

# China's innovation imperative

McKinsey Global Institute July 2015

An aging population, rising debt, and declining returns on investment mean that the country must promote innovation to secure a high-growth future, a new McKinsey Global Institute report finds.

**How innovative is the** Chinese economy? On the surface, the answer seems clear: by traditional measures, China is innovating at an increasing larger scale and is close to becoming the global innovation leader. In 2014, for example, the country spent nearly \$200 billion on research and development, the second-largest investment by any country in absolute terms (and about 2 percent of gross domestic product). China's universities graduate more than 1.2 million engineers each year—more than any other country. And it leads the world in patent applications, with more than 825,000 in 2013, compared with about 570,000 for the United States.

<sup>1</sup> Productivity matters for global growth as well. For further reading on the magnitude of the challenges and potential improvement opportunities, see “Can long-term global growth be saved?,” McKinsey Global Institute, January 2015, on [mckinsey.com](http://mckinsey.com).

<sup>2</sup> To measure the impact of innovation on a macroeconomic level, economists have long used multifactor productivity, which measures changes in output per unit of combined inputs. Although multifactor-productivity gains may have many explanations (such as broad catch-up activities and efficiency improvements in developing economies), innovation is arguably the primary source of their long-term growth. See Bronwyn H. Hall, “Innovation and productivity,” National Bureau of Economic Research, June 2011; and “The OECD innovation strategy,” Organisation for Economic Cooperation and Development, October 2010.

Are these metrics the most appropriate ones to assess China's innovation ascendancy? We undertook a deeper examination of “micro” activity—processes, products, marketing, and organizational structures—and found a mixed picture: both world-beating commercial leadership and investments that have yet to pay off. Our perspective is that a more granular, nuanced approach is needed to determine if China is on track to convert itself from an “innovation sponge”—absorbing and adapting technology, best practices, and knowledge<sup>1</sup>—into an innovation leader. And making that transition is critical; unless innovation becomes a priority, China may struggle to generate enough high-value-added, high-productivity work and jobs to support its growing urban population.

Despite the headline numbers, the impact of innovation on China's GDP growth (as measured by multifactor productivity<sup>2</sup>) has declined in recent years. From 1990 to 2010, multifactor productivity supplied 40 to 48 percent of that growth. However, over the past five years, its contribution was just 30 percent, or some 2.4 percentage points of GDP annually—the lowest level since about 1980. To maintain annual GDP growth of 5.5 to 6.5 percent through 2025, China will need to generate 35 to 50 percent of it (2 to 3 percentage points) from multifactor productivity.

Innovation will also be critical to generating jobs and income, especially in services. Continued urbanization is expected to bring 100 million more residents to large Chinese cities by 2020. That will create a need for ten million new urban jobs every year, even as manufacturing employment drops.

Traditional approaches to assessing innovation involve evaluating the capacity of nations and corporate entities to undertake it. But for this study, the McKinsey Global Institute used an alternate method that looks at four archetypes of innovation and identifies the factors needed to innovate in different types of industries. We began by examining more than 30 industries to understand how innovation occurs in them, its drivers, and how it determines the success of companies. In this analysis, we looked at all kinds of innovations that have been commercialized successfully, from pure scientific discoveries to engineering breakthroughs to new business models to efficiency improvements. Each of the four archetypes of innovation we identified requires a different degree of R&D intensity, understanding of customer needs, and capital–labor intensity:

- **Customer-focused innovation** involves solving the problems of consumers through novel products and business models. Industries in this category include appliances, mobile phones and smartphones, Internet retailing, and consumer packaged goods. These are characterized by high marketing intensity (typically about 3 to 10 percent of sales) and short development cycles of less than a year or two.
- **Efficiency-driven innovation** mostly involves process improvements to reduce costs and production times and to enhance quality. Efficiency-driven industries include textiles, electrical equipment, and solar panels, which tend to have high capital and labor intensity.
- **Engineering-based innovation** is about designing and engineering new products by integrating technologies from suppliers and partners. Industries that rely on this kind of innovation include aerospace, automotive, and telecom equipment. These have moderate to high R&D intensity, typically spend 3 to 14 percent of sales on R&D, and can have product life cycles of five to ten years or longer.
- **Science-based innovation** involves developing new products through the commercial application of basic research. Industries such as pharmaceuticals, biotechnology, and semiconductor design rely on this approach. They may spend 16 to 33 percent of their revenues on R&D and devote 10 to 15 years of effort to bring an invention to market.

China sits apart from its peers by virtue of its uniquely dynamic and massive consumer market, its unparalleled manufacturing ecosystem, and the willingness of its government to invest in unprecedentedly large engineering projects. Yet the country has yet to make an internal-combustion engine that could be exported and lags behind developed countries in sciences ranging from biotechnology to materials.

By better understanding the way innovation works, Chinese business leaders, academics, and policy makers can more effectively focus their efforts to promote it. Building on the success

of today's innovators, they can create policies that support innovation in each of the four archetypes. In this way, China can continue to evolve into a more mature, productive, and innovation-based economy and may even provide a model for countries around the world.

[This article is an edited extract from \*The China Effect on Global Innovation\*, a preview of an in-depth study to be released later this year by the McKinsey Global Institute.](#)