

GLOBAL PRODUCTIVITY SLOWDOWN AND THE ROLE OF TECHNOLOGY ADOPTION IN EMERGING MARKETS

The global productivity slowdown is affecting mature as well as emerging economies and this pattern has been particularly prominent over the past five years. Productivity levels in mature economies are almost five times higher than those of emerging countries, providing ample catch-up opportunities for emerging markets in their efforts to generate growth and eradicate poverty. This article highlights the forces of new technologies and business models as key drivers for emerging and mature economies' productivity and hence future growth patterns. However, emerging markets have to find a way to make good use of available productivity-enhancing technologies and business models that meet their economies' needs and capabilities.

The global growth rate of total factor productivity (TFP), which measures the efficiency gains of labor and capital together, has come to a near standstill in the aftermath of the 2008-2009 financial crisis. It grew on average 1.2 percent a year from 1999 to 2008, slowed to 0.3 percent from 2009 to 2012, and has fallen to near zero since then.

Most advanced economies, including the United States, Japan, and the Euro Area, are experiencing zero or negative productivity TFP growth (Figure 1), while developing countries are more of a mixed bag, with productivity growth rates that vary greatly. China and India experienced TFP growth of 0.8 percent and 1.0 percent, respectively, from 2010 to 2014; Brazil and Mexico saw TFP fall over that period, by 0.4 percent (Brazil) and 0.9 percent (Mexico).

Nonetheless, in absolute terms, TFP levels in advanced economies remain almost five times as high as those of emerging economies and there is also a substantial gap in labor productivity levels, or value-added per worker (Figure 2). The large disparity in productivity levels between advanced and emerging economies suggests that there is ample room for emerging markets to accelerate productivity growth.

To reduce poverty and boost shared prosperity, emerging markets have to rely on TFP increases—especially through the adoption of technological innovations—rather than relying solely on demographic factors such as population growth or natural resources.

Why Total Factor Productivity Matters

It is the growth of productivity, not total GDP, which determines the standard of living. Productivity measures how effective a firm or a country turns inputs such as labor and capital into outputs. If a firm produces twice as many cars as its competitor with a similar set of employees, machines, and other inputs, we can conclude that the former firm is twice as productive as the latter. Technology (in its broadest sense, encompassing both physical technology as well as new knowledge and business models) is the main driver of productivity changes.

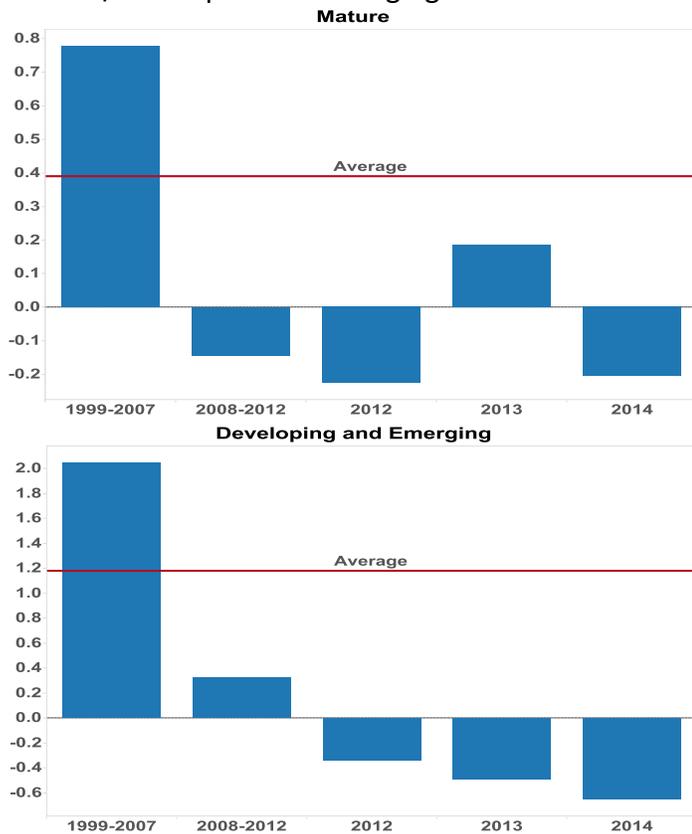
GLOBALIZATION PAUSE

Prior to the financial crisis emerging markets experienced a few decades of strong growth, thanks in large part to globalization, increased market access, and ready consumer demand in advanced economies. Emerging economies experienced record-high growth rates from the early 1990s to 2008 (increasing their share of global GDP by a factor of 1.5, to 34 percent).¹

Yet since the crisis, the ongoing integration of the world economy has lost momentum when measured by countries' trade intensities, overall exports, and foreign direct investment. And globalization cuts both ways: Less global trade, lower commodity prices, and tighter financial conditions (including trade finance) have resulted in slower growth rates in the developing world, led by China's slowdown. Average GDP growth in emerging markets fell from 7.6 percent in 2010 to 4 percent in 2015 and is expected to decline further.¹¹

Increasingly since 2010, the biggest drag on emerging market growth rates has come from domestic factors (as external conditions deteriorated), including bouts of policy uncertainty and a lack of fiscal and monetary stimulus. Looking at the contribution to the growth rate in emerging economies, the primary factor holding back economic growth in recent years has been a slowdown in productivity.ⁱⁱⁱ By 2014, total factor productivity growth in the developing world had fallen well below its historical average.

Figure 1: Total Factor Productivity Growth Rates – Mature/Developed and Emerging Countries



Source: The Conference Board, IFC Research

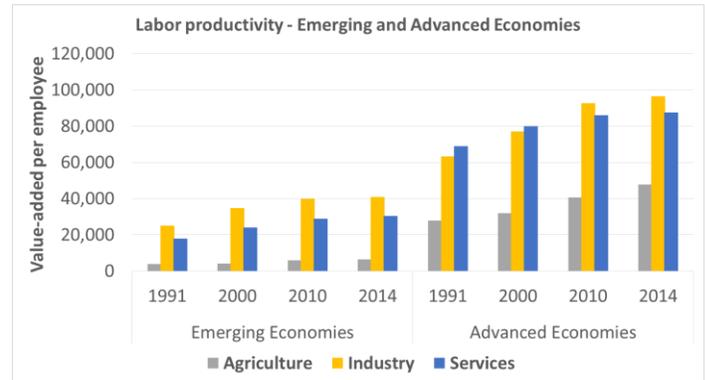
SHRINKING THE TECHNOLOGY GAP

The growth of TFP is driven primarily by the adoption of technological advancements. “New technologies embody higher productivity. Therefore, an acceleration in the rate at which new technologies arrive in [a] country raises aggregate productivity growth,” wrote Diego Comin and Marti Ferrer in a 2013 paper on the role of technology adoption in income divergences between advanced and emerging economies.^{iv}

Fortunately, emerging markets have been adopting technologies much more rapidly in recent decades. Late nineteenth-century innovations such as telephones and electricity took decades to disseminate from western to non-western countries. By contrast, more recent technologies such as cellphones and the Internet spread to these economies at a far higher rate.

However, productivity is also affected by the penetration rate—the percentage of workers in a country using the new technology. And while emerging markets are adopting technologies more quickly, penetration rates and diffusion of these pre-existing, new-to-market, or new-to-firm technologies remain low among developing and transition countries.^v

Figure 2: Labor Productivity – Emerging and Advanced Economies



Source: ILO, UNdata, IFC Research; calculated using 2011 PPP exchange rates

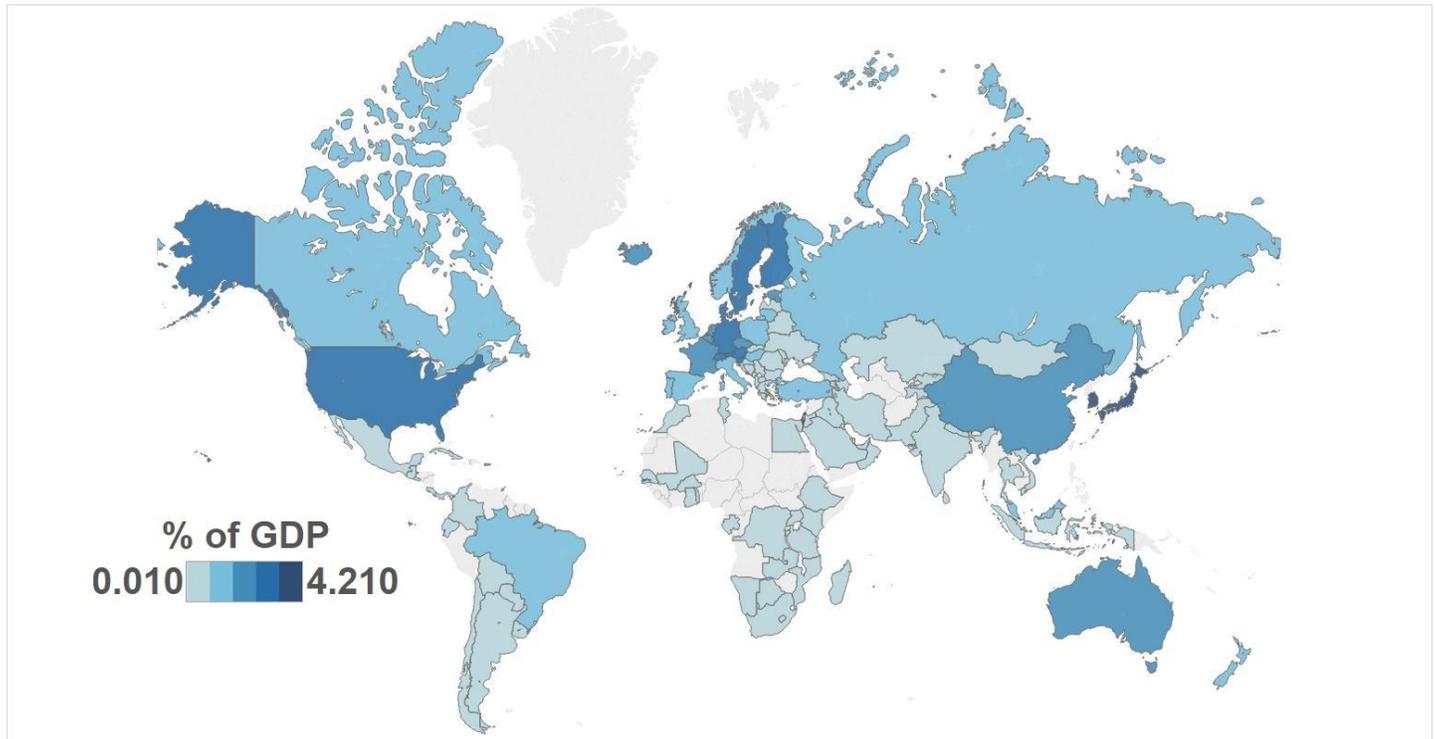
Factors that account for the low penetration levels can be categorized under country-specific characteristics (for example political risk), firm-level characteristics (such as level of managerial quality), and general bottlenecks (access to finance, infrastructure, among other factors), that are common in emerging economies. Comin and Ferrer found that while adoption rates between advanced and emerging economies have converged over the last two centuries, penetration rates have diverged, and that divergence has played a dominant role in sustaining the gap in productivity levels between advanced and emerging countries.

Innovations that lead to technological advances provide comparative advantages to companies that then generate higher revenues through market power over a limited period of time. However, innovations also come at a price, that of significant spending on research and development. Innovative activity is highly concentrated within high-income countries, yet economic catch-up among lower-income countries also leads to an increase in their R&D capacities (Figure 3).

CHANNELS FOR TECHNOLOGY ADOPTION

While most innovations and new technologies are produced in advanced economies, they find their way to lower-income countries through a variety of channels. International trade, foreign direct investment, and cross-country research collaborations are most highly correlated with an increase in knowledge and technology flows from advanced to emerging economies.

Figure 3: Gross Domestic Expenditures on R&D (GERD) as % of GDP
GERD (latest available data)



Note: GERD refers to gross expenditures on R&D from the business enterprise, higher education, government, and private non-profit sectors. Latest available data from 2008-2014; source: UNESCO Institute for Statistics.

- **International trade:** For example, an auto manufacturer produces a new model with fuel efficiency significantly above that in models produced by its competitors. When the new model is exported to another country, the importing country immediately gains access to the embodied technology, even if not in an intellectual property sense (for example it cannot alter the model and resell it on the global market). Foreign firms routinely gain technology from imported products, especially through reverse engineering. As a result, integration into global value chains via trade networks and regional integration plays a major role in disseminating knowledge of technologies and business models.
- **Foreign Direct Investment:** Should the abovementioned carmaker not only export cars but also invest in another country—either through a factory, a merger or acquisition, or a loan to a foreign supplier—flows of knowledge occur through the transfer of physical technology (machinery or software) or the streamlining of managerial practices (better accounting techniques, for example). The firm may also choose to train local employees and thereby provide them with knowledge about the use of the new technology, an indirect channel of technology transfer through education.
- **Research and Development Collaboration:** The same automaker might choose to relocate some of its own R&D activity to another country. Cost differences between advanced and emerging economies, coupled with an increase in the stock of human capital in emerging economies, can lead to a relocation of research activities from higher to lower-income countries. Recent empirical evidence^{vi} suggests that an increase in R&D collaboration with countries that have lower levels of innovative capacity also

increases the flow of technology and technical knowledge. As discussed above, this development also has the potential to allow emerging economies to generate more innovative capacity.

“Buyer-seller relationships along the value chain are effective ways to transfer both technological knowledge and better working practices.”^{vii} Vertical integration along the value chain may be more conducive to knowledge “spillovers” than horizontal integration, which can be impeded by competition between the company with the technology (the new entrant into the market) and domestic/incumbent firms. However, market competition in general, and competition across borders in particular, do provide incentives for firms to upgrade their production technology in order to retain their consumer base in domestic markets and to extend it into foreign markets.

Of course, technology adoption by emerging economies also has the potential to slow the growth of international trade. Greater automation in manufacturing industries in developing countries has made production there less labor intensive, decreasing those economies’ greatest cost advantage (inexpensive labor). This has a potentially adverse effect on the labor market by reversing the trend of outsourcing labor-intensive manufacturing from high-income to low-income countries, and hampering those low-income countries’ ability to create new manufacturing jobs.^{viii}

THE CRITICAL ROLE OF DIGITAL TECHNOLOGIES

The spread of digital technologies in an economy provides the IT infrastructure that facilitates the adoption of new technologies and

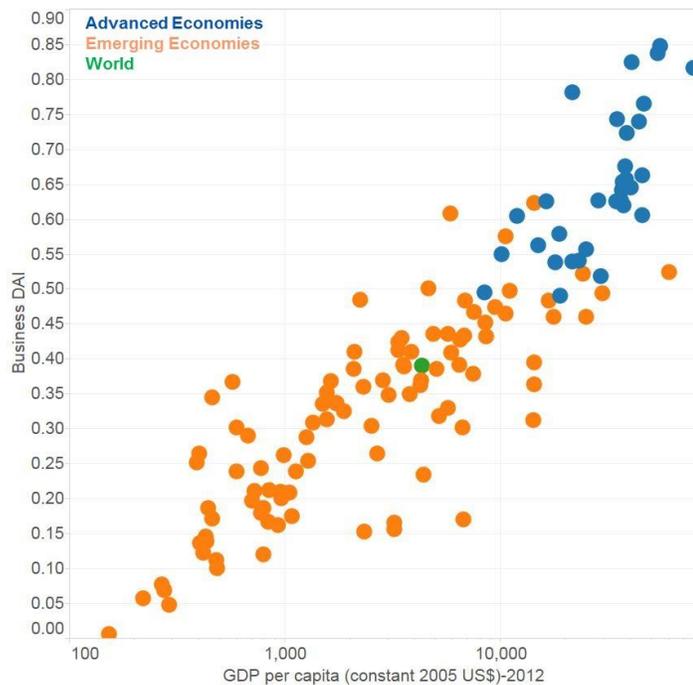
business models.^{ix} It increases an economy's capacity to absorb and capitalize on business innovations that significantly reduce transaction costs through technologies such as online markets and mobile payment systems. Such technologies require information and communication infrastructure in order to supply customers and allow market entrants to develop new products and/or tailor existing business models to the local market.

There is a high correlation between a country's per-capita income level and the extent to which digital technologies are available to key agents in its economy, according to a Digital Adoption Index created by the World Bank and Microsoft (Figure 4). Most adopted innovations do not advance the global technological frontier, but instead utilize existing technologies to help firms boost their productivity.

OPPORTUNITIES AHEAD

According to the World Economic Forum, a fundamental shift is going on "in how we produce, consume and relate to one another, driven by the convergence of the physical world, the digital world and human beings ourselves."^x This has implications for service delivery by the private sector in developing and emerging countries and also offers tremendous opportunities to advance development goals by providing access to financial, energy, and education services.

Figure 4: Digital Adoption Index



The Business sub-index is the simple average of four normalized indicators: the percentage of businesses with websites, the number of secure servers per million residents, download speed (Kbps), and 3G coverage in the country. Note: Advanced/developed economies (UAE, Qatar and Kuwait excluded); Emerging markets (groups as defined by IMF); source: World Bank Group, Microsoft (<http://www.digitaladoptionindex.org/>)

New technologies arrive in emerging countries with high expectations among development actors and great potential for citizens of those countries. Adopted innovations and technologies can raise productivity levels and living standards in these economies without relying on increased labor inputs. There is considerable scope for emerging countries to adopt technologies, step-by-step moving closer to the technological frontier.

If it is to be effective, technology must take local context into consideration. Ideally, low-income and low-productivity economies can find a path toward more efficient production activities that are also inclusive. While powerful, technology is merely one of many tools needed for successful development.

KEY TAKEAWAYS

Global productivity growth has largely stalled since the global financial crisis, both in emerging and mature economies. The latter, however, continue to exhibit productivity levels five times higher than the former. This vast gap suggests that increasing the rate of productivity growth in developing countries is critical to a rebound in growth and broad-based increases in standards of living.

The causes of the productivity growth slowdown in emerging markets are manifold and complex. Some are cyclical, while other, structural changes in domestic political economy and global financial and trade systems are highly uncertain. One thing however is for sure: Digital technology has lowered the threshold for technology-driven growth in emerging markets, an opportunity that should not be missed. ■

Florian Mölders, Associate Operations Officer (fmoelders@ifc.org), Office of the Chief Economist – Thought Leadership & IFC Research.

ⁱ Didier, Kose, Ohnsorge, Ye, "Slowdown in Emerging Markets: Rough Patch or Prolonged Weakness?" December 2015.
ⁱⁱ This is also the case for potential GDP growth rates: The IMF expects a decline of the potential output growth in the medium term due to aging populations, weaker investment, and lower productivity growth. (IMF World Economic Outlook, April 2015: "Uneven Growth: Short- and Long-Term Factors").
ⁱⁱⁱ Didier, Kose, Ohnsorge, and Ye, 2015.
^{iv} Comin and Ferrer, "If Technology Has Arrived Everywhere, Why Has Income Diverged?" May 2013.
^v Comin and Ferrer, 2013.
^{vi} Belitz and Moelders, "International Knowledge Spillovers through High-Tech Imports and R&D of Foreign-Owned Firms," January 2016; Ang and Madsen, "International R&D Spillovers and Productivity Trends in the Asian Miracle Economies," April 2013.
^{vii} Brookings Institution, "Understanding FDI Spillover Mechanisms," November 2015.
^{viii} "Technology at Work v2.0," Citi GPS: Global Perspectives and Solutions, January 2016.
^{ix} The World Bank, "World Development Report 2016: Digital Dividends," <http://www.worldbank.org/en/publication/wdr2016>
^x World Economic Forum "5 Ways of Understanding the Fourth Industrial Revolution", World Economic Forum, 2015.