

BOX 3.2 Sectoral sources of productivity growth

Labor reallocation towards higher-productivity sectors has historically accounted for about one-third of aggregate productivity growth in EMDEs. This mechanism has, however, weakened since the global financial crisis. Fading productivity gains from labor reallocation have accounted for about one-half of the post-crisis productivity slowdown in EMDEs. In commodity-exporting EMDE regions, deindustrialization contributed to the slowdown.

Introduction

Factor reallocation towards higher-productivity sectors has long been recognized as one of the most powerful drivers of aggregate productivity growth (Baumol 1967).¹ It has been identified as an important driver of productivity growth in economies as diverse as Sub-Saharan Africa, China and Vietnam (Cusolito and Maloney 2018; de Vries, de Vries and Timmer 2015; Fuglie et al. 2019). Especially in East Asia, the move out of agriculture into higher-productivity industry and services has been credited with rapid productivity growth (Helble, Long, and Le 2019).

In part as a result of several decades of sectoral reallocation away from agriculture, agriculture now accounts for only 10 percent of EMDE value-added—one-quarter less than two decades earlier and less than one-third the share of industrial production (Figure 3.2.1). LICs are an exception where agriculture still accounts for one-third of value-added, more than industry, and accounts for over 60 of employment.

Meanwhile, services sectors have grown rapidly over the past two decades. They now account for about one-half of value-added in EMDEs as well as LICs, compared with three-quarters of value-added in advanced economies. Services sectors have also been the main source of post-crisis productivity growth, accounting for almost two-thirds of productivity growth in the average EMDE (compared with one-fifth accounted for by industry) and more than three-quarters in the average LIC.

Services describe a highly heterogeneous set of activities. Whereas industry mostly consists of manufacturing (64 percent in the average EMDE), services include in almost equal measure trade services, transport services, financial and business services, and government and personal services. These service subsectors vary widely in their skill- and capital-intensity as well as their productivity.

Note: This box was prepared by Alistair Dieppe and Hideaki Matsuoka.

¹Throughout this box, productivity refers to labor productivity, defined as value added per employed worker.

Against this backdrop, this box examines the sources of the post-crisis slowdown in productivity growth from a sectoral angle. Specifically, it addresses the following questions.

- What are the main features of sectoral productivity?
- What was the role of sectoral reallocation in the post-crisis productivity growth slowdown?

Much of the earlier literature on sectoral productivity has focused on three sectors (agriculture, manufacturing, and services) with only a limited number of cross-country studies including more sectors.² There is evidence that the findings of reallocation are sensitive to the level of aggregation (de Vries et al. 2012; Üngör 2017). To explore these issues, this box draws on a comprehensive dataset for 80 countries and 9 sectors over 1995-2015.

Features of sectoral productivity

Wide productivity differentials across sectors. Productivity differs widely across sectors, offering large potential for productivity gains by factor reallocation across sectors (Figure 3.2.3). In the average EMDE, productivity in the most productive sector—mining, which accounts for 4 percent of value-added—is twelve times that in the least productive sector—agriculture, which accounts for 10 percent of value-added.³ In the average LIC, the range is even larger: productivity in the most productive sector—financial and business services, accounting for 13 percent of value-added—is twenty-two times that in the least productive sector—agriculture, which accounts for almost one-third of value-added

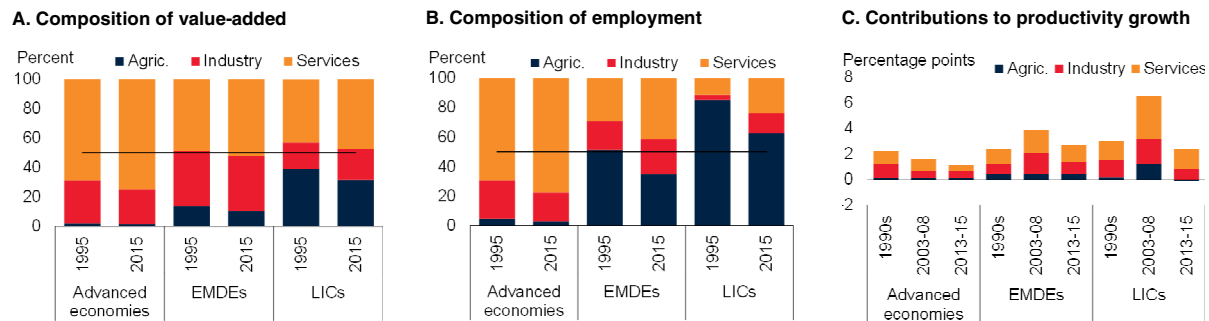
²Diao, McMillan, and Rodrik (2017) and McMillan, Rodrik, and Verduzco-Gallo (2014) employ 38 and 39 countries; Martins (2019) use 7 sectors and 169 countries, and International Monetary Fund (2018) use 10 sectors and 62 countries. Further disaggregation using micro panel data (such as by Hicks et al. 2017) would help to ensure differences in marginal product are accounted for.

³The high productivity extractive sectors offer few opportunities for sectoral reallocation and are intrinsically limited by the size of the resource, and market power. It should be noted that refining and processing of extractives can sometimes be classified as manufacturing in resource rich countries.

BOX 3.2 Sectoral sources of productivity growth (continued)

FIGURE 3.2.1 Agriculture, industry and services

In part as a result of a several decades of sectoral reallocation away from agriculture, agriculture now accounts for only 10 percent of EMDE value-added—one-quarter less than two decades earlier and less than one-third the share of industrial production. LICs are an exception; agriculture still accounts for one-third of value-added in these economies, more than industry. Meanwhile, services sectors—which include a highly heterogeneous set of activities—have grown rapidly over the past two decades, accounting for about half of post-crisis productivity growth.



Source: APO productivity database, Expanded African Sector Database, Groningen Growth Development Center Database, Haver Analytics, ILOSTAT, OECD STAN, United Nations, World KLEMS.

Note: Based on sample of 80 countries.

A.B. Share of agricultural, industry and services in value added. Industry includes mining, manufacturing, utilities, and construction. Services include trade services, transport services, financial and business services, government and personal services. Black horizontal line indicates 50 percent.

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(Figure 3.2.2).⁴ Since the 1990s, the productivity dispersion within the manufacturing and service sectors, has narrowed. Similar differentials, between the most productive sector (financial and business services) and the least productive sector (agriculture), in advanced economies are considerably narrower.

Wide sectoral productivity differentials across countries.

Productivity in all sectors is lower in EMDEs than in advanced economies, and lower again in LICs. The gap between EMDE and advanced-economy productivity is particularly wide (almost 80 percent) in agriculture, which tends to be characterized by smallholder ownership and family farms in EMDEs (Lowder, Scoet, and Raney 2016). This reflects in part slow technology adoption in the agriculture sector in some of the poorest EMDEs. In mining, which tends to be dominated globally by a few large companies, the productivity gap is considerably narrower (just over 20 percent).

Sectoral productivity growth. Productivity growth in the various subsectors of services varied widely, from negative

(pre-crisis) or near zero (post-crisis) in mining to the highest sectoral growth rates (4.8 percent) in transport services in EMDEs in 2003-08 (Duernecker, Herrendorf, and Valentinyi 2017).⁵ The post-crisis (2013-15) slowdown in manufacturing productivity growth was the largest among all nine sectors, nearly 2 percentage points below the pre-crisis average (2003-08).

In advanced economies, the post-crisis productivity growth slowdown was broad-based across almost all sectors (except construction). More than one-half of the post-crisis (2013-15) slowdown in productivity growth from pre-crisis rates (2003-08) in the average EMDE originated in the manufacturing sector. The slowdown in agricultural productivity growth had only a limited aggregate effect in EMDEs due to its relatively small share in the economy. In contrast, EMDE productivity growth picked up after

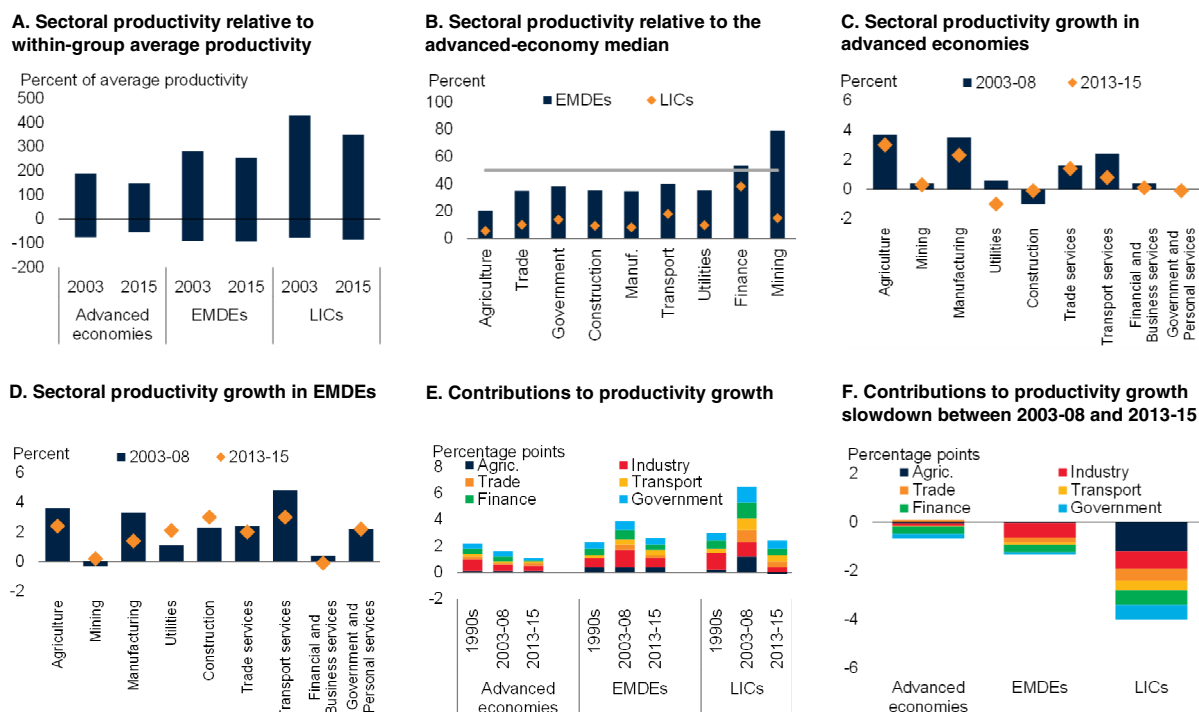
⁴ As agricultural workers often do not work full time in agriculture, the sectoral gap is diminished if productivity is measured per hours instead of per worker (McCullough 2017). However, even after accounting for hours and human capital per worker, a large sectoral gap remains for many of countries (Gollin, Lagakos, and Waugh 2014).

⁵ Two waves of service sector growth have been identified in the literature: a first wave in countries with relatively lower income levels and a second wave in countries with higher income levels. The first wave appears to be made up primarily of traditional (personal) services, the second wave of modern (financial, communication, computer, technical, legal, advertising and business) services that are receptive to the application of information technologies and tradable across borders (Eichengreen and Gupta 2013). Moreover, there is evidence of the second wave also occurring in lower income countries after 1990 which are democracies, and have high trade and financial openness.

BOX 3.2 Sectoral sources of productivity growth (continued)

FIGURE 3.2.2 Sectoral labor productivity

Productivity differs widely across sectors and subsectors, especially in EMDEs and even more so in LICs. Productivity in all sectors is lower in EMDEs than in advanced economies, and lower again in LICs. The gap to advanced-economy productivity is particularly wide in agriculture, and narrow in mining. Industry was the main source of pre-crisis productivity growth; its slowdown accounted for more than half the post-crisis slowdown in aggregate productivity in EMDEs.



Source: APO productivity database, Expanded African Sector Database, Groningen Growth Development Center Database, Haver Analytics, ILOSTAT, OECD STAN, United Nations, World KLEMS.
 Note: Based on samples of 80 countries. Median of the county-specific productivity level, or growth rate.
 A. Bar charts range from the minimum to the maximum sector productivity gap.
 B. Sectoral productivities compared at PPP exchange rates.
 E.F. "Industry" includes mining, manufacturing, utilities, and construction; "Finance" includes business services; "Government" includes personal services.
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the global financial crisis in construction, utilities and mining.

Role of sectoral reallocation

Framework. The productivity differentials between sectors offer the potential for productivity gains from labor reallocation towards higher-productivity sectors, in addition to within-sector productivity gains (Figure 3.2.3).⁶ This is captured in a shift-share analysis that

decompose aggregate labor productivity into within-sector and between-sector components (Wong 2006, Padilla-Pérez and Villarreal 2017). *Within-sector productivity growth* captures changes in aggregate labor productivity growth due to productivity improvements within sectors. This may reflect improvements in human capital, investments in physical capital, or the reallocation of resources from the least to the most productive firms within each sector. *Between-sector productivity growth* is driven by the change in employment share and the productivity differential. It reflects both the reallocation of resources to sectors with higher productivity *levels* (static sectoral effect), and the reallocation of employment towards sectors with higher productivity *growth* (dynamic

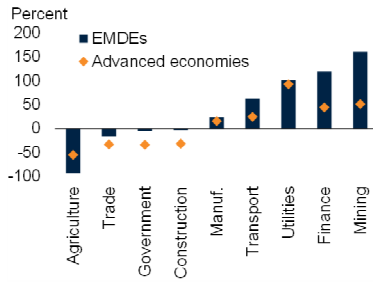
⁶ However, Fuglie et al. (2019) point out that different factor shares in value added would result in a gap of average labor productivity even if the factor allocation is efficient. A gap in average productivity is not sufficient evidence of misallocation because labor productivity can be equalized at the margin.

BOX 3.2 Sectoral sources of productivity growth (continued)

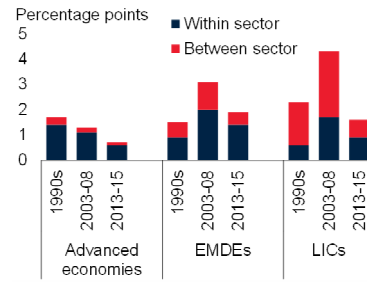
FIGURE 3.2.3 Between- and within-sector sources to productivity growth

While productivity growth in advanced economies has predominantly originated within sectors, between-sector gains have accounted for a sizable portion of EMDE productivity growth, and its post-crisis slowdown. In EMDEs, the between-sector productivity gains have involved shifts out of agriculture into higher-productivity sectors that have differed over time.

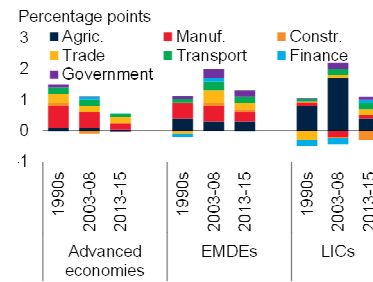
A. Sectoral productivity relative to country productivity



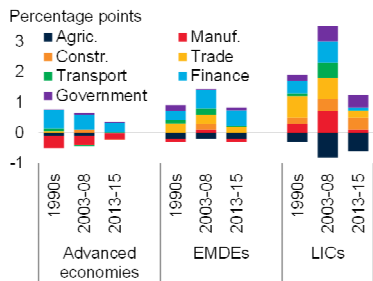
B. Contributions to productivity growth



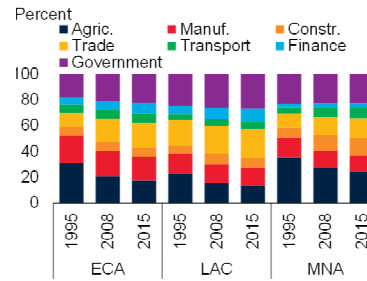
C. Contributions to within-sector productivity growth



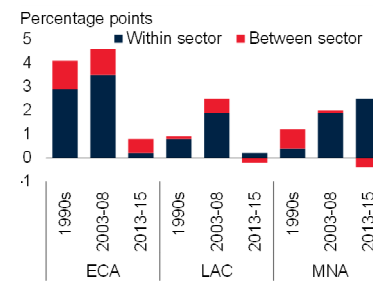
D. Contributions to between-sector productivity growth



E. ECA, LAC, MNA: Composition of employment



F. ECA, LAC, MNA: Contributions to productivity growth



Source: APO productivity database, Expanded African Sector Database, Groningen Growth Development Center Database, Haver Analytics, ILOSTAT, OECD STAN, United Nations, World KLEMS.

B-D. Growth within sector shows the contribution of initial real value-added weighted productivity growth rate and structural change effect give the contribution arising from changes in the change in employment share. Median of the county-specific contributions. Based on samples of 80 countries. "Manuf." includes mining and utilities; "Finance" includes business services; "Government" includes personal services.

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sectoral effect). Underlying drivers of such between-sector productivity growth include changes in household's preferences and changes in relative sectoral productivity, in part as a result of diverging evolutions of labor quality (Lagakos and Waugh 2013).⁷

⁷Improvements in agricultural productivity can significantly reduce agriculture's share of employment, contributing to between-sector productivity growth (Gollin, Parente, and Rogerson 2007). The role of agriculture in structural change depends on economic integration within the domestic economy and with global markets (Barrett et al. 2017).

Decomposition of aggregate productivity growth. While productivity growth in advanced-economies has predominantly originated within sectors, between-sector gains have accounted for one-third of EMDE productivity growth since the 1990s. In part as a result of narrowing cross-sector productivity differentials and, in some regions, labor movements into lower-productivity sectors, fading sectoral reallocation has accounted for about one-half of the post-crisis slowdown in EMDE productivity growth. The between-sector EMDE productivity gains have involved shifts out of agriculture into higher-productivity sectors that have differed over time.

BOX 3.2 Sectoral sources of productivity growth (continued)

- *Advanced economies.* Productivity growth in advanced economies, where sectoral productivity differentials tend to be narrower than in EMDEs, has been almost entirely driven by within-sector productivity growth since the 1990s. Within-sector productivity growth has dwindled to 0.6 percent during 2013-15—less than half its 1990s average (Figure 3.2.3). The predominant structural change has been the reallocation of resources from manufacturing to the financial and business services sector, two sectors with comparable levels of productivity.
- *EMDEs.* In contrast, between-sector productivity gains in EMDEs boosted productivity growth pre-crisis (2003-08) by 1.1 percentage points. Post-crisis, this contribution fell to 0.5 percentage points, accounting for about one-half of the slowdown in EMDE productivity growth. Between-sector productivity gains have mainly reflected a move out of agriculture and manufacturing into services. In LICs, between-sector gains accounted for almost half of post-crisis productivity growth, down from almost three-quarters of pre-crisis productivity growth.⁸ Whereas pre-crisis between-sector productivity gains in LICs mainly reflected a shift out of agriculture into manufacturing, their main post-crisis source was a shift out of agriculture into services such as trade services and finance and business services that have benefited from information and computing technologies (Eichengreen and Gupta 2013).

Leapfrogging. Over the two decades until the global financial crisis, one-third of the EMDE employment that left agriculture moved into industrial sectors (predominantly manufacturing and construction) and another one-third into trade services. The share of agricultural employment in EMDEs declined by 9.4 percentage points between 1995 and 2008 while the shares of industry and trade services rose by 2.5 and 3.0 percentage points, respectively. Although trade services and construction typically have below-average productivity and manufacturing productivity is near the EMDE average, the employment shift out of extremely low-

productivity agriculture generate aggregate productivity gains. In LICs, a somewhat larger portion (almost half) of the 10 percentage point decline in the share of agricultural employment was absorbed by trade services and only just over one-third by industry. The phenomenon of employment shifting out of agriculture into services has been dubbed “leapfrogging” in the context of concerns about premature deindustrialization (Rodrik 2016). Looking ahead, productivity gains arising from low-skilled labor shifting out of agriculture into manufacturing or services may diminish if robotization and artificial intelligence discourage this movement.

Deindustrialization. In three regions—Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), the Middle East and North Africa (MNA)—the manufacturing sector’s (as well as agriculture’s) share of employment has shrunk since the crisis, continuing a pre-crisis trend.⁹ Employment has largely shifted into construction (MNA), finance (ECA, LAC) and trade services (ECA, MNA). Since some of these sectors, especially construction and trade services, have lower productivity than manufacturing, this has resulted in a sharply lower contribution (ECA) or even negative contribution (LAC, MNA) of between-sector sources of productivity growth (Rodrik 2016). In LAC, for example, trade liberalization in the 1990s led to cheaper manufacturing imports and a contraction in employment in the uncompetitive manufacturing sector. Much of this labor was absorbed in construction and trade services that were buoyed by pre-crisis commodity boom (Gollin, Jedwab, and Vollrath 2015).

Conclusion

Large sectoral productivity differentials in EMDEs and LICs offer the potential of additional productivity gains when labor moves towards higher-productivity sectors. Such between-sector productivity gains have contributed importantly to productivity growth in EMDEs and LICs since the 1990s. However, since the global financial crisis, these gains appear to have faded.

⁸This is consistent with Diao, McMillan, and Rodrik (2017) and, for Sub-Saharan Africa, McMillan, Rodrik, and Verduzco-Gallo (2014).

⁹To some degree this could reflect an outsourcing of parts of the manufacturing sector to the service sector.