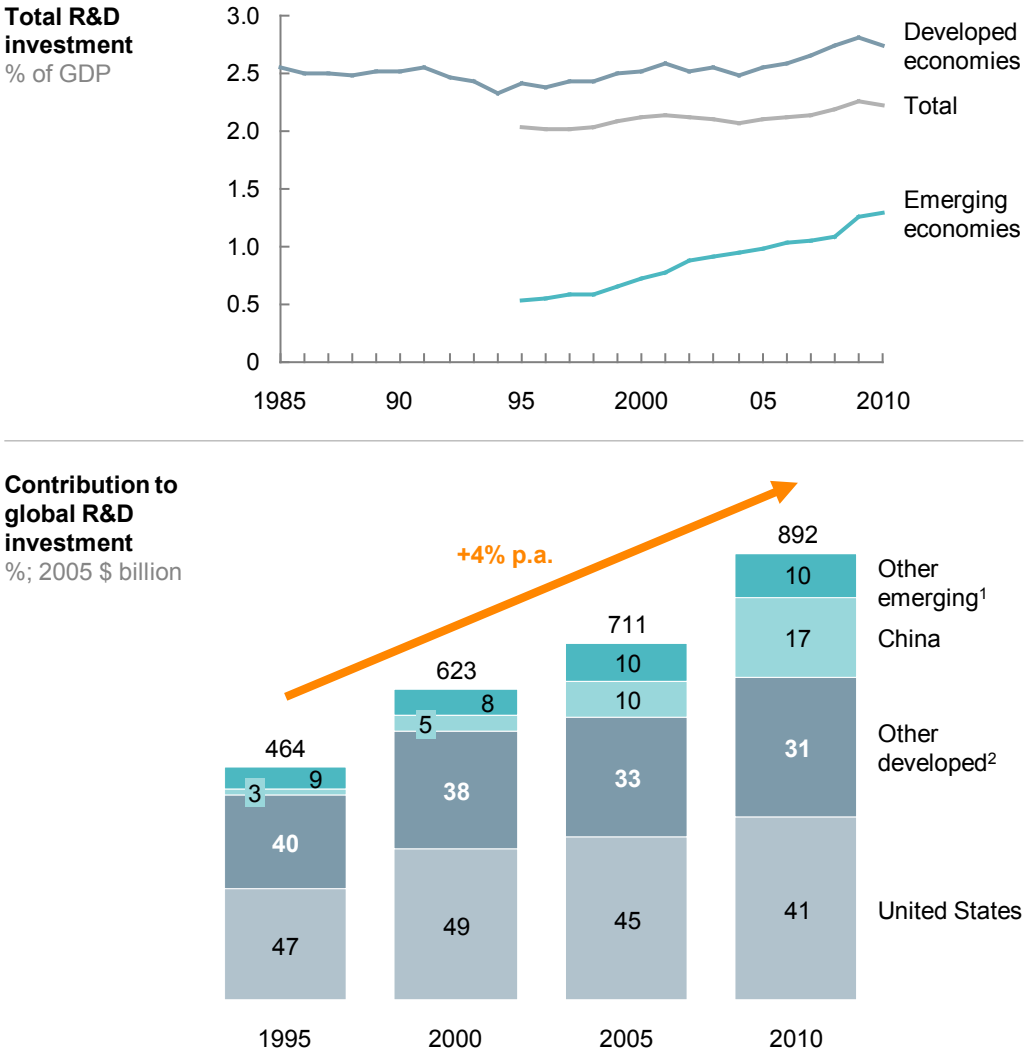
[144] Christine Larsen, "Inside China's genome factory, " *MIT Technology Review*, February 11, 2013.

[145] *Who's winning the clean energy race? 2010 edition*, Pew Charitable Trusts, March 2010.

technology related to design, the materials used, and production, as well as to develop a broader set of products from each generation of a particular technology that are tailored to regional needs or preferences. In these areas, good understanding of local markets will be an advantage.

Exhibit 36

Investment in innovation has grown in tandem with GDP in developed economies and outpaced GDP growth in emerging economies



1 Other emerging economies include Mexico, Russia, and South Africa.
2 Other developed economies include Australia, France, Germany, Japan, South Korea, and the United Kingdom.
NOTE: Numbers may not sum due to rounding.

SOURCE: OECD statistics; McKinsey Global Institute analysis

Demand for emerging technologies from the public sector will continue to be an important catalyst for research and innovation. The case for direct public-sector intervention to foster basic research is strong when social benefits outweigh the private returns to the funder of the original research, as is often the case for early-stage, groundbreaking research.[146] To continue to build a platform for sustained productivity growth in the decades to come,

[146] Dirk Czarnitzki and Hanna Hottenrott, "Financial constraints: Routine versus cutting edge R&D investment," *Journal of Economics & Management Strategy*, volume 20, issue 1, spring 2011.

public-sector demand for emerging technologies and support of long-term R&D will be needed.[147]

Beyond demand for emerging technologies and solutions, governments have invested directly in R&D in the form of grants and loans and indirectly through tax credits and incentives. Over the past few years, about half of the 23 countries analyzed by OECD increased R&D tax incentives, which accounted for more than 50 percent of government R&D support in Australia, Canada, France, and South Korea. Furthermore, governments can foster growth in innovation by promoting knowledge transfers and collaboration, creating innovation clusters and effective intellectual property rights protection policies.[148] Given that the academic evidence on the effectiveness of R&D subsidies is mixed, there are opportunities for improving the policy tools and the way they are implemented to ensure high social returns to these public investments.[149]

6. Exploit existing and new data to identify transformational improvement opportunities

We have already mentioned the need for performance metrics to motivate efficiency improvements in the public sector, but the role of information—and big data specifically—is much broader than that. MGI research has estimated that fully mining big data—large pools of data—could create $300 billion of value each year in US health care and boost annual productivity growth by about 0.7 percent; €25 billion of value a year in European public-sector administration and an additional 0.5 percent of productivity growth; and, in the case of global personal-location data, value of at least $200 billion in revenue to service providers, and up to $700 billion of value for end-users. The research estimated that using big data could increase net margins in US retail by at least 60 percent, boosting annual productivity growth by 0.5 to 1.0 percent. In manufacturing, big data could cut product development and assembly costs by up to 50 percent and reduce the need for working capital by 7 percent.[150]

The productivity potential of big data comes from five broadly applicable ways to use it that can not only create value but also transform the way that organizations are designed, organized, and managed. First, big data creates transparency. In manufacturing, integrating data from R&D, engineering, and manufacturing units to enable concurrent engineering can significantly cut time to market and improve quality. Second, big data enables experimentation to discover needs, expose variability, and improve performance. Third, big data allows organizations to analyze their customers in terms of microsegments and tailor products that precisely meet their various needs. Fourth, sophisticated analysis of big data can replace or support human decision making with automated algorithms; some organizations are already making better decisions by analyzing entire data sets from customers, employees, or even sensors embedded in products. The final way that big data

[147] In the second half of the 20th century, government procurement and support, especially in defense, energy, and transport, was a major force behind many new technologies. It was, for instance, a Finnish government defense contract for military radios that was the spark for collaboration between Nokia and the University of Oulu to develop wireless communications for sparsely populated areas during the 1980s and 1990s. US defense and aerospace contracts were a major source of revenue for the emerging semiconductor industry. Fairchild Semiconductor, the predecessor of Intel, received 80 percent of its revenue in the 1950s from direct government or government supplier contracts. See *How to compete and grow: A sector guide to policy*, McKinsey Global Institute, March 2010. Between 1974 and 1995, the United States Department of Defense invested $8.9 billion in the development and procurement of GPS, which today is used in an enormous range of consumer and business applications including surveying, automotive navigation systems, and precision farming. See Scott Pace et al., *The Global Positioning System: Assessing national policies*, RAND Corporation, 1995. Yet increasingly constrained public spending may mean that the public component wanes. In the United States, for instance, public R&D has been steadily declining, from 66 percent of total R&D spending in 1960 to 47 percent in 1985 and to 32 percent in 2009. See OECD Research and Development Statistics, www.oecd.org/science/inno/researchanddevelopmentstatisticsrds.htm.

[148] *Innovation matters: Reviving the growth engine*, McKinsey & Company, June 2013.

[149] OECD, *Business innovation policies: Selected country comparisons*, OECD Publishing, October 2011.

[150] *Big data: The next frontier for innovation, competition, and productivity*, McKinsey Global Institute, May 2011.

can create value and boost productivity is by enabling innovation not just in products and services but also in business models.[151]

The opportunities are large and vary by industry. In health care, for instance, big data can be used for comparative effectiveness research that allows health-care systems to sort through the many wide variations in practices, outcomes, and costs and much more quickly arrive at optimal treatments, improving care and cutting costs. Data on health-care quality and performance can help patients make more informed decisions by enabling them to compare treatments or medical facilities. Big data also enables the collection of data from remote-patient monitoring, which can then be analyzed, leading to improved drug and treatment options. In retail, retailers can gather increasing amounts of data—much of it in real time—on how their customers behave, which they can use to improve the layout of shelves and the product mix and to cut down on unnecessary inventory. One leading drug retailer reduced its overall stock-keeping units by 17 percent as a result of such data. Automated tracking of time and attendance among employees can help retailers to predict staffing needs more accurately and therefore avoid overcapacity—important given that staff accounts for 30 percent of retailers' fixed costs, on average.

The amount of data being generated and analyzed is exploding. Using that data creatively is likely to be one of the major platforms sustaining productivity growth in manufacturing and services for years to come. However, new business models also often require adjustments in old regulatory systems. To harness the full range of productivity potential from big data, policy makers need to create the institutional framework to allow companies to easily create value out of data while protecting the privacy of citizens and providing data security.[152] New kinds of companies, such as Airbnb and Uber in the sharing or peer-to-peer economy, are creating new challenges for established industries. Digital products and services that can have very low marginal costs create particular challenges for applying competition regulation.[153] The large economies of scale in social networking, search, and online retailing, for example, create "winner takes all" dynamics that challenge regulators as they attempt to apply competition law to companies like Google, Facebook, and Amazon. Timely regulation that creates effective coordination and standards but avoids unnecessary barriers to innovation is vital to ensure that innovation flourishes.[154]

7. Harness the power of new actors in the productivity landscape through digital platforms and open data

Digital technologies are empowering global citizens in unprecedented ways, and the public's increased participation in the global economy—as individuals, as workers, and as entrepreneurs—needs to be tapped to make the most of the global growth potential. Online platforms enable even the smallest companies and even individuals to become "micromultinationals." Fundraising platforms such as Kickstarter mean that today individuals can raise funds across borders. Online sites such as oDesk and Mechanical Turk enable people around the world to do remote work for companies in other countries, overcoming immigration barriers. Samasource combines training with online jobs in areas of the world where employment opportunities are scarce; it operates nine centers in Haiti, India, Kenya, and Uganda. InnoCentive is an online platform that crowdsources innovation. The company has 300,000 registered solvers in nearly 200 countries. One study of the platform found that it had enabled solutions to one-third of a sample of problems that large R&D-intensive firms in a variety of industries, including pharmaceuticals, defense, and electronics, had

[151] Ibid.

[152] Ibid.

[153] Jeremy Rifkin, *The zero marginal cost society: The Internet of Things, the collaborative commons, and the eclipse of capitalism*, Palgrave Macmillan, 2014.

[154] *Data-driven innovation for growth and well-being,* OECD interim synthesis report, October 2014.

been unable to solve.[155] Furthermore, companies are using social technologies to increase collaboration within the organization. All of this oils the wheels of growth.

Consumers and citizens also have increasing power through the Internet and their smartphones to spot the best prices, give instant feedback to providers of goods and services, and, through crowdsourcing, even help design those products and services. Price comparison websites are a pervasive example of direct consumer scrutiny of the products they are buying that adds to competition. By posting reviews on sites such as TripAdvisor and Amazon, they help to give fellow shoppers pointers, boosting their confidence in a purchase, and this enhances sales (a bad review, of course, can hurt sales, and thereby such services put pressure on providers to offer high-quality goods and services). Other examples of crowdsourced customer ratings include Yelp for restaurants and local businesses and IMDb for movies and television shows. Citizens can similarly provide a wealth of information on public-service deficiencies. Collectively, these efforts can have a large productivity impact as greater transparency and the faster flow of information increase competition among businesses and expose poor performance within organizations.

Digital technologies are empowering global citizens in unprecedented ways.

Governments at all levels have also found ways to engage their citizens in spotting problems and building solutions. Cities are increasingly interacting with their citizens through the power of technology to make urban areas run more efficiently for everyone, enhancing their productivity and injecting more potential for growth. To give just two examples from the United States, Boston put in place a program called Speed Bump, which crowdsources information on potholes and adverse road conditions to speed up maintenance and improve traffic flows. San Francisco's Urban EcoMap, in turn, is an Internet-based tool that provides its citizens with information on carbon emissions from transportation, energy, and waste among neighborhoods, organized by zip code; this helps citizens to make sustainability part of their everyday decision making.

Another, very different application is the potential to improve the response to natural disasters. During the cholera outbreak that followed the 2010 earthquake in Haiti, scientists at Boston Children's Hospital and Harvard Medical School analyzed communication on two social media sites—HealthMap and Twitter—to determine whether the trend in the volume of cholera cases reported on the sites would correlate with official reports. This exercise indeed revealed a correlation, but using social media was two weeks quicker than using official sources of data. By getting information early on the spread of a disease, governments improve their chances of containing an epidemic and treating patients.[156]

An increasing amount of government data is now being made available—so-called open data—and this has the potential to have an even deeper transformative effect.[157] The Chinese government launched its first open-government platform in the city of Qingdao, providing open data and one-stop access to public services. In the Philippines, the Department for Education and the Affiliated Network for Social Accountability in East Asia

[155] Karim R. Lakhani et al., *The value of openness in scientific problem solving*, Harvard Business School working paper number 07–050, January 2007.

[156] Rumi Chunara, Jason R. Andrews, and John S. Brownstein, "Social and news media enable estimation of epidemiological patterns early in the 2010 Haitian cholera outbreak," *American Journal of Tropical Medicine and Hygiene,* volume 86, number 1, 2012.

[157] *Open data: Unlocking innovation and performance with liquid information*, McKinsey Global Institute, McKinsey Center for Government, and McKinsey Business Technology Office, October 2013.

got together to create Checkmyschool.org, which uses open data to get citizens involved in monitoring the quality of schools. Within six months of the platform's launch, 8,000 of the country's 44,000 public elementary and high schools were mapped. Norway today has one of the world's most advanced open-data systems. The Offentlig Elektronisk Postjournal platform allows users to search and request documents throughout government. The database contains more than five million entries from 105 government agencies, and it processes around 20,000 requests from citizens, businesses, journalists, and academics every month.[158]

In sub-Saharan Africa, SMS for Life is a public-private initiative that uses data collected from mobile phones to eliminate stock shortages of essential medicines and therefore improve access to them. During a 21-week pilot covering 1.2 million people in Tanzania, the incidence of antimalarial tablet shortfalls dropped from 78 percent to 26 percent.[159]

Mobilizing labor to counter waning demographic tailwinds

8. Put in place measures to boost labor-market participation among women, young people, and older people

There is a range of ways to mitigate the impact of the demographic slowdown, including boosting labor-force participation and employment rates; removing any unnecessary restrictions on the hours employees work; and, in the case of individual countries, easing restrictions on immigration, particularly of workers with skills needed in an economy.[160]

We estimate that measures to raise participation among women, young people, and older workers could potentially double employment growth from 0.3 percent to 0.6 percent per annum, adding 390 million employees by 2064 in our 20-country sample. That is close to twice the current population of Brazil (Exhibit 37). However, achieving this doubling is extremely ambitious and would require each age and gender group across countries to close the employment gap to top-quintile performers for the group.[161]

The largest opportunity—at close to 60 percent of the total—is boosting female participation, particularly in emerging economies where participation is low today. Increasing youth employment and boosting participation among the 65-plus age group contribute about an additional 15 percent each. Increasing adult male labor-force participation and reducing unemployment could contribute the remaining 10 percent of the total opportunity.

Across all demographic groups, the scope to boost participation is greater in some countries than others. One of the most severe population declines anywhere in the world over the next 50 years will take place in Japan, whose population is set to shrink at a rate of 0.72 percent a year, and China, whose population is expected to shrink at a rate of 0.45 percent per year. The challenge for those two countries is that they already have high participation rates across most segments: 70 percent of women in China work outside the home, and 67 percent in Japan. Although these rates are still more than 20 percentage

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158 *Future of government smart toolbox*, World Economic Forum, June 2014.

159 Roll Back Malaria.

160 In the past, government policies and programs have had a significant impact on the initiation and rate of fertility decline in high-fertility countries. However, government-led attempts to raise fertility from low levels have generally been less successful, although recent research shows that some types of child-care subsidies and benefits have produced modest rises in fertility among some European countries. See R. Davies, *Promoting fertility in the EU: Social policy options for member states*, EU Library Briefings, European Parliament, 2013.

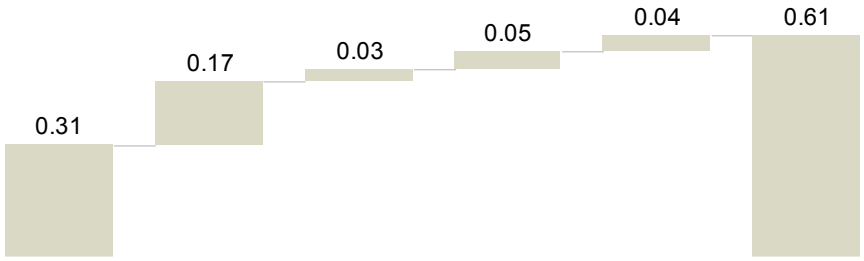
161 To estimate the size of the potential to expand employment, we assume that all countries close current gaps to the employment rate of top-quintile performing nations in each demographic category. For prime-working-age women (aged 15 to 64), our benchmarks are Norway and Canada, with a participation rate of 75 percent and unemployment at 5 percent. For young people, the United States pre-recession is the benchmark, with a 55 percent participation rate and 10 percent unemployment rate. For prime-working-age men, the benchmark is 90 percent participation and, at most, 5 percent unemployment. For those aged 65-plus, the potential participation rate is set at 25 percent and the unemployment rate at 10 percent. For nations that exceed these benchmarks in any of the categories, we use their current participation rates instead.

points lower than male participation rates in these countries, the female participation rates are exceeded in our 20-country sample only in Australia, Brazil, the United Kingdom, and the United States.

Exhibit 37

Boosting participation among women, young people, and those aged 65-plus can mitigate slowing of growth in the labor pool

Impact of increased participation and employment on total employment projection, G19 and Nigeria, 2014–64E
Compound annual growth rate, %



	Baseline projection	Women 25–64	Men 25–64	Youth 15–24	Older 65+	Potential best-case scenario
Developed economies	0.10	0.04	0.04	0.03	0.08	0.30
Emerging economies	0.40	0.19	0.03	0.05	0.03	0.70

NOTE: In the best-case scenario, we assume a participation rate of at least 75 percent for women and an unemployment rate of less than 5 percent. For men, we assume at least 90 percent participation and unemployment of 5 percent at most. For youth, the participation rate is at least 55 percent and the unemployment rate less than 10 percent. Among those aged 65 and older, participation is more than 25 percent and unemployment less than 10 percent. Numbers may not sum due to rounding.

SOURCE: United Nations Population Division; McKinsey Global Institute analysis

Female participation is the largest opportunity to boost the labor pool

Although female employment has been on a rising trajectory for several decades, participation rates in the G19 remain lower than those of men by as much as 40 percentage points—and the gap is even higher in the case of Saudi Arabia, India, and Turkey.[162] The opportunity to boost female participation is particularly large in emerging economies. The same levers used so successfully in developed economies need to come into play.[163]

One important lever is the provision of paid and protected maternity leave. The International Labour Organisation encourages member states to offer at least 14 weeks of maternity leave at a rate of at least two-thirds of previous earnings in cases where the employer is not solely responsible for the payment. However, only 30 percent of International Labour Organisation members meet this requirement.[164] Yet this lever has been shown to be

[162] For example, the female labor-force participation rate in Saudi Arabia is 24 percent, compared with 91 percent among men. In many emerging economies, many women dedicate themselves to household work, which is classified as a non-economic activity. This trend is particularly common in South Asia, the Middle East, and North Africa. See *Women in labour markets: Measuring progress and identifying challenges*, International Labour Office, March 2010.

[163] Olivier Thévenon, *Drivers of female labour force participation in the OECD*, OECD Social, Employment and Migration working paper number 145, May 2013.

[164] Alice Newton, *Women in work: How can policy makers encourage female labor force participation?* Harvard University Press, 2011.

effective. In Taiwan, for instance, employment-protected, paid maternity leave has increased women's employment and hours by 7 percent.[165] The provision of affordable, high-quality child care is also important.

Another effective way to boost female participation is through the tax system by, for instance, lowering the effective tax rate paid by the second earner in a household (often the woman) or by making the cost of child care tax-deductible.[166] Another way to encourage women to enter, and then stay in, the labor force is for countries to promote labor regulation and business practices that allow for part-time employment and other flexible working arrangements such as swapping shifts and teleworking.[167]

68%
female participation rate in Brazil in 2012, up from 48% in 1990

Importantly, women need access to job opportunities. In many emerging markets, even as women become more educated, they still have limited access to work from rural areas and are segregated to a narrow selection of occupations.[168] Basic policies in many cases can make a large difference. In Brazil, for instance, the female participation rate increased from 48 percent in 1990 to 68 percent in 2012 following a number of measures, including a National Documentation Program for Rural Women Workers, which helps women obtain the necessary documentation to get access to credit and work opportunities. The *Bolsa Familia* direct cash transfer program, launched in 2003, was not explicitly targeted at boosting female participation but nevertheless increased women's propensity to work by giving them more financial independence through cash transfers channeled to women in the household.[169] As emerging markets urbanize, more job opportunities are likely to open up for women, making it important to facilitate their efforts to join the labor force.

A considerable body of research shows that improved opportunities for women to work—boosting their access to education, for instance—and to control their income and that of their households could help to increase growth. Women are more likely than men to invest a large proportion of their household income in the education of their children. Higher female participation and higher women's earnings could result in more spending on education, including that of girls, creating a virtuous cycle. According to the International Labour Organisation, women's paid and unpaid work may be the single most important factor in reducing poverty in developing economies.[170] There is an argument that a relative lack of work opportunities for women in developing economies inhibits growth in these economies, but also that economic growth leads to improvements in opportunities for women to participate in economic life outside the home.[171]

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[165] Ibid.

[166] Spain, for instance, has legislated for a number of measures to encourage participation by women, including a Law of Conciliation between Family and Work Life in 1999 that allowed for a reduced working day and a proportional reduction in salary for women looking after children younger than six years. Sweden achieved a female participation rate of 88 percent among women aged 25 to 54, the highest of any OECD economy, and a 14 percent share of women working part time, the lowest in Europe, by action on taxes and benefits. Women's participation jumped immediately after 1971 when Sweden switched from joint to individual taxation, which significantly reduced the marginal tax rates on second earners in a household. See *Beyond austerity: A path to economic growth and renewal in Europe*, McKinsey Global Institute, October 2010.

[167] A European Commission survey of the EU in 2009 showed that approximately three-quarters of all employees would prefer more flexibility to balance their work and personal lives, and that the share of people expressing this desire is particularly high among women. See *Reconciliation between work, private and family life in the European Union*, European Commission, Eurostat Statistical Books, 2009.

[168] Stephan Klasen and Janneke Pieters, *What explains the stagnation of female labor force participation in urban India?* Institute for the Study of Labor (IZA) discussion paper number 7597, August 2013.

[169] Katrin Elborgh-Woytek et al., *Women, work and the economy: Macroeconomic gains from gender equity*, IMF staff discussion note, September 2013; Fábio Veras Soares, Rafael Perez Ribas, and Rafael Guerreiro Osório, *Evaluating the impact of Brazil's* Bolsa Família*: Cash transfer programmes in comparative perspective*, International Poverty Center evaluation note number 1, December 2007.

[170] James Heintz, *Globalization, economic policy and employment: Poverty and gender implications*, International Labour Organisation, 2006.

[171] See Katrin Elborgh-Woytek et al., *Women, work and the economy: Macroeconomic gains from gender equity,* IMF staff discussion note, September 2013, and Janet G. Stotsky, *Gender and its relevance to macroeconomic policy: A survey*, IMF working paper 06/233, 2006.

Reducing youth unemployment is another opportunity

The youth unemployment rate was as high as 46 percent in South Africa and 20 percent in Italy in 2007—before the global recession that caused youth unemployment to rise even higher. Youth unemployment is not only detrimental to today's labor supply but can also impose a lasting penalty on young people's long-term employment prospects if they are out of work for a lengthy period. Young people who experience unemployment in the early stages of their career are likely to have lower wages throughout their working lives. Some have estimated that this loss of earning power could be 10 to 15 percent and that it can persist for 20 years and raise the odds of future unemployment.[172] For a global labor market that is short of people and skills in key areas, bringing more young people into work not only makes a contribution to filling that gap but also helps young people build relevant skills that make them more capable and productive workers over time.[173]

The goal of raising youth employment should not take precedence over productive education.

Youth unemployment and youth employment vary significantly among countries, suggesting considerable room for progress by emulating those countries that have been successful on this front. A number of levers have proven to be effective, including programs to help those who are young and unemployed get needed skills and job opportunities, plus apprenticeships.

The Netherlands posted the lowest rate of youth unemployment in Europe between 2004 and 2008—at 6.8 percent—as a direct result of a major program launched in 2003 that aimed to cut by half the number of students leaving school without sufficient qualifications and to offer each young person either training or a job before any of them had been unemployed for six months. Projects were set up in which young people seeking benefits were put to work immediately in low-paid, subsidized jobs. Refusal to take such a job came at a cost: forfeiting at least part of the benefits. Companies were invited by the government to introduce pay for low-skill young people at the level of the statutory minimum youth wage.

The goal of raising youth employment should not take precedence over productive education. Apprenticeship schemes have proved highly effective in many countries. One study finds that dual-vocational training—combining apprenticeship with education—has the largest positive impact on employment and real wages.[174] In Germany, nearly 60 percent of students were enrolled in vocational training in upper secondary and post-secondary

[172] Research has shown that the annual cost of youth NEETs (not in education, employment, or training) in the European Union was €153 billion ($191 billion) in 2011. See *Education to employment: Getting Europe's youth into work*, McKinsey Center for Government, January 2014. Studies of the generation that came of age in the 1980s have found that those who endured a period of unemployment before the age of 23 suffer long-term consequences, earning 12 to 15 percent less than their peers at age 42. See Laurence Steinberg, Suzanne Fegley, and Sanford M. Dornbusch, "Negative impact of part-time work on adolescent adjustment: Evidence from a longitudinal study," *Developmental Psychology*, volume 29, number 2, March 1993. Also see Thomas A. Mroz and Timothy H. Savage, "The long-term effects of youth unemployment," *Journal of Human Resources*, volume 41, number 2, spring 2006.

[173] See Elisabeth Jacobs, *Twelve ways to fix the youth unemployment crisis*, Governance Studies at Brookings, Brookings Institution, May 2014. MGI estimates that the world could face a shortage of 40 million high-skill workers, up to 18 million of whom could be in developed economies. See *The world at work: Jobs, pay, and skills for 3.5 billion people*, McKinsey Global Institute, June 2012. For instance, France could face a shortage of 2.2 million high-skill workers (those with a baccalaureate and beyond) by 2020. See *French employment 2020: Five priorities for action*, McKinsey Global Institute, March 2012. Developing economies could face a gap of 45 million workers with a medium level of skills by 2020.

[174] Jérôme Adda et al., *Career progression and formal versus on-the-job training*, IZA discussion paper number 2260, August 2006.

education in 2010. This system is widely credited for Germany's low youth unemployment—even during the recent global financial crisis.[175]

Another increasingly popular option is investing in developing the human capital and creativity of the young generation. In South Africa, where around 70 percent of the unemployed are young, one response has been government programs that help young people to start and sustain their own business. South Africa provides 2.7 billion rand ($252 million) to support young entrepreneurs. In Finland, Aalto University has established an enterprise accelerator called "Startup Sauna" on its campus, fostering promising startups and helping to connect and inspire students with entrepreneurial interests.[176]

There is strong evidence that young people who invest more time in education and/or training benefit in the longer term through direct wage increases in early years and that they also have higher productivity—a good rate of return on education and training.[177] One study of Indian companies found that $1 invested in education returns $53 in value to the employer at the start of a person's working life.[178] Ensuring that the future labor force is educated and has the skills to be productively employed is vital. The demographic transition from youthful to mature populations offers an exceptional opportunity to invest in human capital and therefore to counter the declining number of workers with more qualified workers who have higher education and skills.[179] As child cohorts decline in size, the same overall resources allocated to education mean that more money is available for each child at both the national and household level.[180] Higher skills can, in turn, help abate the slowing expansion of the labor pool.[181] Nations that invest in building the human capital of their large cohorts can derive a double benefit from their demographic transition, as the economic history of South Korea illustrates.

3/4
people in Japan aged 60–64 still working

There is also scope to boost employment among older people

One of the major factors affecting participation in this age group is regulation of retirement ages.[182] The official retirement age has been declining for decades, but, in some countries, this trend is now reversing. France, Germany, Taiwan, and the United Kingdom, for instance, have announced increases in the official retirement age over the past decade. This official retirement age is important as it provides an "anchor" on when people should stop work. In Finland, the government worked with businesses and labor organizations on a national initiative to raise the effective retirement age. The official retirement age of 65 was replaced with a flexible option to retire between the ages of 63 and 68. Companies adjusted their practices to accommodate older workers through initiatives such as a shorter workweek

[175] Ibid.

[176] For more, see the StartUp Sauna website.

[177] See, for example, George Psacharopoulos, "Returns to investment in education: A global update," *World Development*, volume 22, issue 9, September 1994.

[178] Rebeca Winthrop et al., *Investment in global education: A strategic imperative for business*, Center for Universal Education at the Brookings Institution, September 2013.

[179] Jeffrey G. Williamson, "Demographic dividends revisited," *Asian Development Review*, volume 30, number 2, September 2013. Also see Ian Pool, Laura R. Wong, and Éric Vilquin, *Age-structural transitions: Challenges for development*, Committee for International Cooperation in National Research in Demography, 2006.

[180] Ronald Lee and Andrew Mason provide cross-country and time series evidence that lower fertility—fewer children per household—leads to higher investment in the human capital of each child. See Ronald Lee and Andrew Mason, "What is the demographic dividend?" *Finance and Development*, volume 43, number 3, September 2006.

[181] See, for example, Ronald Lee and Andrew Mason, "Fertility, human capital, and economic growth over the demographic transition," *European Journal of Population*, volume 26, issue 2, May 2010; A. V. Goujon, "Demographic transition and education in developing countries," in *Sustainable human development in the twenty-first century: An evolutionary perspective*, volume 3, Ismail Sirageldin, ed., UNESCO Encyclopedia of Life Support Systems (UNESCO-EOLSS), 2003; Carol Scotese Lehr, *Evidence on the demographic transition*, Virginia Commonwealth University School of Business, Department of Economics working paper number 0302, 2003; and Sascha O. Becker, Francesco Cinnirella, and Ludger Woessmann, "The trade-off between fertility and education: Evidence from before the demographic transition," *Journal of Economic Growth*, volume 15, issue 3, September 2010.

[182] *Pensions at a glance: Retirement-income systems in OECD and G20 countries*, OECD, 2011.

or extended time off. As a result, the average retirement age in Finland went up by almost four years in a decade, and the employment rate for workers aged 55 to 64 rose from 36 percent in 1997 to 59 percent a decade later.[183]

Social-security systems, wages, and taxation all have a bearing on participation, too. In Japan, three-quarters of people aged 60 to 64 are still active in the workforce, reflecting the fact that the country has the lowest implicit tax rate when workers choose to extend their working life. In contrast, countries with higher implicit taxes on continuing to work, including Italy and the Netherlands, had significantly higher withdrawal rates among this age group. On average, only 20 percent of 60- to 64-year-olds remain active in the workforce in these two countries. Australia has introduced a number of tax incentives, including Work Bonus, to make extended working lives attractive.[184] Adjusting taxes and pensions to give older workers a "bridge" between full-time work and full-time retirement is increasingly popular, helping the many people who want to work longer to do so.[185] In the United Kingdom and Ireland, the full-time wage declines beyond 50 and 55 years of age, respectively, breaking the system of automatic increase of wages with seniority.[186] Another model is replacing seniority with performance clauses in public-sector wage arrangements, as Sweden does, an approach that could be replicated in the private sector.[187] Another form of bridging mechanism is giving older workers more flexibility. Some US companies allow employees to work flexibly while collecting pension benefits.[188]

Another important ingredient of efforts to boost participation among older workers is tackling discrimination. Research suggests that many companies have negative perceptions of older workers.[189] Such discrimination is deemed to be widespread in working life by almost half of Europeans over the age of 55.[190] Examples of efforts to counter age discrimination include the United Kingdom's "Age Positive" campaign and Finland's provision of "age management" training that teaches younger executives that jobs can be adjusted to the changing abilities of older workers.[191] In Europe, several companies have introduced progressive policies to support their older employees.[192]

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183 See *Talkin' 'bout my generation: The economic impact of aging US baby boomers*, McKinsey Global Institute, June 2008, and Jonathan Gruber, Kevin Milligan, and David A. Wise, *Social security programs and retirement around the world: The relationship to youth employment*, NBER working paper number 14647, January 2009.

184 *Working past our 60s: Reforming laws and policies for older workers*, Australian Human Rights Commission, 2012.

185 *Staying ahead of the curve 2013: The AARP work and career study—older workers in an uneasy job market*, January 2014.

186 *Ageing and employment policies: Norway 2013—working better with age*, OECD, June 2013.

187 *Pensions at a glance 2011: Retirement-income systems in OECD and G20 countries*, OECD, 2011.

188 Bon Secours Richmond Health System has a variety of arrangements that let employees continue working after they start receiving pension benefits. From the age of 65, they can work up to 24 hours a week and collect their full pensions. They can even work full time after the age of 70.5 and still collect full pension payments. They have an incentive to work longer because they continue to earn pension credits if they work more than 20 hours a week. Later, when they retire completely, their pension benefit is recalculated and increased. See Rudolph G. Penner, Pamela Perun, and Eugene Steuerle, *Legal and institutional impediments to partial retirement and part-time work by older workers*, Urban Institute, November 2002.

189 See Alicia H. Munnell, Steven A. Sass, and Mauricio Soto, *Employer attitudes towards older workers: Survey results*, An issue in brief, series 3, Center for Retirement Research, June 2006; Richard W. Johnson, *Managerial attitudes toward older workers: A review of the evidence*, The Retirement Project discussion paper number 07–05, September 2007; and Warren C. K. Chiu et al., "Age stereotypes and discriminatory attitudes towards older workers: An East-West comparison," *Human Relations*, volume 54, number 5, 2001.

190 Eurobarometer, 2012.

191 *Talkin' 'bout my generation: The economic impact of aging US baby boomers*, McKinsey Global Institute, June 2008.

192 In France, the electronic systems group Thales committed to raising the number of employees over the age of 55 by 5 percent a year and introduced an integrated policy that includes vocational training and mentorship, improved working conditions, and management of the transition between work and retirement. See *French employment 2020: Five priorities for action*, McKinsey Global Institute, March 2012. In 2006, British Gas removed age limits on training and apprenticeships, and the average age of apprentices has risen. The company has trainees as old as 57.

By 2064, the 65-plus age group will account for more than one-third of the population in a number of the countries we study. There are many advantages to keeping older workers in the workforce. First, it retains much-needed skills.[193] Second, there is evidence that working longer is good for people's health.[194] In any case, working longer may be an economic necessity for many older individuals and their families. Older people in many low-income economies rely on their families for old-age support and continue to work at higher rates. In developed economies, too, there is evidence that people need to work longer for financial reasons.[195] The recent global recession has arguably raised the pressure to work. One study has suggested that more people will need to work past the age of 65 in an effort to recoup losses in their retirement funds and to replenish their savings.[196]

9. Improve education and matching skills to jobs, and make labor markets more flexible

There are two imperatives in the labor market. The first is to boost the skills of the workforce and then help to match individuals to the jobs that are available. The second is to ensure that labor markets are sufficiently flexible to ease the transition of workers from one type of job to others in the churn created by continuous technological and economic change.

Continual skills training and job matching will be needed to meet the demands of the labor market

Given decades in which there was both an expanding labor pool and high pockets of unemployment, it would be expected that companies would have their pick of workers—that labor would not now be a constraint on their growth. But this does not appear to be the case. In a 2012 survey of more than 2,800 employers around the world by the McKinsey Center for Government, four out of ten employers said that they could not find workers to fill entry-level positions, and more than one-third of respondents said that their businesses were suffering from a lack of the skills they need.[197] This suggests a strong imperative to invest in education and skills that prepare the future labor force for the tasks needed for future growth.

As growth in employment slows, it is vital that the workforce has sufficient skills to find work and to meet the requirements of companies. Training needs to improve as well as mechanisms to match available skills with job vacancies. Programs in several countries are designed not only to reduce unemployment but also to ensure better matching of the skills learned and those that employers want and need. South Korea's skill-development strategy

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[193] One survey of more than 1,000 employers indicated that a majority believed that an older workforce would lead to an increase in overall knowledge and skills, as well as to fewer conflicts in the work environment. (At the same time, there were some negative perceptions, including the belief that older workers are slower to adopt technology and are more likely than younger workers to take time off work.) See Chantal Remery et al., "Managing an aging workforce and a tight labor market: Views held by Dutch employers," *Population Research and Policy Review*, volume 22, 2003.

[194] One study found that retirement increases the probability of suffering from clinical depression by about 40 percent and the probability of having at least one diagnosed physical condition by about 60 percent. Similarly, a UK study found that employment and socioeconomic status are the "main drivers of social gradients in physical and mental health and mortality" and that, conversely, a strong association exists between unemployment and poor health. See Gabriel H. Sahlgren, *Work longer, live healthier: The relationship between economic activity, health and government policy*, Institute of Economic Affairs discussion paper number 46, May 2013, and Gordon Waddell and A. Kim Burton, *Is work good for your health and well-being*? Report commissioned by the UK Department for Work and Pensions, 2006.

[195] MGI research in the United States found that approximately two-thirds of the baby-boomer generation now aged between 53 and 64 had not accumulated sufficient savings to finance retirement. See *Talkin' 'bout my generation: The economic impact of aging US baby boomers*, McKinsey Global Institute, June 2008.

[196] Shawn Meekhof, Kim Mangliers, and Jitendra Mishra, "Elderly workers in the workforce," *Advances in Management*, volume 7, number 3, March 2014.

[197] *Education to employment: Designing a system that works*, McKinsey Center for Government, January 2013. MGI research has found that the world could face a shortage of 30 million to 40 million college-educated workers—but potentially a surplus of 95 million low-skill workers. See *The world at work: Jobs, pay, and skills for 3.5 billion people*, McKinsey Global Institute, June 2012. McKinsey research has found that, in the United States alone, the opportunity cost of failing to improve the education system and therefore provide businesses with the skills they need could amount to $1.7 trillion by 2030. In China, plugging a growing skills gap could add $250 billion to GDP by 2020. See "China's next chapter," *McKinsey Quarterly*, series, June 2013.

has often been credited with driving that economy's remarkable growth in the second half of the 20th century. Between 2000 and 2009, South Korea spent $255.4 million on skills development.[198]

Educators and employers need to work more closely together. Today, one-third of employers never interact with education providers and only 15 percent of them interact once a month or more. Promising initiatives are under way. For instance, employers in the automotive, tourism, advanced manufacturing, and shipbuilding sectors have begun to guarantee a job to those who complete a rigorous training program. In Brazil, the state-owned energy company Petrobras and Prominp, a coalition of government agencies, businesses, trade associations, and labor unions, have together developed five-year projections for the number of workers needed in specific skills areas. Prominp then identifies an education provider to co-develop an appropriate curriculum with selected companies, while Petrobras covers 90 percent of the costs. Governments need to ensure that sufficient data are made public on what skills are in demand and what training is needed.[199]

Labor markets should be flexible to ease the transition from "old" jobs to "new" ones

One of the main conclusions we draw from our case studies is that rising productivity will require big changes in most jobs, and it is important to do everything possible to enable new kinds of activities and jobs to be created. Protecting occupations whose importance in the world economy is dwindling is costly—even more so as the speed of technological change has accelerated. Rather than protection, the key to strong employment is fostering the creation of new companies and new ways of working. There is no sign that the speed at which the jobs mix evolves is slowing—to the contrary, rapid technological change is creating "churn" in that mix like never before. Old, established occupations are becoming obsolete, while many new types of jobs are being created. That process needs to happen with as few barriers as practicable by making labor markets as flexible as possible.

About one-third of the new jobs created in the United States over the past 25 years were types that did not exist, or barely existed, 25 years ago.

Countries that have flexible labor markets have tended to experience rapid changes in the kind of jobs that the economy creates. Take the United States as an example. About one-third of the new jobs created in the United States over the past 25 years were types that did not exist, or barely existed, 25 years ago.[200] An analysis by the OECD of 13 countries found that young firms, aged less than five years, generated close to half of all the new jobs from 2001 to 2011.[201] Rigid regulations and labor policies can stand in the way of such employment growth. For example, the Indian state of West Bengal lost more than 620,000 manufacturing jobs to other states as a result of restrictive regulations.[202]

198 Hong-Min Chun and Kyu Cheol Eo, "Aid for skills development: South Korea case study," background paper prepared for the *Education for All Global Monitoring Report 2012*, UNESCO, 2012.

199 *Education to employment: Designing a system that works*, McKinsey Center for Government, January 2013.

200 Examples of new occupations since 1988 include computer programmers, computer-system analysts, fitness instructors, and medical technicians, to name a few. To understand the changing mix of occupations, we analyzed three separate years of data—1988, 2000, and 2013—from the US Bureau of Labor Statistics on employment by type of occupation since 1988. To determine the absolute number of jobs and the relative share of jobs created in new occupations, we created a "crosswalk" between occupation classifications in 1988 and 2013. This enabled us to determine the change in employment across occupations and distinguish new occupations from existing ones that have been reclassified since 1988.

201 *New sources of growth: Knowledge-based capital*, OECD, 2013.

202 Ahmad Ahsana and Carmen Pagés, "Are all labor regulations equal? Evidence from Indian manufacturing," *Journal of Comparative Economics*, volume 37, number 1, March 2009.

Making policies less rigid can reduce labor costs and boost labor productivity. There are different ways of achieving this. There are a variety of approaches in Europe, for instance. The liberal Anglo-Saxon model typified by the United Kingdom, Ireland, and, to a lesser extent, Eastern European economies provides only limited unemployment support but a low tax wedge between labor costs and take-home income. The Germanic model, typified by Germany and Austria, offers high employment protection but with tight eligibility criteria, extensive vocational training, and short-term working schemes. And then there is the Nordic model, typified by the Danish system of "flexicurity" that balances high labor-market flexibility with high levels of support for those seeking employment. In contrast to these three relatively successful approaches, a fourth model in Europe—the Mediterranean model in Southern Europe and France—has tended to lead to high unemployment and high social spending. This model combines high protection, high unemployment benefits, a low degree of labor-market flexibility, and high tax wedges on labor incomes.[203]

In recent years, some Mediterranean countries have reformed their labor markets to make them more flexible. For instance, the OECD estimates that Spain's 2012 labor-market reform, which centered on more flexible wage setting, working conditions, and contracts especially in the case of small businesses, will cut Spain's unit labor costs by almost 2 percent and increase annual labor productivity growth by 0.25 percent.[204] In Germany, the Hartz reforms of 2002 to 2005 restructured and strengthened federal job centers, made available startup grants for unemployed people becoming self-employed, and introduced sweeping changes in unemployment benefits to tighten eligibility and their duration. The consensus is that these reforms helped Germany weather the 2008 global crisis and its aftermath relatively successfully. In Denmark, the adult unemployment rate fell from 8.9 percent in 1993 to 2.5 percent in 2008, a much larger decline than the European average, reflecting labor-market reforms in the 1990s. Denmark decentralized wage bargaining, substantially tightened its unemployment-benefits system, shifted toward active labor-market policies focused on boosting skills, and reduced marginal tax rates on labor.[205]

10. Open up economies to cross-border economic flows, from trade in goods and services to flows of people

Over the past 50 years, one of the most potent enablers of growth was closer integration of regional and global markets of tradable goods that spurred scale benefits and increasing competition. The widespread adoption of free trade agreements, first between developed economies and later with emerging regions, has contributed to productivity and GDP growth since 1964 (Exhibit 38).[206]

On average, the sum of imports and exports as a share of GDP rose from 13 percent in 1964 to 40 percent in 2012 in the G19 countries and Nigeria. In the United States, the share rose from 7 percent of GDP to 24 percent, in China from 7 percent to 47 percent, and in India from 8 percent to 42 percent.[207] Overall, recent MGI research has estimated that cross-border flows of goods, services, finance, people, and data and communications contribute 15 to 25 percent of global GDP growth each year.[208]

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[203] André Sapir, "Globalization and the reform of European social models," *Journal of Common Market Studies*, volume 44, number 2, June 2006. Also see *Beyond austerity: A path to economic growth and renewal in Europe*, McKinsey Global Institute, October 2010.

[204] *The 2012 labour market reform in Spain: A preliminary assessment*, OECD, December 2013.

[205] *French employment 2020: Five priorities for action*, McKinsey Global Institute, March 2012.

[206] For an overview of the academic evidence on the impact of trade, see Romain Wacziarg and Karen Horn Welch, "Trade liberalization and growth: New evidence," *World Bank Economic Review*, volume 22, number 2, June 2008.

[207] McKinsey Global Institute analysis using World Trade Organization and World Bank data. Also see Paul Krugman, *Growing world trade: Causes and consequences*, Brookings Papers on Economic Activity, volume 26, issue 1, 1995.

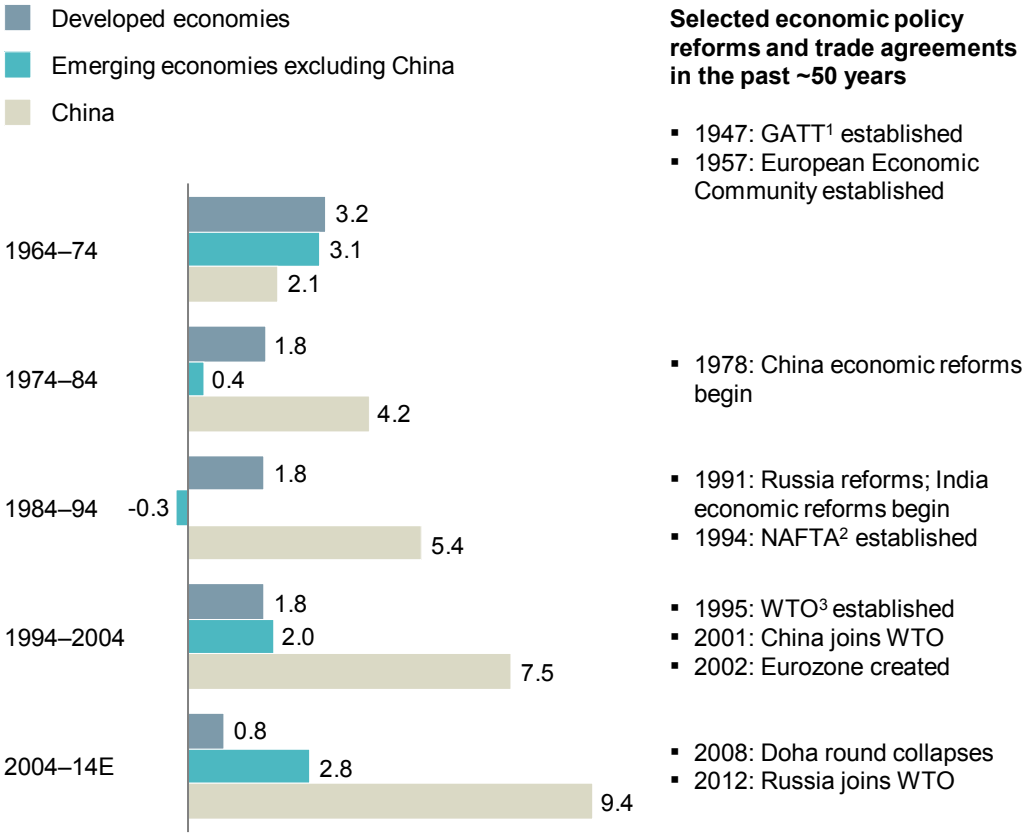
[208] *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, McKinsey Global Institute, April 2014.

In the coming decades, ongoing efforts to reduce trade barriers in manufacturing—and to resist the temptation to increase protection—will continue to be important. There is much room to open services to broader international competition, as well as to invest in physical and digital infrastructure to integrate countries and regions that remain isolated today, as we discussed in the infrastructure section earlier in this chapter. More open policies toward foreign direct investment and a search for more consistency across national policies have also facilitated technology transfer and business process transfers across regions.[209] The cost of isolation can be high. MGI research has found that countries with more connections to other nations in global flow networks will benefit 40 percent more than countries on the periphery with fewer connections.[210] MGI estimates, for example, that Brazil, which lags behind its peers in trade and people flows, could raise its annual growth by 1.25 percent per annum by removing regulatory barriers to these flows.[211]

Exhibit 38

Over the past 50 years, policy reforms and trade agreements have helped to catalyze subsequent productivity gains

G19 and Nigeria productivity growth by decade
GDP per employee, compound annual growth rate (%)



1 General Agreement on Tariffs and Trade.
2 North American Free Trade Agreement.
3 World Trade Organization.

SOURCE: The Conference Board Total Economy Database; Comtrade; IMF Balance of Payments; World Trade Organization; McKinsey Global Institute analysis

[209] *New horizons: Multinational company investment in developing economies*, McKinsey Global Institute, October 2003.
[210] *Global flows in a digital age: How trade, finance, people, and data connect the world economy*, McKinsey Global Institute, April 2014.
[211] *Connecting Brazil to the world: A path to inclusive growth*, McKinsey Global Institute, May 2014.

As emerging economies become increasingly open to, and participants in, the world economy, their companies offer a wave of new competitors. MGI has estimated that the number of companies with $1 billion or more in revenue is likely to almost double by 2025, and 70 percent of the new companies will come from emerging regions.[212] Just as Toyota and Honda helped to transform the competitiveness of their counterparts in developed economies from the 1980s onward with the revolution of lean production, for instance, South Korea's Samsung and LG have done in consumer electronics. By 2025, the global leaders in many industries may be companies we have not yet heard of, and many are likely to be based in cities that we could not point to on a map. The corporate giants that emerge in the years ahead will be central actors shaping the global economy, disrupting and transforming today's industries with productivity-enhancing solutions.

Immigration can help to adjust regional imbalances in jobs opportunities and labor supply.

Being open to flows of people can do more than contribute much-needed additional labor to an economy whose own labor pool is eroding. Countries that are more open to immigrants have experienced faster expansion in their labor forces, and will continue to do so, than those that are more closed. By 2064, in our baseline projection, the labor pools in the United States and Australia, for instance, will expand by 23 percent and 43 percent, respectively, reflecting their relative openness to immigrants. Countries with smaller immigrant shares in their populations could emulate their approach to bolster their labor pools in the face of difficult demographic trends. Immigration can help to adjust regional imbalances in jobs opportunities and labor supply. It can also enable the flow of ideas and research that add to global growth. Skilled migrants have been critical to the growth of some of the world's leading technology hubs. Recent research found that nearly half of the top US venture-capital-funded companies had at least one immigrant founder.[213] Silicon Valley has long drawn depth and a steady stream of new ideas from the international students who come to study at the region's leading research universities and then stay on to work in the high-tech industry. Today, the region remains a magnet for the world's top engineering and IT talent. Similarly in India, Ireland, and Israel, skilled migrants have played a key role in the growth of local software clusters.[214] India and Ireland have been beneficiaries of the "brain gain" phenomenon, in which citizens who lived or worked abroad eventually return home, bringing internationally acquired education, skills, and personal contacts with them.

New Zealand, the United States, Australia, and Canada have large shares of foreign-born people in their economies—between 13 percent and 27 percent of their populations were born elsewhere—which reflects their open and transparent immigration systems geared toward attracting people with the skills their economies need. Their experience could point the way for other countries that are facing erosion in their labor and skills pools.

Australia has a two-stage system that relies heavily on temporary visas.[215] There is no cap on temporary workers, and they are only lightly regulated. Australia encourages immigrants to raise their skills in order to qualify for permanent residency. Unemployment

[212] *Urban world: The shifting global business landscape*, McKinsey Global Institute, October 2013.

[213] Vivek Wadhwa, AnnaLee Saxenian, and F. Daniel Siciliano, *Then and now: America's new immigrant entrepreneurs*, Ewing Marion Kauffman Foundation, October 2012, and Stuart Anderson, *Immigrant founders and key personnel in America's top 50 venture-funded companies*, National Foundation of American Policy policy brief, December 2011.

[214] Ashish Arora and Alfonso Gambardella, eds., *From underdogs to tigers: The rise and growth of the software industry in Brazil, China, India, Ireland, and Israel*, Oxford University Press, 2006.

[215] Robert G. Gregory, *The two-step Australian immigration policy and its impact on immigrant employment outcomes*, IZA discussion paper, number 8061, March 2014.

among immigrants is low, and about half of those who have temporary visas win the right to stay permanently. Canada's "supply-driven" system is based on points awarded for specific criteria; the points system changes to match the skills the economy needs and is kept current and easily accessible online. Applications can be filled out online, reducing processing times and costs.[216]

•••

The ten enablers we have discussed could boost productivity, counteract the waning of demographic tailwinds, and act in concert to bring global GDP growth closer to its potential. The past 50 years were exceptional, but largely because of a fast-growing population. That era is ending. The next phase of growth is likely to be more complex and challenging. Now is the time to have a wide-ranging, clearheaded, and frank discussion about long-term growth that considers not only productivity in the classical sense but every aspect of how to grow smarter, sustainably, and equitably.

[216] *Comparative immigration study 2013–2014: Migration formalities for third-country nationals in 26 European countries*, Deloitte, November 2013.

Construction workers, Singapore
© Alamy

6. A NEW CONVERSATION ABOUT LONG-TERM GROWTH

The past 50 years have been ones of extraordinary economic expansion around the world. But now one of the twin engines of growth—rapid population growth—has lost power. The world economy must now forge ahead with just one engine—productivity—working at full throttle. However, the business and policy changes needed to sustain and accelerate productivity gains will undoubtedly involve tough trade-offs.

We need to have a frank discussion about the difficult decisions ahead.

Leaders of companies will need to think ever harder about every aspect of how they do business and conduct their working lives. Governments need to act on many fronts to help craft an environment that is conducive to growth. Only sweeping change—and being smarter about growth—will meet the challenge. Productivity and innovation need to be at the core of all conversations about long-term growth. Without giving them our full attention, global prosperity is in jeopardy.

In this report, we have looked at growth from a traditional economic standpoint. We have defined growth as expanding GDP and rising per capita GDP, studying the main factors that have driven increases in these metrics in the past and homing in on opportunities to improve productivity to counter the waning of demographic tailwinds. But we acknowledge that this approach has limitations and that some big questions now being actively debated have not been addressed in any detail in this report.

We briefly discuss some of these questions in this chapter and offer some thoughts on what we believe to be an important component of how we think about and approach growth: growing smarter, a concept that encompasses a much broader view of productivity. Being smart about growth is not just about labor productivity but efficiency in the way to use resources, clever ways to track a broader set of metrics that matter, and thinking about how most effectively to share the benefits from growth.

How much growth do we want?

Some of the productivity enablers that we have discussed will require making trade-offs that might be uncomfortable. Increasing competition may not be welcome for incumbents that benefit from current regulation, whether state-supported auto manufacturers or small-scale retailers. There is a balance to be struck between making big data widely accessible and easy to use while maintaining privacy and data protection. Workers who are employed today worry about the additional risks they face in more flexible labor markets and in an era of increasing global competition.

All the trade-offs involved should be assessed. Raising people out of poverty in many regions continues to be vital. But what trade-offs do people living in nations that are already rich want to make? Is the answer less income growth and more free time—or even happiness? Some economists have found that there is no correlation between growth in

incomes and happiness.[217] How slow could growth be and still meet the aspirations of the world's peoples and allow businesses to thrive? Other researchers have drawn a rather different conclusion from the evidence with the finding that, within a country, poor people are less happy than rich people, suggesting that it is relative incomes rather than absolute incomes that matter to them. For many people, it is inequality that matters. Any new conversation about growth needs to include these deep and fundamental questions about how the world economy is run.

Can we reconcile growth with environmental sustainability?

There are those who go further, questioning the very need to make growth a primary aim. A common reason expressed in this camp is that a race to growth is putting strains on the environment. An example of such thinking is Tim Jackson. In his book *Prosperity without growth: Economics for a finite planet*, he says: "The idea of a non-growing economy may be an anathema to an economist. But the idea of a continually growing economy is an anathema to an ecologist."[218]

Higher resource productivity leads to substantial cost savings for businesses and consumers in the long run.

50%
potential reduction in energy-demand growth by boosting energy productivity, without reducing GDP growth

But it is possible to have growth that is ecologically responsible. MGI has looked extensively at opportunities to be smarter about how resources are used and how the environment is treated, and thereby help to ensure that the global economy can grow sustainably and create economic opportunities for the many millions of people who still have limited scope to improve their lives. One motivation for reaching for higher resource productivity is the desire to grow while imposing the least damage on the natural ecosystems. But there is a strong purely economic and business case, too. Resource productivity leads to substantial cost savings for businesses and consumers in the long run. MGI has found that seizing opportunities to increase the level of output achieved from the energy consumed—energy productivity—could cut projected growth in energy demand by half in the period to 2020, without reducing economic growth.[219]

Smart energy policy can be good for the economy and good for jobs. Take the case of California. The state has kept its per capita energy consumption roughly constant over the past 30 years—while that consumption has grown by 50 percent in the rest of the United States—largely due to stringent energy-efficiency policies. Such policies have not compromised economic growth—in fact, the opposite is true. One study found that energy-efficiency policies created 1.5 million jobs because $56 billion in savings from lower

[217] The link between economic growth and happiness was questioned by economist Robert Easterlin in an analysis of the correlation between per capita income and self-reported happiness level. He found no correlation. See Robert Easterlin, "Does economic growth improve the human lot? Some empirical evidence," in *Nations and households in economic growth: Essays in honor of Moses Abramovitz*, Paul A. David and Melvin W. Reder, eds., Academic Press, 1974. This seminal paper initiated a rich academic debate that continues today.

[218] Tim Jackson, *Prosperity without growth: Economics for a finite planet*, Routledge, reprint, 2011.

[219] Additional annual investment of $170 billion over 13 years would be sufficient to capture the full opportunity. With an estimated internal rate of return of 17 percent, such investment would lead to energy savings of up to $900 billion a year by 2020. In short, in just 13 years, more than five times would be saved on the global energy bill than the initial investment. See *The case for investing in energy productivity*, McKinsey Global Institute, February 2008. Also see *Curbing global energy-demand growth: The energy productivity opportunity*, May 2007; *Fueling sustainable development: The energy productivity solution*, October 2008; and *Resource revolution: Meeting the world's energy, materials, food, and water needs*, November 2011.

electricity consumption was spent on goods and services that generate more employment than producing the energy would have done.[220]

It is particularly important for the continued growth of the world's burgeoning cities that they lock in the benefits of higher resource efficiency. Rising demand for resources from the increasingly wealthy urban world is one major source of strain on the planet's natural resources that led to sharp price rises in the first decade of the new century.[221] There is an opportunity here. With their dense populations, cities tend to be more productive in their use of resources than more sparsely populated areas. MGI research on China's urbanization has found that a concentrated pattern of urbanization could have almost 10 percent higher energy efficiency than a more dispersed development of cities.[222] The reason for this is that the types of industry in very large cities, including services and electronics, tend to be less energy-intensive. Moreover, people tend to live and work in smaller spaces that require less heating and lighting. Insulation, too, is easier and less costly to install in larger buildings, and mass public transportation is more cost-effective in large cities than across a number of smaller urban centers, as long as it is well planned. The higher the residential density of a city, the more that driving declines, cutting gasoline use.[223] Those cities that are investing in new infrastructure have a golden opportunity to lock in higher levels of energy and resource efficiency for decades to come, laying the groundwork for further growth once their demographics-driven growth spurt is over.

Leveraging new technologies will be an important part of smart growth in cities. City managers can, for instance, encourage the installation of broadband in new housing developments, which is much less costly than retrofitting existing housing. The increasing use of sensors and digital devices in physical objects and machinery is enabling the birth of "smart" urban infrastructure.[224] For example, smart grids and sensors in water and sewage systems can help avoid system breakdowns and can reduce leaks by half. Smart transport systems can use sensors to monitor transportation flows to avoid congestion and traffic delays.[225]

2.3B
additional people who have access to clean water today than in 1990

Can growth be consistent with equality?

The issue of how the fruits of growth are distributed has become subject to intense debate in recent years. Rapid GDP growth has contributed to a significant closing of the income gap *among* nations, but there appears to be increasing inequality *within* nations. An OECD report in December 2014 found that the gap between rich and poor is at its highest level in 30 years and that income inequality has a negative and statistically significant impact on subsequent growth.[226]

The good news is that absolute poverty has declined in many regions. Since 1980, China has reduced the number of people living on less than $2 a day from more than 80 percent

[220] David Roland-Holst, *Energy efficiency, innovation, and job creation in California*, Center for Energy, Resources, and Economic Sustainability, October 2008.

[221] *Resource Revolution: Meeting the world's energy, materials, food, and water needs*, McKinsey Global Institute and McKinsey & Company's Sustainability and Resource Productivity Practice, November 2011.

[222] See *Preparing for China's urban billion*, McKinsey Global Institute, February 2009, and *Urban world: Cities and the rise of the consuming class*, McKinsey Global Institute, June 2012. Peter Calthorpe has written extensively on sustainable cities. See, for example, *Urbanism in the age of climate change*, Island Press, 2010, and *The next American Metropolis: Ecology, community, and the American Dream*, Princeton Architectural Press, 1993.

[223] *Fueling sustainable development: The energy productivity solution*, McKinsey Global Institute, October 2008.

[224] Michael Chui, Marcus Löffler, and Roger Roberts, "The Internet of Things," *McKinsey Quarterly*, number 2, March 2010.

[225] In Mumbai, for instance, traffic control that adapts to traffic conditions has cut average travel time by 12 percent. London's congestion-pricing scheme has reduced bus delays by 50 percent and increased the average speed of all traffic by 31 percent. See *How to make a city great*, McKinsey & Company, September 2013.

[226] Federico Cingano, *Trends in income inequaity and its impact on economic growth*, OECD Social, Employment and Migration working papers, number 163, December 9, 2014.

of the population to less than 20 percent today. In India, the share of people in poverty dropped from 82 percent in 1994 to 61 percent in 2011—reflecting a GDP-growth rate of nearly 7 percent a year during this period. The Millennium Development Goal of halving poverty will be met by 2015, ahead of schedule. Child mortality has almost halved since 1990, 2.3 billion more people have access to clean water today than they did in 1990, and women are increasingly gaining access to education.[227]

In the developed world, including the United States and Europe, there are increasingly vocal concerns about stagnant median incomes and rising inequality. But recently Thomas Piketty started a firestorm of debate with his analysis that concluded that declining inequality during the 20th century was an exception and that inequality will continue to rise in the coming decades.[228] Piketty advocates a progressive global tax on capital. Others, including Robert Shiller, have long warned about the inequalities produced by advanced technology. Schiller argues that we need to plan now and enact legislation to head off a "disaster," which he defines as a return to levels of inequality not seen since the late 19th and early 20th centuries. He has suggested indexation of the tax system that would automatically raise taxes on the rich in the future if inequality becomes much worse.[229]

While perspectives vary on potential solutions for rising inequality, the reality is that, given slower population growth in the decades ahead, expanding global GDP will come from rising per capita income. In most regions, individual markets for goods and services will depend on increasing the purchasing power of consumers who are likely to expand their consumption as their incomes rise. Changes in average income—or per capita GDP—will not be enough to increase sales if most of the gains accrue to individuals whose needs and wants have been met. Broad-based income gains will therefore also matter for the growth of markets for many products and services.

If GDP alone is not the right measure, what is?

There is almost universal agreement that GDP alone is an imperfect metric for growth and prosperity. As the *Financial Times* has put it, "GDP may be anachronistic and misleading. It may fail entirely to capture the complex trade-offs between present and future, work and leisure, 'good' growth and 'bad' growth. Its great virtue, however, remains that it is a single, concrete number. For the time being, we may be stuck with it."[230] Our choice to use GDP has been dictated by limitations on data across a large number of countries and over a long historical time frame.

GDP has not been able to keep pace with the changing nature of economic activity. Designed to measure the physical production of goods in the market economy, GDP is not well suited to accounting for private- and public-sector services without an output that can be measured easily by counting the number of units produced. Nor does GDP lend itself well to the assessment of improvements in the quality and diversity of goods and services or to estimating the depletion of resources or degradation of the environment associated with production. Transformative change in technology is not easy to measure using GDP, either, because so much of its benefit accrues to consumers. Perhaps most importantly, GDP was not meant to become an anchor metric for targeting national economic performance or a measure of national well-being when expressed as average per capita GDP. For the

[227] *The Millennium Development Goals report 2014*, United Nations, 2014.

[228] Thomas Piketty, *Capital in the twenty-first century*, translated by Arthur Goldhammer, Belknap Press of Harvard University Press, 2014.

[229] See Robert J. Shiller, *The new financial order: Risk in the 21st century*, Princeton University Press, 2004, and an interview with Shiller in "The great decoupling," *McKinsey Quarterly*, September 2014.

[230] David Pilling, "Has GDP outgrown its use?" *Financial Times*, July 4, 2014. For an overview of the evolution of GDP as a measure of economic performance and the challenges in its measurement and use, see Diane Coyle, *GDP: A brief but affectionate history*, Princeton University Press, 2014.

latter, there are many alternative measures, including the Human Development Index (HDI) introduced by the United Nations in 1990 and the OECD's Better Life Index.[231]

We acknowledge that there is opportunity for improvement, and we welcome the portfolio of initiatives that aspire to improve the GDP accounts, define new metrics of importance, and create dashboards that reflect a more robust picture of well-being. Statistical agencies including the Bureau of Economic Analysis in the United States are continuously refining the GDP measurement system, with recent efforts to add subaccounts that provide insight into income distribution and consumer surplus. Others are calling for a new metric or set of metrics—the "dashboard approach"—that captures elements of mental and emotional health and sustainability.[232]

The search for new ways to measure growth needs to take into account the fact that the geographical centers of economic growth are changing rapidly. It is no longer adequate to track the growth of nations when there are megacities whose economic output is larger than the economies of some nation-states.

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The impending global growth challenge is an opportunity to have a radical rethink about how to shape the world for our children and grandchildren. This research, taking a classical view of growth through the lenses of GDP and per capita GDP, has found that the past half century was exceptional largely because the world's population was expanding so rapidly that the world economy needed to grow robustly to cater to people's aspirations. But these demographic trends have shifted—and are continuing to shift—dramatically, transforming the outlook for growth.

It is difficult to be certain how the growth story will play out. The evidence suggests that the global economy will expand at a much slower pace in the next 50 years, but there is still the possibility that this analysis could prove to be unduly pessimistic. There is much that can collectively be done to mitigate the impact of the demographic shift on growth by being smarter about every aspect of running a business or how to work. There is significant scope to accelerate global productivity growth, but doing so will be hard work and require accepting trade-offs that might feel uncomfortable. In this new era, business leaders need to think ever harder about every aspect of how they do business and conduct their working lives—placing the emphasis on being smart about growth, rather than on an absolute number, perhaps—and debating every assumption about growth and the role it plays in people's lives.

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[231] Country performance measured using per capita GDP and broader measures of well-being such as the HDI are not identical, but they correlate with one another. This reflects positive feedback mechanisms in both directions: healthier, more educated people are more productive, while higher national incomes generate resources that can be used to improve health and public services. For further discussion, see Human Development Reports published by the United Nations Development Programme (UNDP) since 1990 at www.hdr.undp.org/en; Millennium Development Goals reports and Beyond 2015 reports at www.un.org/millenniumgoals/reports.shtml; and the OECD's Better Life Index at www.oecdbetterlifeindex.org/. Also see Joseph Stiglitz, Amartya Sen, and Jean-Paul Fitoussi, *Report by the Commission on the Measurement of Economic Performance and Social Progress*, 2009.

[232] See, for instance, Joseph Stiglitz, Amartya Sen, and Jean-Paul Fitoussi, *Report by the Commission on the Measurement of Economic Performance and Social Progress*, 2009; Yusuf J. Ahmad, Salah El Serafy, and Ernst Lutz, eds., *Environmental accounting for sustainable development*, World Bank, June 1989; and *Moving towards a common approach on green growth indicators*, Green Growth Knowledge Platform scoping paper, April 2013.

Welder working on car doors in an assembly line, Newark, Delaware
© Getty Images

TECHNICAL APPENDIX

This appendix provides details on the data sources and methodologies used in this report. Our detailed discussion of definitions and methodologies falls into the following sections:

1. Historical GDP, employment, and productivity analyses
2. Future demographic projections
3. Future productivity-growth potential in five industry case studies
4. Aggregate future productivity-growth potential
5. Estimating the investment required for productivity growth

1. Historical GDP, employment, and productivity analyses

For all retrospective analysis on GDP, employment, and productivity from 1964 to 2012, we relied on the Total Economy Database of The Conference Board and the Groningen Growth and Development Centre (GGDC). GDP numbers are in constant 2012 dollars based on purchasing power parity. Employment refers to the number of employees including both the self-employed and people who work for someone else and are remunerated for their labor. The self-employed include subsistence farmers. Productivity is calculated as GDP per employee.[233] The data for 2013 and 2014 are extrapolated from past trends.

2. Future demographic projections

For our estimates on employment, we focused on four population segments:

- **Youth.** Individuals of both genders aged 15 to 24.
- **Adult female working-age population.** Women aged 25 to 64.
- **Adult male working-age population.** Men aged 25 to 64.
- **Older population.** Individuals of both genders aged 65 or over.

For our study of the demographic transition and employment projections, we used the following metrics and their respective data sources:

- **Historical population and employment data.** We used historical population and employment data by country from the Conference Board between 1964 and 2012 for the G19 and Nigeria, and then extrapolated population data for 2013 and 2014 from past trends.
- **Historical working-age population data.** We took the working-age population (aged 15 to 64 years) as the major supply of labor and human capital. We used United Nations Population Division data on the share of population by age group to develop an estimate of the working-age population using Conference Board data.

[233] For more on data and details of sources and data adjustments, see www.conference-board.org/economics/database.cfm.

- **Labor-force participation and unemployment rate by population segment.** We used International Labour Organisation data for labor-force participation and unemployment rates. However, data were available for each of these metrics only since 1990.

- **Future population projection by age group.** We used medium-scenario fertility population projections by the United Nations Population Division for future population growth by age group to 2064.[234]

To project future employment, we used the United Nations Population Division's base population estimates from 2014 to 2064. We then calculated employment using the following relationship:

$$\text{Employment}_i = \text{Population}_i \times \text{Labor-force participation rate}_i \times (1 - \text{Unemployment rate}_i)$$

where i stands for the specific demographic segment in question.

We estimated each country's employment assuming that the labor-force participation rate of each demographic segment was the highest rate observed in that country between 2007 and 2012, and assuming the lowest unemployment rate that prevailed during that same period. This mitigates the impact of the global recession on the estimates, and implicitly implies no dramatic changes from recent trajectory.

3. Future productivity-growth potential in five industry case studies

To gauge future productivity-growth opportunities, we took a sector-level microeconomic view to identify levers and estimate their potential impact. It is virtually impossible to estimate these opportunities over a 50-year time frame given the likelihood of major disruptions over such a long period. Over the past century, there has been no 20-year period that has not experienced dramatic and unexpected disruptions (such as World War II, or the invention of antibiotics, personal computers, and the Internet). For this reason, we limited our analysis to the period to 2025, which we believe allows us to arrive at a reasonable analysis of the opportunities. However, we acknowledge that there are likely to be innovations and disruptions that are not foreseeable, and therefore believe that the opportunities that we have identified are likely to underestimate the true potential.

We chose five sectors for detailed analysis based on their size, their relevance to overall productivity and growth, and the availability of data. They are agriculture, food processing, automotive, retail, and health care. In each of these case studies, we focused on eight large countries with available data: Brazil, China, Germany, India, Japan, Russia, the United Kingdom, and the United States. We relied on the World Input-Output Database (WIOD) for sector employment and value added data for the countries it covers; for the countries not covered by the WIOD, we used data from IHS.[235]

We used MGI's in-depth productivity analysis to estimate the growth opportunities in the eight countries and five sector cases. This analysis drew on extensive input from and interviews with experts, McKinsey's accumulated sector knowledge (we had input from more than 100 McKinsey experts across countries to understand micro-level trends and estimate their impact), an extensive literature review, and many sector-specific databases for different countries. For example, in addition to statistics from national accounts, we used data from the Food and Agriculture Organization of the United Nations for the case study

[234] *World population prospects: The 2012 revision*, United Nations, Department of Economic and Social Affairs, Population Division, updated April 2014.

[235] Marcel P. Timmer, ed., *The World Input-Output Database (WIOD): Contents, sources and methods*, WIOD working paper number 10, April 2012.

on agriculture, data from IHS for automotive, the Euromonitor Passport for retail and food processing, and International Monetary Fund (IMF) government expenditure data and UK National Health Service data for the case study on health care.

4. Aggregate future productivity-growth potential

Throughout this report, we define "productivity" as labor productivity, specifically the GDP (or value added for individual sectors) per person engaged in economic activity. We extrapolated the potential for aggregate productivity growth from our sector cases by using employment-weighted industry productivity-growth projections from 2009 to 2025. The approach varied depending upon our sector case study analysis and the availability of data.

- **Deep-dive market sectors (agriculture, food processing, automotive, and retail).** For the countries analyzed in our sector case studies (Brazil, China, Germany, India, Japan, Russia, the United Kingdom, and the United States), we used productivity-growth rates estimated from the bottom-up sector analyses. For countries included in the WIOD database but not in our deep-dive analyses, we applied a weighted average of productivity growth to the same industries in the period to 2025 separately for developed and emerging groups of countries. For example, the productivity-growth rate for an industry in France and South Korea was derived from a weighted average of that rate in the other developed countries on which our analysis focused—namely Germany, Japan, the United Kingdom, and the United States.

- **Non-focus market sectors.** We assumed that productivity growth for retail trade was similar to that in other market sectors, and that the weighted average of food processing and automotive was similar to other manufacturing subsectors and mining. We applied those growth rates to each sector and country, directly in the case of the countries on which we focused in our case studies, and using a weighted average, separately for developed and emerging country groups, for countries that were not our focus.

- **Health care.** We used our bottom-up analysis to identify opportunities in our focus countries, and extended that analysis to other non-focus countries. We recognize that the analyses, focused only on cost savings, produce an underestimate of the overall potential.

- **Public services (government and education).** We estimated productivity-improvement opportunities in the public sector by extending the methodology from an earlier MGI effort to a broader set of countries.[236] Based on our experience across specific government activities, we identified opportunities to increase the productivity of government operations by between 1.0 percent and 1.5 percent per annum, lower costs of inputs through better procurement practices by between 1.0 percent and 1.5 percent per annum, and improve financial management, for example through fraud prevention, by between 0.1 percent and 0.2 percent per annum. We used a very conservative 0.9 percent per annum productivity-improvement opportunity in our global projection of that opportunity. While we are confident that the overall opportunity is significantly higher, we are conscious of the measurement challenges associated with public-sector output and productivity, and did not want the aggregate global productivity and growth results to rely on public-sector outcomes.

- **Countries not covered by WIOD (Argentina, Nigeria, Saudi Arabia, and South Africa).** Due to data limitations, we assumed that aggregate productivity growth in these countries was the weighted average of other emerging economies.

[236] McKinsey & Company, "Better for less: Improving public sector performance on a tight budget," discussion paper for the 11th Rencontres Economiques d'Aix-en-Provence, July 8–10, 2011.

5. Estimating the investment required for productivity growth

To assess the level of investment needed for productivity to accelerate sufficiently to compensate fully for slower employment growth, we relied on the McKinsey Global Economic Growth database for population, GDP, fixed capital investment, and fixed capital stock, all expressed in 2010 dollars at market exchange rates. Our analysis covers the G19 but not Nigeria because of limitations in the historical investment data. We grouped countries into developed and emerging, as we have done throughout this report.

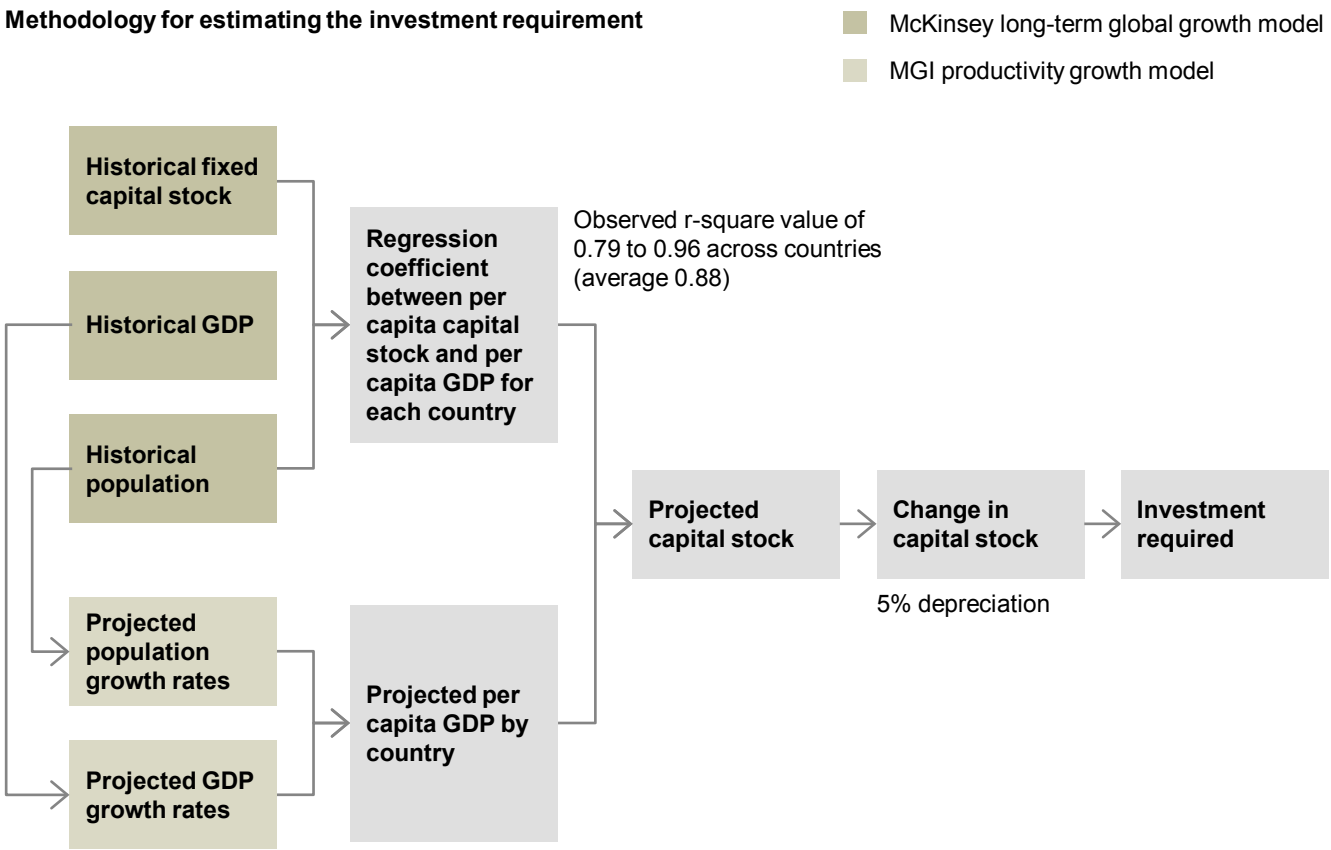
Our main measure of investment was gross fixed investment. This includes investment in housing, commercial and industrial real estate, equipment and machinery, roads, railroads, ports, airports, power plants, electric grids, water-supply systems, and other infrastructure. We included both public- and private-sector investment.

To estimate the investment required for future growth scenarios, we used a regression to estimate a linear relationship between per capita capital stock and per capita GDP in individual countries. Our analysis finds a high correlation between the two in the countries we analyzed with an r-square value ranging from 0.79 to 0.96.[237]

Using potential future rates of GDP growth, population growth from our demographic analysis, and the imputed relationship between per capita GDP and per capita capital stock for each country, we computed the capital stock requirement in 2025 (Exhibit A1). Assuming a 5 percent overall depreciation rate and projected change in the capital stock, we then estimated the total fixed investment required for a given rate of GDP growth.

Exhibit A1

Methodology for estimating the investment requirement



SOURCE: McKinsey Global Institute analysis

[237] For more details on the correlation between per capita capital stock and per capita GDP, see *Farewell to cheap capital? The implications of long-term shifts in global investment and saving*, McKinsey Global Institute, December 2010.

Customer at a grocery store checkout
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Doctor examining a boy with a stethoscope,
Hasanpur, Haryana, India
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