



The Changing Geography of Innovation, the Current Crisis, and Implications for Economic Growth

*Shahid Yusuf**

Long-term growth in middle-income countries will be sustained by gains in productivity arising from technological convergence, structural change, improved efficiency, and innovation. As countries move closer to the technology frontier, more of the increases in productivity will need to be sourced from innovations of all kinds—product, process, design, organizational, and others. Most innovations will be incremental, interspersed with the occasional radical breakthrough. A few countries, such as the Republic of Korea and Finland, have effectively managed interactions among government, universities, and business entities and have developed the capabilities to generate a stream of innovations. However, most industrializing countries are struggling to arrive at the optimal mix of government policies, institutions, human and research and development (R&D) capital, and corporate cultures.

Some researchers, among them Tyler Cowen, Robert Gordon, and Benjamin Jones, question the likelihood that future gains from innovation will match those realized in the twentieth century. They believe that the low-hanging fruit from structural transformation and axial technologies has already been harvested. They also note that the flow of significant innovations from the

Internet is becoming sparser and might not necessarily enhance productivity (for example, productivity growth in the United States since 2004 has declined to 1.65 percent per year compared to 3.2 percent during the preceding eight years). Finally, they observe that growth-enhancing innovations from biotechnology have been slow to materialize, and that the potential of green technologies remains uncertain.

The majority opinion is more positive and envisions that innovation in the future will likely be substantially buoyed by the globalization of R&D and the increased volume of resources devoted to research. This process is being supported by the expanding pools of scientific, engineering, and math skills, especially in China, India, and a few other emerging economies. These economies have enlarged their tertiary-level programs in science and technology and are steadily ramping up both their public and private R&D. For example, Huawei of China was the leading applicant for patents from the World Intellectual Property Organization (WIPO) in 2008, and many other Chinese, Indian, and Brazilian firms are redoubling their efforts to generate patents and translate them into profitable innovations. In addition, multinational corporations are

*Chief Economist, the Growth Dialogue. Send comments to syusuf@growthdialogue.org with a copy to info@growthdialogue.org

diversifying their R&D operations and transferring more of their research activities to emerging economies in order to capitalize on the elastic supply of skills and on expanding market opportunities.

The economic crisis of 2008–09 and its lingering aftermath appear to have reinforced a trend increase in the contribution of emerging countries to innovation activities worldwide. Growth has slowed markedly in developed countries, dampening investment in R&D whereas thus far R&D has proven more resilient in a few of the middle-income economies. If such trends persist, these latter countries could benefit from an accelerated convergence towards more slowly evolving frontier technologies.

The upshot of these developments is the increasing likelihood of a geographic redistribution in the locus of innovation associated most strongly with the rise of China. Undoubtedly, a changing landscape of innovation will demand wide-ranging policy actions by advanced and middle-income countries alike.

Prognostication is always risky, but without some effort at anticipating the likely direction of change, it is difficult to define strategies and to prepare the groundwork for policy. Below are some preliminary thoughts on how the landscape of innovation might evolve and the implications.

- Slow growth and fiscal constraints are likely to reduce public R&D spending in the advanced countries. However, modest reductions need not significantly affect innovation and productivity growth in the short and medium run. In fact, high-income countries could retain their comparative advantage in discovering and exploiting general-purpose technologies, and a rationalization of R&D spending combined with more stringent evaluation of research projects

could raise the efficiency of public R&D and the quality of innovation.

- It is likely that the vast increase in China's spending on research and the sharp gains it has registered in patenting and the publication of scientific articles will catapult it into the ranks of the world's most innovative economies. It is much less apparent from their recent performance and policies that countries such as the Russian Federation, South Africa, India, Malaysia, and Brazil will quickly follow suit—although they have the potential. Under this scenario, innovation might be increasingly concentrated in North America, Northern Europe, and Northeast Asia.
- The globalization of R&D, with multinational corporations taking the lead, is being paralleled by a globalization of the learning economy. Demand for tertiary education is surging in middle-income countries while it is likely to shrink in high-income countries because of the diminishing cohort size of potential college applicants. Therefore, universities in high-income countries are trying not only to enroll more students from overseas but also enter into collaborative arrangements with universities in middle-income countries. To this end, universities are setting up satellite campuses in middle-income countries so as to extract the maximum gains from institutional brand names, in-house talent, and tacit knowledge. China, Singapore, and the United Arab Emirates have attracted the most attention and traditional knowledge hubs in the advanced countries may soon be joined by knowledge hubs in East Asia.
- If new knowledge hubs do take root—in Beijing, Shanghai, Hong Kong SAR China, and Singapore, for example—this would contribute to the greater

circulation of knowledge workers, reinforce the redistribution of R&D, and further integrate the national innovation systems of countries pursuing innovation-led growth strategies. Countries that are slow to reform and upgrade their education systems to take advantage of the globalizing process risk being left behind—and this includes some of the advanced countries that have allowed the quality of education to slip.

- The dominance of services in high-income countries and the rapidly increasing share of the service sector in middle-income countries could fundamentally alter the composition and even the tempo of innovation. Traditionally, research, technological change, and innovation have been most vigorous in manufacturing and especially in the high-tech industrial segments. However, looking ahead, services might take the lead in innovation with formal R&D playing a much diminished role. Moreover, the productivity gains from such innovation might be smaller than past gains that have accrued from product and process innovation (in manufacturing).
- Furthermore, the character of innovation might be transformed if those middle-income countries richly endowed with labor become the drivers of innovation. Capital-intensive and labor-saving process innovation suited for advanced countries and products sought by higher-income buyers might lose ground to innovations tailored to the factor endowments and markets of economies where per capita incomes are lower, employment generation is a burning concern, and the need to narrow income gaps is urgent. How such a change in the character of innovation

might affect productivity and growth remains to be determined, but it is quite possible that a dollar of R&D anywhere will produce less growth in the future.

- Many governments see green technologies as the drivers of innovation. Rapidly urbanizing countries with deep pockets—such as China—are pinning their hopes on advances in transport, renewable energy technologies, and information technology, among others. However, given trends in (green) patenting and the costs of scaling up promising green technologies, it is far from obvious that a greening of innovation will be rapid or that it will deliver the sort of growth that followed the introduction of electricity and the internal combustion engine. If the payoff from “greening” falls well short of current expectations, then much R&D spending will have been in vain and there may be the drought of innovation that Cowen fears may occur.
- Lastly, a global innovation landscape with a few peaks and many deep valleys and a global learning economy with hubs concentrated in a handful of the most innovative countries could result in widening international disparities in growth rates and in incomes. These disparities likely would lead to other imbalances (and associated pressures) and would threaten trade and capital flows. The risk is that a highly uneven globalization of innovation would strongly impinge upon the role of government and perhaps encourage dirigisme or protectionism. Avoiding such an outcome should be one of the highest priorities for policy makers. A change in the landscape of innovation should be advantageous for the majority and not just for the early movers and a few large resource rich countries.

How this landscape unfolds will depend on the actions of individual countries and on a form of globalization that maximizes spillovers and encourages sharing. At the country level much depends on the interaction among elements of the ‘quadruple helix’ that determines the dynamics of innovation—the government, the business community, universities, and the financial sector. The quality and effectiveness of the

government’s innovation policy will be the trigger in most countries, but absent the constructive contribution of the other three elements of the helix, progress will be slow. If, however, enough countries can make headway with national innovation policies, then there is a real possibility that they will capture the benefits of innovation for further economic growth.