

BOX 3.2 Understanding the recent productivity slowdown: Facts and explanations

Potential total factor productivity growth slowed, post-crisis, below its longer-term average and pre-crisis levels. The slowdown started well before the global financial crisis in advanced economies (AEs) and spread to EMDEs after the crisis. Weaker productivity growth has been attributed to slower investment growth, partly because of heightened uncertainty and crisis legacies, population aging, increased regulation, and maturing global value chains and information and communications technology.

Introduction

Global growth of total factor productivity (TFP), defined as the residual part of output growth not explained by factor accumulation, has slowed sharply over the past decade. Much of this reflected a steep cyclical slowdown, but global *potential* TFP growth—the focus of this box—also slowed in 2013-17 below its pre-crisis and longer-term average (Figure 3.2.1). Labor productivity growth, defined as output growth per worker, has shown a similar decline.

In advanced economies, TFP growth was flattening before the global financial crisis, as documented in the large literature reviewed below. By contrast, TFP growth in EMDEs surged to 2.5 percent a year during 2003-07, reflecting productivity-enhancing investment, partly financed by capital inflows, and ample room for convergence-driven productivity growth (Adler et al. 2017). Reforms of policy frameworks after EMDE financial crises in the late 1990s and early 2000s and greater integration into global value chains provided a conducive environment for rapid productivity growth. However, TFP growth in EMDEs slowed to 1.9 percent a year in 2013-17 amid investment weakness in the two-thirds of EMDEs that are commodity exporters, rapid per capita income convergence in commodity importers that narrowed the room for catchup productivity growth in some EMDEs, and a policy-driven rebalancing away from investment growth in China.

The recent slowdown in TFP growth was broad-based but steepest in commodity exporters (Figure 3.2.1). In EMDE regions where commodity exporters have struggled to adjust to low commodity prices (MNA, LAC, SSA) or which faced heightened political uncertainty that weighed heavily on investment, TFP growth slowed to near-zero during 2013-17. In contrast, TFP growth continued to be robust above 3 percent during 2013-17 in East Asia and Pacific (EAP) and Southeast Asia (SAR)—both regions hosting predominantly commodity-importing economies.

Considering the synchronous slowdown in productivity growth, this box addresses two questions:

- What are the linkages between productivity growth and potential output growth?
- What are the reasons behind the ongoing productivity slowdown?

Linkages between productivity and potential output growth

Differences in productivity growth account for about two-thirds of the variation in per capita income across the world (Jones 2016). Higher productivity lifts firms' marginal product and reduces their marginal cost, which allows firms to increase their demand for factors of production and, in turn, expand output. Technological advances can also reduce the quality-adjusted price of capital equipment, encouraging further capital accumulation which, in turn, embodies further improvements in productivity (Greenwood, Hercowitz, and Krusell 1997).

Weaker productivity growth reduces not only *actual* output growth, but also *potential* output growth. For example, the productivity slowdown in the United States, which pre-dates the global financial crisis, may reflect a return to productivity growth rates before the surge of information and communication technologies (ICT) in the 1990s and the early 2000s and may, therefore, be associated with a long-term reduction in potential output growth (Fernald 2015; CBO 2014).¹ Other factors, such as financial frictions that reduce investment in R&D and population aging, have contributed to the recent slowdown in TFP growth and may have dampened the potential of the economy to innovate in the future, i.e., they may have reduced potential TFP and output growth.

Explanations of productivity growth slowdown

The literature offers a number of explanations for slowing productivity growth. These include temporary factors—

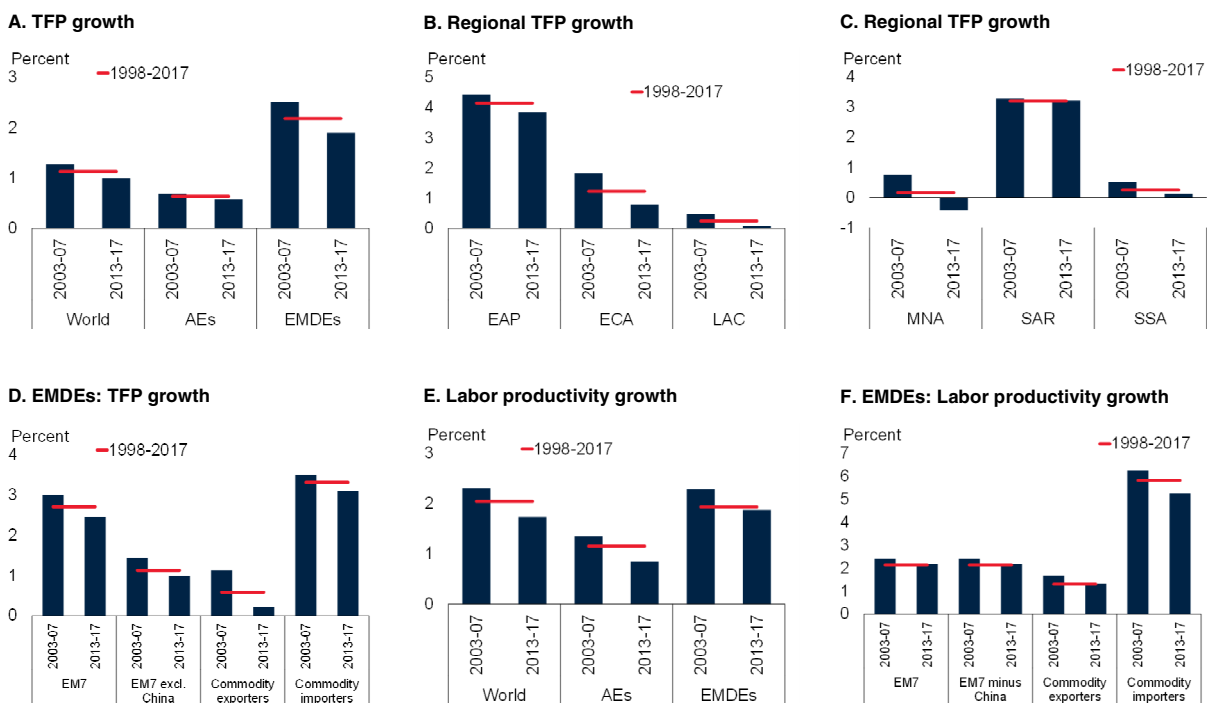
Note: This box was prepared by Ergys Islamaj, M. Ayhan Kose, and Franziska Ohnsorge.

¹CBO (2014) has revised its estimates of potential GDP growth compared to 2007, taking into account a lower rate of productivity growth.

BOX 3.2 Understanding the recent productivity slowdown: Facts and explanations (continued)

FIGURE 3.2.1 Evolution of potential productivity growth

Potential productivity growth slowed in advanced economies and EMDEs during 2013-17 to rates below longer-term averages and average rates a decade ago.



Source: World Bank.

Notes: GDP-weighted averages of potential total factor productivity growth, defined as in Annex 3.1. AEs: advanced economies; EMDEs: emerging market and developing economies; EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MNA = Middle East and North Africa; SAR = South Asia; SSA = Sub-Saharan Africa; EM7: Brazil, China, India, Indonesia, Mexico, Russia, and Turkey; G7: Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

A. D. Sample includes 30 advanced economies and 50 EMDEs.

E. F. GDP-weighted averages of potential labor productivity defined as potential GDP divided by potential employment.

[Click here to download data and charts.](#)

such as heightened policy uncertainty, crisis legacies that have eroded investment—as well as persistent factors, such as maturing global value chains, a switch in information and communications technologies to consumer applications (from productivity-enhancing hardware and software), and slowing human capital accumulation.² In the context of EMDEs, slowing productivity growth has also been attributed to slowing factor reallocation.

Uncertainty and investment slowdown. The decade 2008-17 was marked by heightened policy uncertainty, including following the global financial crisis and the Euro Area crisis. Uncertainty dampens investment, leading to lower productivity growth through less investment in R&D and through the loss of improved technologies embodied in new capital equipment (World Bank 2017a; Box 3.3). Uncertainty may also slow the reallocation of resources from less to more productive firms and from larger and older towards more innovative younger firms, as credit markets may be less willing to finance risky start-ups (Bloom 2009; Bloom 2014; Fort et al. 2013; Baker et al. 2016). In LAC, weak investment, especially in intangible assets, has contributed to low productivity growth (OECD 2016a).

Crisis legacies. Deep recessions, especially those following financial crises, can lower TFP levels (Fatás 2000; Adler et

² Some authors question the very existence of a productivity growth slowdown, arguing that productivity is increasingly mismeasured (Brynjolfsson and McAfee 2011, 2014). However, thus far there has been limited evidence of rising mismeasurement during the last decade (Byrne, Fernald and Reinsdorf 2016; Syverson 2017). In addition, in the United States, the productivity growth slowdown has spread broadly across sectors, and, as a result, cannot be explained by a shift of economic activity towards poorly measured, low-productivity-growth sectors, such as services (Fernald et al. 2017).

BOX 3.2 Understanding the recent productivity slowdown: Facts and explanations (*continued*)

al. 2017; Reinhart and Rogoff 2014).³ Financial frictions following severe recessions and crises may reduce investment in research and development, especially in firms with pre-existing balance-sheet vulnerabilities (Aghion et al. 2012; Duval, Hong and Timmer 2017). Hence, the global financial crisis and Euro Area crisis may have deepened a TFP growth slowdown already underway (Cette, Fernald, and Mojon 2016). An event study of 161 contractions in 93 advanced and emerging market and developing economies during 1981–2016 show that actual TFP growth typically fell sharply during contractions, and the subsequent rebounds were insufficient to lift TFP levels back to their pre-crisis paths (Figure 3.2.2).⁴ In particular, the severe recessions in EMDE commodity exporters following the commodity price slide from 2011 may account for some of the recent slowdown in EMDE productivity growth. Yet, the timing of the productivity slowdown for advanced economies suggests that the main drivers are factors other than the global financial crisis or subsequent coping policies.

Trade slowdown. International trade growth slowed sharply following the global financial crisis (World Bank 2015a). Weaker trade growth slows incentives for firms to invest and eases competitive pressures. As a result, the pace of resource re-allocation within firms and within sectors toward more efficient firms and sectors slows (Adler et al. 2017; Ahn and Duval 2017). In addition, the spread of vertical specialization, which had been a significant force for both earlier productivity gains and trade growth, slowed as global value chains have matured (Matoo, Neagu, and Ruta 2017). While the post-crisis slowdown in trade has dampened productivity growth in open economies, elevated tariff and non-tariff barriers have depressed trade openness, competition, access to global technologies, and, hence, productivity growth in MNA (Freund and Jaud 2015).

Slowing population growth and human capital accumulation. As population growth has slowed, the growth of the labor force has also declined. In advanced economies, the working-age share of the population has declined since the mid-1980s and, more recently, in

EMDEs. An older labor force has, historically, been associated with slower learning of new skills and with slowing innovation and productivity growth (Maestas, Mullen, and Powell 2016). Population aging may have accounted for as much as 0.2–0.5 percentage point lower average productivity growth in advanced economies in the 2000s than the 1990s (Adler et al. 2017). In LAC, specifically, poor education and skills have been central to low productivity growth (OECD/ECLAC/CAF 2016).

Maturing ICT. Information and communication technologies (ICT) has boosted productivity in the ICT-producing and ICT-related industries since the mid-1990s and, as it became a general-purpose technology, in other industries (Fernald 2015; Fernald et al. 2017; Basu et al. 2004). Businesses throughout the economy became more efficient by reorganizing to take advantage of ICT. After an uptick in productivity in the U.S. and other advanced economies in the mid-90s and early 2000s, ICT technologies and their absorption appear to have been maturing (Fernald 2015).⁵ Productivity growth in EMDEs tends to reflect advanced-country productivity trends with a lag, as technological innovations first introduced in countries at the technology frontier are eventually adopted by the rest (Comín et al. 2014; Gordon 2016). Costs of extracting ideas may have also increased over time, making it more likely that productivity growth will remain low in the future (Bloom et al. 2017). In addition, hi-tech innovation seems to have shifted this century from productivity-enhancing hardware and software, toward consumer applications (Gordon 2016).

Rising regulation and loss of dynamism. The stringency of labor and product markets regulations may be negatively correlated with productivity levels across countries (Fatás 2016; Cette, Fernald, and Mojon 2016; Nicoletti and Scarpetta 2005). Deregulation may boost productivity by accelerating the reallocation of resources, facilitating technology diffusion and adoption, and increasing incentives to innovate. In the U.S. ICT sector, deregulation may have also increased labor market flexibility and allocative efficiencies since the early 2000s (Decker et al. 2016, 2017). In contrast, zoning restrictions in U.S. cities heightened housing supply constraints and reduced the efficiency of labor allocation across the United States (Hsieh and Moretti 2015). In the United States, changes in the federal regulatory burden do not appear to

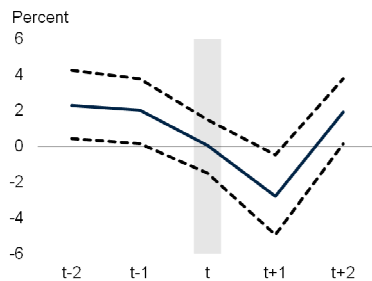
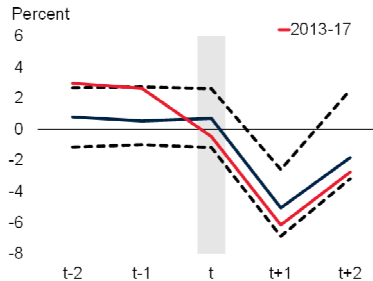
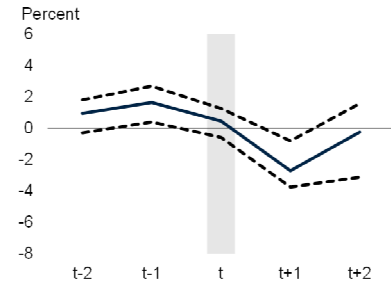
³ In theory, the constraints imposed by credit crunches and recessions should force the least productivity firms out of business and lift aggregate productivity growth (Petrosky-Nadeau 2013).

⁴ Contractions are defined as the years of negative output growth from the year after the output peak to the output trough. Sample includes 161 events for 32 advanced economies and 61 emerging market and developing economies for the period 1981–2017. The methodology is described in detail in Annex 3.4.

⁵ Adler et al. (2017) find that a shock to the U.S. TFP has had a gradual, increasing and significant spillover effect in the TFP of other advanced economies over the 1970–2010 period.

BOX 3.2 Understanding the recent productivity slowdown: Facts and explanations (concluded)**FIGURE 3.2.2 Productivity growth around contractions**

Productivity growth has tended to slow by 4 percentage points during typical contraction episodes and to rebound quickly during subsequent expansions. The contraction episodes in commodity exporters following the commodity price slide after 2011 were associated with sharp declines in productivity growth.

A. Advanced economies**B. Emerging market and developing economies****C. World, 2007-09**

Sources: Penn World Tables, World Bank.

Notes: Blue lines show unweighted averages around 161 contraction episodes in 32 advanced economies and 61 EMDEs. The methodology is described in detail in Annex 3.4. Dashed lines show 25th and 75th percentiles. Horizontal axis shows years.

A. B. t denotes the year of a business cycle peak preceding the contraction.

B. Red line shows unweighted average total factor productivity growth in countries that had recessions during 2013-2017 (Brazil, Burundi, Ecuador, Russia, Sierra Leone, Swaziland, Trinidad and Tobago, Ukraine, and República Bolivariana de Venezuela).

C. There are 52 countries identified as having a business cycle peak in 2008. t denotes 2008.

[Click here to download data and charts.](#)

explain variations in productivity growth, many small changes in the regulatory and institutional framework may have contributed to a decline in entrepreneurship dynamism and a decline in job and worker flows into the high-tech sector (Fernald et al. 2017; Haltiwanger 2015).

Slowing reallocation between firms and sectors. Reallocation of capital and workers toward more efficient firms and sectors has been an important driver of productivity growth over the past two decades both in AE and EMDEs (Restuccia and Rogerson 2017). In Europe, structural rigidities in labor and product markets may have hindered a favorable reallocation of resources. In China, the reallocation of labor from agriculture to manufacturing has been an important source of productivity growth (Cao and Birchenall 2013; Deininger et al. 2014). A reallocation of labor from low-productivity to high-productivity activities has been a major driver of productivity growth in Africa, Latin America and the Caribbean, and East Asia and the Pacific (Üngör 2017;

McMillan, Rodrik, and Verguzco-Gallo 2014). As the potential for reallocation is gradually exhausted, related productivity gains may be slowing.

Conclusion

Global productivity growth has slowed over the past two decades. Some of the underlying drivers of this slowdown may fade over time, such as policy uncertainty and crisis legacies. Others, however, are likely to persist: the decline in labor force growth and population aging; a levelling-off of productivity-enhancing innovations in information and communication technologies; and maturing global supply chains. Policies to address these persistent factors include better education for improved learning in aging populations and initiatives to stimulate investment in physical capital and research and development. Other measures, such as regulatory reform and trade liberalization, could raise productivity by reducing informality and increasing competition.