CHAPTER 3

SLOWDOWN IN GLOBAL MEDIUM-TERM GROWTH: WHAT WILL IT TAKE TO TURN THE TIDE?

The global economy, while demonstrating remarkable resilience to recent shocks, faces a sobering reality: its medium-term growth prospects have consistently been revised downward since the 2008–09 global financial crisis. This reflects a downward trend in actual global growth, with the slowdown starting in the early 2000s in advanced economies and after the crisis in emerging market and developing economies. This chapter examines the factors behind this trend, revealing that a significant and broad-based slowdown in total factor productivity growth accounted for more than half of the growth decline. This deceleration was driven in part by increased misallocation of capital and labor across firms within sectors. A widespread drop in postcrisis private capital formation and slower working-age-population growth in major economies exacerbated the slowdown. This chapter predicts that, without timely policy interventions or a boost from emerging technologies, global growth will be only 2.8 percent by the end of the decade, significantly below its prepandemic (2000–19) average by a gap of 1 percentage point. This highlights the urgent need for policies and structural reforms that enhance growth by improving capital and labor allocation to more productive firms, enhancing labor force participation, and harnessing the potential of artificial intelligence. Such measures are critical, especially in light of challenges such as high public debt and geoeconomic fragmentation, which could further constrain global growth.

Introduction

Since the 2008–09 global financial crisis, forecasters have persistently lowered their expectations for growth over the medium term (Figure 3.1). Estimates of potential output growth—an economy's maximum noninflationary growth given its resources and technological capabilities—indicate a similar decline (Kilic Celik, Kose, and Ohnsorge 2023). This suggests a possible downshift to a lower-growth regime.

The growth decline implies worsening prospects for living standards and global poverty reduction. An entrenched low-growth environment, coupled with high interest rates, would threaten debt sustainability and could fuel social tension and hinder the green transition. Furthermore, expectations of weaker growth may deter investment in capital and technologies and so, in part, become self-fulfilling. Therefore, addressing the weakening growth outlook is a policy priority for all economies.

Changes in growth performance can be attributed to the contributions of labor and capital inputs and the efficiency of their use—known as total factor productivity (TFP). Among these proximate drivers, growth in labor inputs is held back by demographic pressures and declining labor force participation trends (Chapter 2 of the April 2018 *World Economic Outlook* [WEO]; Goodhart and Pradhan 2020). In addition, ever since the global financial crisis, anemic private investment in advanced economies has impeded capital deepening (Chapter 4 of the April 2015 WEO; Döttling, Gutiérrez, and Philippon 2017). However, a comprehensive analysis of business investment dynamics that includes emerging market economies is lacking.

TFP, a prime contributor to trend growth, can increase through *within-firm* productivity increases resulting from technological progress and through better resource allocation *across firms*—resources flow toward more productive firms—improving overall "allocative efficiency" in an economy (Restuccia and Rogerson 2008). Whereas technological advances have attracted extensive research, little attention has been paid to how allocative efficiency varies over time and how shifts in allocative efficiency have affected TFP growth.[1] To fill this gap, this chapter employs an

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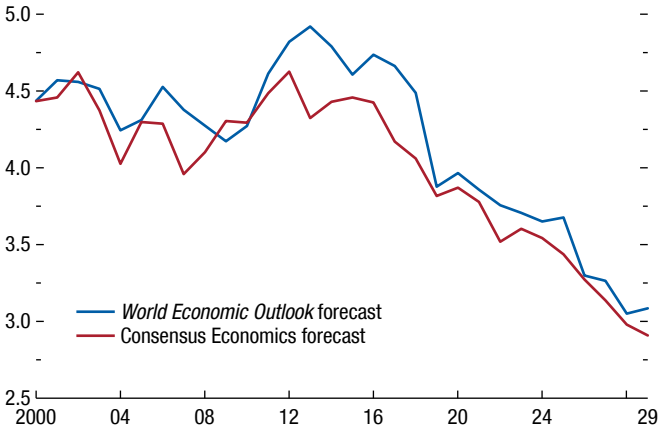
[1]The contribution of slowing innovation to the decline in TFP growth has already been studied extensively; see, for example, Gordon (2016); Bloom and others (2020); Chapter 3 of the October 2021 *World Economic Outlook;* and Acemoglu, Autor, and Patterson (2023). In addition, a large body of literature, surveyed in Restuccia and Rogerson (2017) and including Chapter 2 of the April 2017 *Fiscal Monitor*, has studied the role of misallocation in explaining global gaps in productivity levels. Unlike that literature, this chapter focuses on changes in misallocation over time, their causes, and their contribution to recent and prospective TFP growth.

Figure 3.1. Five-Year-Ahead Real GDP Growth Projections, 2000–29
(World growth, percent)



Sources: Consensus Economics; and IMF staff calculations.
Note: *World Economic Outlook* (WEO) sample comprises 196 economies and Consensus Economics sample comprises 88 economies. Global real GDP growth projections are calculated using GDP in purchasing power parity in international dollar weights. The years on the horizontal axis refer to the year for which a forecast is made, using the April WEO from five years earlier. For example, the 2029 forecast is based on the April 2024 WEO, and so on. The red line depicts the mean of the Consensus Economics forecasts.

approach developed by Hsieh and Klenow (2009) that proposes that a growing gap in revenue productivity among firms signals a decline in allocative efficiency (see Box 3.1 for detailed explanations of the notion and measurement of allocative efficiency).

In this context, this chapter seeks to answer the following questions:

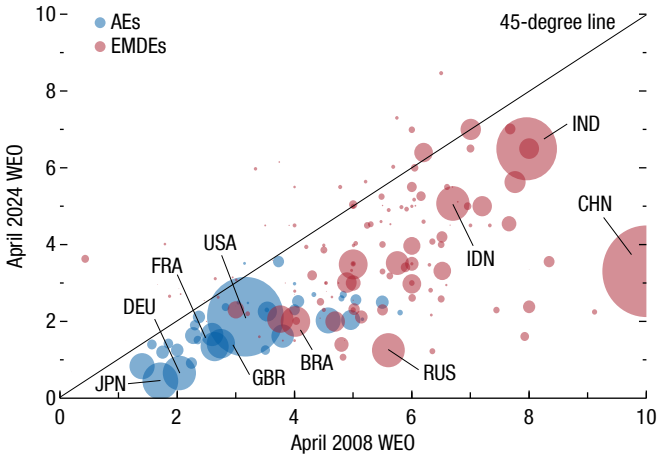
- *What are the insights from forecasts?* How did forecasters' views on medium-term growth evolve, and what do they imply about income inequality and convergence?
- *How did we get here?* What factors account for the decline in actual growth over the past two decades? What role did demographics and private investment play? To what extent have changes in allocative efficiency affected productivity growth?
- *Where is growth heading?* What are the potential trajectories for medium-term growth given demographic trends and prevailing economic forces, such as higher debt burdens, geoeconomic fragmentation, and the emergence of artificial intelligence (AI)? What policies could enable a return to the higher growth rates seen in the two decades preceding the pandemic?

To answer these questions, the chapter begins by examining medium-term (five-year-ahead) WEO growth projections, alongside actual growth trends, over the past three decades across a wide range of economies. Subsequent sections provide in-depth analysis of the proximate drivers of growth: labor inputs, private capital formation, and allocative efficiency. Last, the chapter presents various scenarios to assess the likely growth paths in the medium term and the potential effects of policy interventions.

The chapter's main findings are as follows:

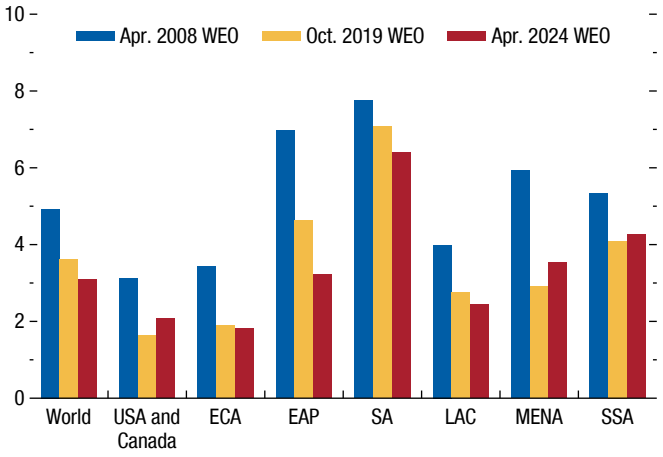
- *The decline in medium-term growth projections is widespread, reflecting secular forces rather than forecaster pessimism*. Expectations for medium-term growth have been revised downward across all income groups and regions, most significantly in emerging market economies.
- *Actual growth has similarly declined, and this is largely because of TFP growth dynamics.* In advanced economies, productivity growth started to decrease before the global financial crisis. In contrast, TFP growth in emerging market and developing economies rose before the crisis and then fell, mirroring the globalization cycle. For both, changes in TFP growth have significantly shifted overall economic growth, accounting for more than half of the decline in advanced and emerging market economies and nearly all of the decline in low-income countries.
- *Increased misallocation of capital and labor among firms has exerted a drag on TFP of 0.6 percentage point a year in the economies considered in the analysis.* This suggests that TFP growth could have been 50 percent higher if misallocation had not increased. Most of this misallocation increase is because of uneven firm productivity growth within sectors, requiring reallocation of capital and labor, which was impeded by economic frictions. Although shocks may temporarily worsen misallocation, two-thirds of it at any time can be attributed to persistent structural frictions, which policy measures can address to lift productivity.
- *Reduced private capital formation since the global financial crisis in many advanced and emerging market economies has also contributed to the growth decline.* Deterioration in firms' valuations relative to the cost of capital and rising corporate leverage are the two most important firm-specific factors contributing to the decline in business investment. At the macroeconomic level, lackluster growth

Figure 3.2. Five-Year-Ahead Real GDP Forecast by Country: April 2008 versus April 2024
(Percent)



Source: IMF staff calculations.
Note: Bubble size reflects size of the economy using April 2024 GDP in purchasing-power-parity international dollars. Data labels in the figure use International Organization for Standardization (ISO) country codes. AEs = advanced economies; EMDEs = emerging market and developing economies; WEO = *World Economic Outlook*.

Figure 3.3. Five-Year-Ahead Real GDP Forecast by Regions, 2008, 2019, and 2024
(Percent)



Source: IMF staff calculations.
Note: The figure uses GDP in purchasing-power-parity international dollars from the corresponding vintages for aggregation. EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = sub-Saharan Africa; USA = United States; WEO = *World Economic Outlook*.

performance and uncertainty have inhibited investment in advanced economies.

- *Demographic pressures weighing on labor supply are expected to intensify in the medium term in most advanced economies and major emerging markets, contributing to lower global growth.* By 2030, global labor supply growth is projected to be a mere 0.3 percent, less than a third of its average in the decade before the pandemic.
- *Confronted with several structural headwinds, returning global growth to its historical average requires both strong policy support and harnessing the potential of emerging technologies.* Based on projected demographic trends and conservative assumptions about technological progress, global growth in the medium term could fall below 3 percent. Returning to the historical (2000–19) annual growth average of 3.8 percent requires growth-enhancing policies and reforms. Their implementation should aim to improve allocative efficiency and labor participation and facilitate cross-border trade and knowledge exchange. These policies and reforms should also enhance innovation capabilities and maximize the capacity to benefit from technological advances such as AI.

Insights from Medium-Term Forecasts

Five-year-ahead WEO growth projections show a broad-based downturn in growth prospects since 2008 that affects nearly 82 percent of economies, including the world's largest (Figure 3.2). Notably, the five largest emerging market economies—Brazil, China, India, Indonesia, and Russia—contributed approximately 0.8 percentage point of the 1.8 percentage point drop in projected global growth. The downshift is evident across different regions and most pronounced for East Asia and the Pacific (Figure 3.3).

The dimming growth outlook raises two questions. First, could it be driven by growing pessimism among forecasters, especially after recent global shocks? Tracking the average discrepancy between forecast and realized growth shows no evidence of pessimism bias (Online Annex Figure 3.1.1).[2] The subdued prospects could in part reflect a correction to previous optimism, especially since 2012. Second, to what extent does the dimming outlook reflect secular growth trends? Forecasters typically consider the medium term the

[2]All online annexes are available at www.imf.org/en/Publications/WEO.

horizon during which economies close the gap between actual and potential output. Indeed, the evidence suggests that WEO medium-term growth forecasts are generally well aligned with projections of potential output growth (Online Annex Figure 3.1.2). Deviations have occurred only after crises when forecasters expected faster growth (relative to potential) to close a large output gap.

The decline in global growth forecasts may in part reflect progress in living standards and a subsequent slowdown in growth rates. However, when the historical pace of income convergence across countries is considered, the catch-up efforts of emerging market and developing economies explain only about a quarter of the projected global growth decline since 2008 (see Box 1.1 of the October 2023 WEO). In addition, the more accelerated decline in growth prospects in these economies, compared with that in advanced economies, poses concerns about future convergence. Using various measures, Box 3.2 suggests that the pace of convergence in regard to income and social welfare is slowing or potentially reversing over the medium term—in stark contrast to prepandemic historical trends.

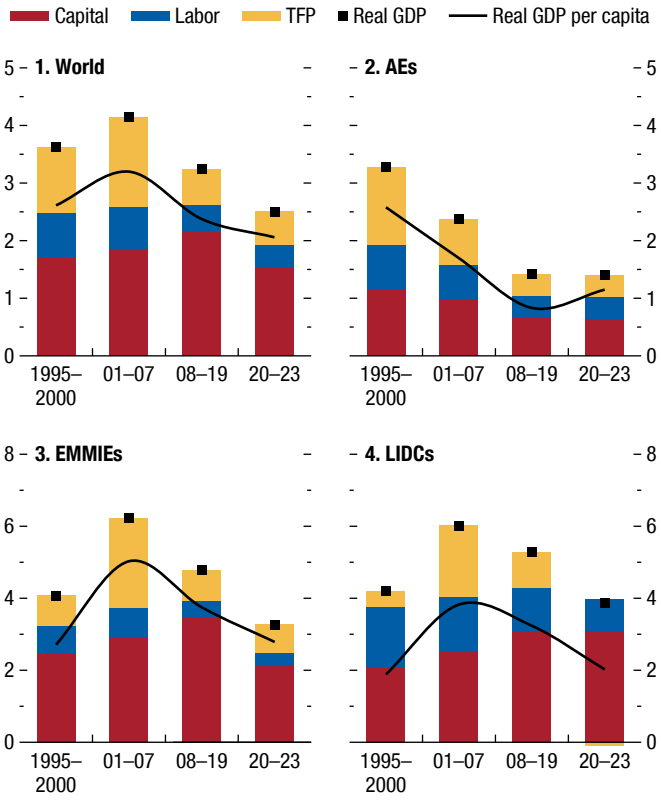
How Did We Get Here?

World growth accelerated from the early 2000s until the global financial crisis in 2008 and has declined ever since (Figure 3.4), aligned with the dynamics of medium-term projections. This pattern has been reflected in both emerging market economies and low-income countries, mirroring the ebbs and flows in globalization that have affected capital flows and productivity. Advanced economies, however, have experienced declining growth, beginning in the early 2000s.[3] In per capita terms, GDP growth has followed a similar trend in all country groups, with a modestly smaller postcrisis decline as population growth has slowed.

For all country groups, these shifts in growth have primarily been the result of changes in TFP growth. In advanced economies, annual TFP growth fell from 1.3 percent during 1995–2000 to 0.2 percent after the pandemic, accounting for half of the GDP growth reduction. Similarly, in emerging market economies and low-income countries, TFP growth dropped from 2.5 percent and 2 percent, respectively, during 2001–07 to just 0.7 percent and nearly zero, respectively, after the pandemic. In addition, slower capital formation after 2008 for advanced economies and since 2013 for emerging market economies has also contributed to the global growth slowdown. A consistent decline in the labor contribution as a result of an aging population and a related retreat in labor force participation in major economies have also played a role.

This section examines each component of output growth to understand the drivers behind their trends.

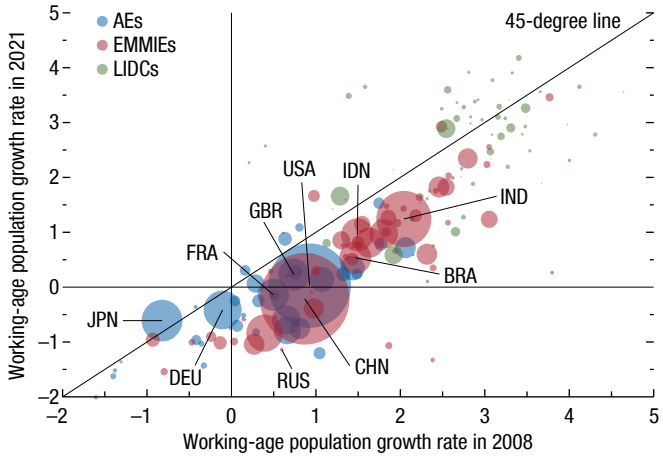
Figure 3.4. Contribution of Components of GDP Growth, 1995–2023
(Percent)



Sources: International Labour Organization; Penn World Table version 10.01; United Nations, World Population Prospects; and IMF staff calculations.
Note: Growth decomposition sample comprises 140 countries. Contributions of capital growth and labor growth reflect output share of respective factor inputs and their growth rates. AEs = advanced economies; EMMIEs = emerging market and middle-income economies; LIDCs = low-income developing countries; TFP = total factor productivity.

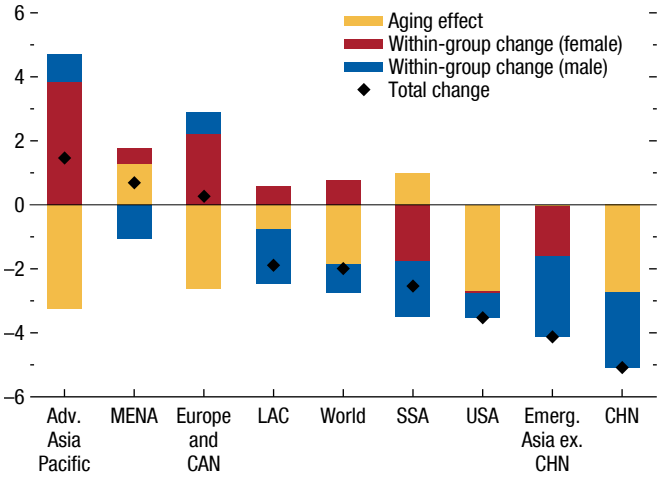
[3]GDP mismeasurement with expansion of the digital economy is often mentioned as a potential explanation for the productivity slowdown, particularly in the United States. The quantitative relevance of this issue, however, remains an open question. For instance, Syverson (2017) provides evidence that challenges the "mismeasurement hypothesis"; Crouzet and Eberly (2021) estimate that it may account for a significant share of the decline in TFP and, consequently, GDP growth.

Figure 3.5. Slowdown in the Growth of the Working-Age Population, 2008 versus 2021
(Growth in the working-age population, percent)



Sources: United Nations, World Population Prospects; and IMF staff calculations.
Note: Working-age population is defined as people ages 15 to 64. Outlier countries are excluded to enhance presentation. Including them does not change the pattern. Data labels in the figure use International Organization for Standardization (ISO) country codes. AEs = advanced economies; EMMIEs = emerging market and middle-income economies; LIDCs = low-income developing countries.

Figure 3.6. Breakdown of Change in Labor Force Participation Rate, 2008–21
(Percentage points)



Sources: International Labour Organization; and IMF staff calculations.
Note: Adv. Asia = advanced Asia; CAN = Canada; CHN = China; Emerg. Asia = emerging Asia; ex. = excluding; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SSA = sub-Saharan Africa; USA = United States.

A Demographic Drag on the Labor Supply

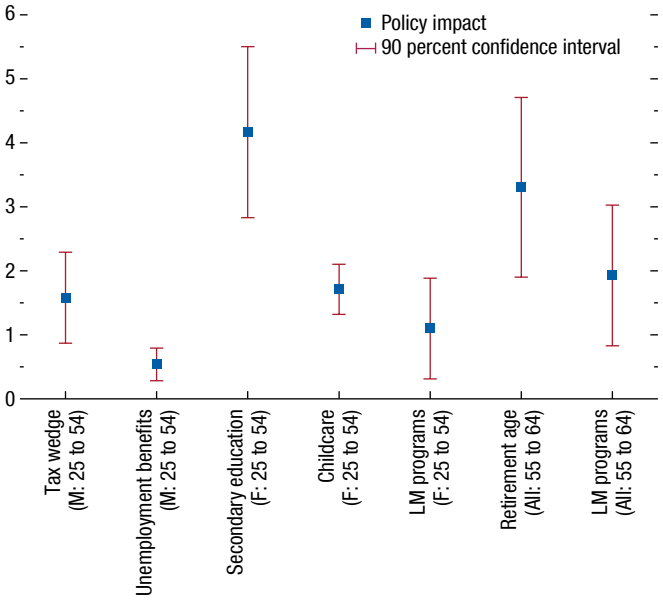
As a country undergoes a demographic transition, with declining fertility rates and an aging population, the share of its working-age population starts to shrink. Several large economies (Canada, China, United Kingdom, United States) experienced this turning point around the time of the global financial crisis (Online Annex Figure 3.2.1), in line with a noticeable decline in labor's contribution to growth (Figure 3.4).

Since 2008, growth in the working-age population (ages 15–64) has slowed in about 92 percent of the global economy and has been negative in about 44 percent (Figure 3.5). The slowdown is visible in most advanced and emerging market economies, whereas low-income countries still enjoy a demographic dividend. These demographic shifts have a direct bearing on global labor supply. Countries with a current demographic dividend could help support growth in the global workforce, in which nearly two in every three new entrants over the medium term will come from India and sub-Saharan Africa. The global imbalance in labor supply also hints at the importance of migrant workers for advanced economies.

As the labor force ages and the share of older workers increases, aggregate labor force participation may also suffer, since older workers are less likely to participate in the labor market. Shift-share analysis helps tease out some effects of aging and gender disparities in labor force participation on aggregate participation rates (Figure 3.6). First, aggregate labor force participation rates declined somewhat significantly between 2008 and 2021 in most world regions, except Advanced Asia and the Pacific, the Middle East and North Africa, Europe, and Canada. Second, the drag on participation from aging is visible in all advanced economies and China, and to a lesser extent in Latin America. Third, advanced economies—except the United States—managed to counter this aging effect by significantly increasing their within-group labor force participation, mostly through impressive gains in female participation and higher participation of older workers. The decline in average hours worked in Europe (Astinova and others 2024) may have countered some of these gains. Last, for emerging market economies and the United States, the decline in male participation was a drag on aggregate participation.

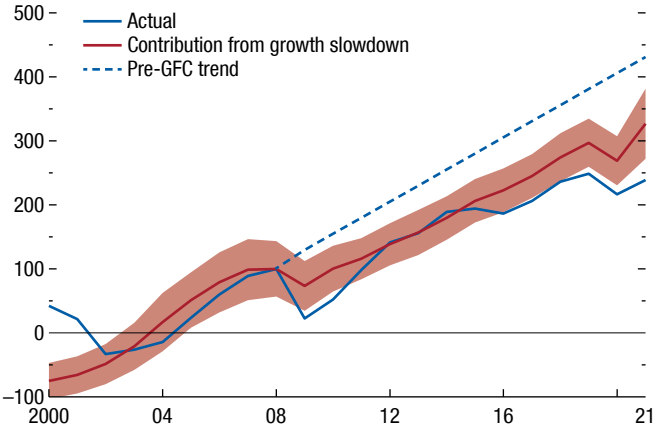
Although these trends were evident before 2019, the pandemic shock has exacerbated the drop in participation somewhat, especially in emerging markets. The initial pandemic shock led to a strong retraction in participation rates between 2019 and 2020, especially in China and Latin America, with some recovery in 2021. That noted, participation remained broadly

Figure 3.7. Policies and Labor Force Participation by Gender and Age
(Change in labor force participation rate, percentage points)



Sources: International Labour Organization; Organisation for Economic Co-operation and Development; and IMF staff calculations.
Note: The estimated policy impact is due to a change in the policy variable from the 75th to the 25th percentile within the distribution of policy variation in the sample, and where the change is aimed at enhancing labor force participation. The sample comprises 26 advanced economies and 3 emerging market economies. F = female; LM programs = labor market programs; M = male.

Figure 3.8. Real Business Investment in OECD Countries
(Index, 2008 = 100)



Sources: Organisation for Economic Co-operation and Development (OECD); and IMF staff calculations.
Note: The figure plots the aggregate business investment for the 21 OECD economies listed in Online Annex 3.2. Actual and predicted real business investment growth are cumulated from 1999 and indexed at 100 in 2008. Predicted values for investment growth are obtained by multiplying the estimated investment-output elasticity reported in Online Annex Table 3.2.3 by output growth. Weaker economic activity is defined as a deceleration in output growth. Pre-GFC trend is the expected linear path of the business investment index in 2002–08. Shaded area denotes the 90 percent confidence interval. GFC = global financial crisis.

lower than in 2019, especially in Latin America, where participation declined about 1.9 percentage points, and in the United States, where it lost about 1.4 percentage points.[4]

Besides cyclical and structural factors, policies can also improve labor participation rates.[5] To understand how policy variations may have contributed to differences across countries, Figure 3.7 shows the estimated impacts of selected policy changes on the participation of different gender-age groups.

The estimates suggest that reduced unemployment benefits and lower labor taxes are associated with higher participation for men of prime working age. For women, an expansion in secondary education enrollment has a positive association with future participation rates. Similarly, labor market programs (such as retraining and reskilling) and childcare programs appear to be supportive. For older workers, retirement-age reforms and spending on labor market programs are also associated with higher participation, which is of particular importance since the population share of this group is on the rise.

Anemic Private Capital Formation

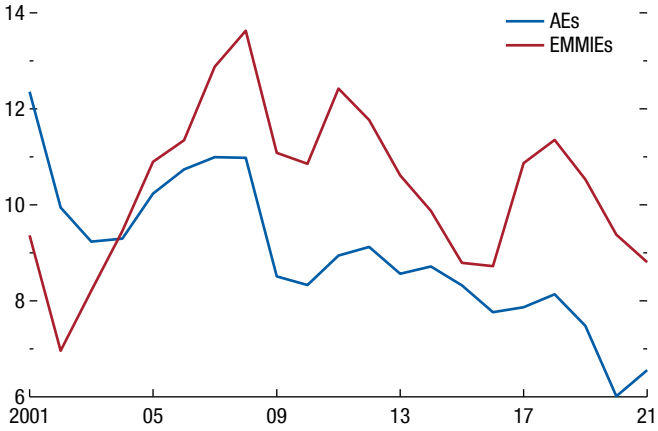
The second proximate driver of economic growth is capital formation. In Organisation for Economic Co-operation and Development economies, business investment—the bulk of total investment—tumbled after 2008, and in 2021 it fell by about 40 percent of its pre-global-financial-crisis trend (Figure 3.8).

This section starts by examining whether the slowdown in economic activity since the 2008 global financial crisis has impeded economy-wide business investment. It uses "narrative fiscal shocks"—fiscal policy changes aimed at reducing budget deficits, likely

[4]More recent data for 2022 for a subset of the economies in the sample reveal upward revisions for participation rates in Chile, Colombia, India, and Thailand. In addition, more recent estimates for labor force participation in the United States suggest some recovery.

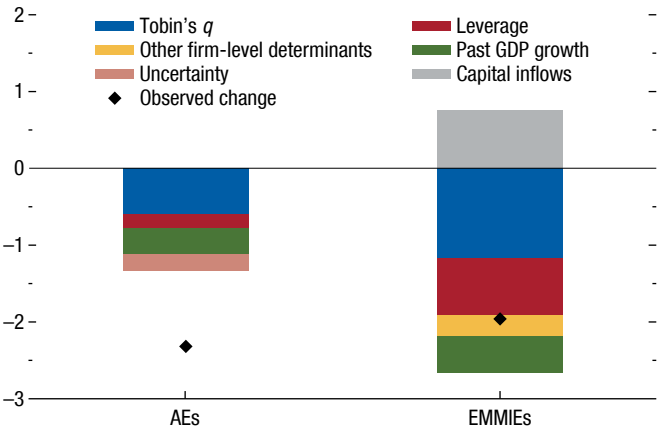
[5]To explain the potential role of policies, the chapter estimates a country panel regression to investigate how participation rates for different age and gender groups respond to policies. This exercise covers only Organisation for Economic Co-operation and Development (OECD) countries, since data on policy variables for non-OECD countries are lacking (see Online Annex 3.2 for details). Given the potential endogeneity of the policies, the results of this exercise should be interpreted as associational and not necessarily causal.

Figure 3.9. Net Investment Rates in Advanced and Emerging Market Economies
(Percent)



Sources: Thomson Reuters Worldscope; and IMF staff calculations.
Note: The net investment rate is computed as aggregate investment over aggregate lagged capital stock net of depreciation. See Online Annex 3.2 for details. The numerator is computed by summing firm-level net investment at the country-year level; the denominator is computed by summing firm-level capital at the country-year level. The figure plots the average ratio for AEs and EMMIEs using GDP in purchasing power parity in international dollar weights. AEs = advanced economies; EMMIEs = emerging market and middle-income economies.

Figure 3.10. Contribution of Firm- and Macro-Level Determinants to Changes in the Investment Rate since 2008
(Percentage points)



Sources: Ahir, Bloom, and Furceri 2022; Thomson Reuters Worldscope; and IMF staff calculations.
Note: The black diamonds represent the average change in investment rates for AEs and EMMIEs since 2008 compared with the period before 2008. For AEs, pre-2008 averages are computed over 2000–08. For EMMIEs, pre-2008 refers to 2006–08. Each layer in the bars represents the average change in the corresponding regressor multiplied by its estimated coefficients. Only regressors with significant coefficients are included. Changes are aggregated at the country level using as weights the relative capital share of each firm. Averages for AEs and EMMIEs are computed using GDP in purchasing power parity in international dollar weights. AEs = advanced economies; EMMIEs = emerging market and middle-income economies; Tobin's q = the ratio of the market value to the book value of a firm's assets.

not responding to economic conditions—as an instrumental variable to analyze the investment-output relationship.[6] The results show that for every 1 percentage point decline in output growth that is not triggered by a contraction in business investment, there is a corresponding 2 percentage point decrease in investment growth. This estimated output-investment relationship is used to calculate the investment shortfall from the growth slowdown following the global financial crisis. Comparing with the precrisis trend, Figure 3.8 suggests that as of 2021, about half of the shortfall in business investment since 2008 can be linked to weaker economic activity.

This exercise, however, provides only a partial view of investment determinants. To gain further insights into constraints on investment, besides economic activity, the chapter explores the characteristics of firms that reduced their investment.

Using firm balance sheet and income statement data, the analysis examines publicly listed firms in 32 advanced economies and 13 emerging markets (see Online Annex 3.2 for details). Figure 3.9 plots the net investment rate—defined as investment divided by lagged capital stock net of depreciation—aggregated across the sample economies. Importantly, both investment and capital stock figures account for intangibles, which are crucial for understanding investment dynamics (see Online Annex 3.2). Consistent with investment trends in Organisation for Economic Co-operation and Development countries (Figure 3.8), the figure shows net investment rates in advanced and emerging market economies declining after 2008.

The chapter uses regression analysis with firm-level data to shed light on the most important firm- and macro-level factors determining the investment decline since 2008 (see Online Annex Table 3.2.5). The findings align with theoretical expectations: investment rates increase with a firm's market value relative to its cost of capital ("Tobin's q"), profits, and cash stock but decrease with higher corporate leverage and the cost of debt.

Figure 3.10 shows that the overall investment rate has declined, on average, by about 2.3 percentage points in advanced economies and 2 percentage points

[6]The narrative fiscal shocks are used as instruments for output growth to address endogeneity concerns that result from simultaneous feedback between investment and output (see Online Annex 3.2 for details). They are constructed based on Pescatori and others (2011) and extended to 2021 for 21 OECD economies. The p-value of the first-stage F-statistic is below 0.1 percent, indicating that the narrative fiscal shocks are relevant in explaining output growth.

in emerging markets. Of that investment decline, the regression analysis reveals that more than half in advanced economies and virtually all in emerging markets can be explained by the determinants included in the analysis.

Since 2008, Tobin's *q*, an indicator of firms' future productivity and profitability expectations, has decreased by 10 to 30 percent on average, contributing to the bulk of the explained decline in investment in both advanced and emerging market economies (Figure 3.10). In emerging markets, the 20 percent average increase in leverage after 2008 is notable as a factor in the overall fall in investment rates (see Online Annex Figure 3.2.4).

The decline in GDP growth since 2008 helps explain the investment decline, even after key firm-level investment determinants are controlled for. Rising uncertainty after 2008 makes a smaller but still significant contribution to the investment decline in advanced economies. In emerging markets, increased capital inflows since 2008 have been positive for investment.

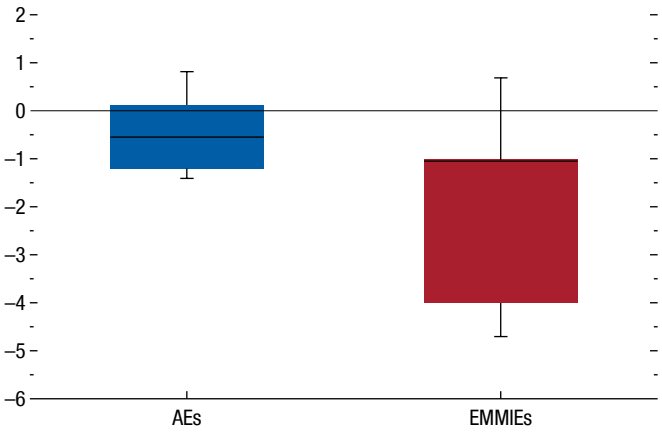
Productivity and the Role of Resource Misallocation

TFP growth has slowed over the past two to three decades. Previous studies suggest several contributors to this trend, particularly affecting within-firm productivity. These include waning gains from information and communication technology (Fernald 2015); declining business dynamism (Decker and others 2016; Akcigit and Ates 2021); tighter credit conditions, limiting new technology investments (Adler and others 2017; Duval, Hong, and Timmer 2020); and a slower expansion of cross-border capital flows and trade since 2008.

This section documents the contribution of rising misallocation of capital and labor to the decline in TFP growth and draws lessons for medium-term growth. So-called *allocative efficiency* measures the extent to which capital and labor are allocated to an economy's most productive firms (see Box 3.1). A decline in allocative efficiency, whereby resources become more concentrated in relatively unproductive firms over a period of time, can reduce TFP growth; an improvement in allocative efficiency, as resources move toward more productive firms, will, however, boost TFP growth.

The approach used here, pioneered by Hsieh and Klenow (2009) and refined by Bils, Klenow, and Ruane (2021), finds that allocative efficiency declined during 2000–19 in most countries in a sample of 15 advanced and 5 emerging market economies (Figure 3.11).[7] The median country in the sample experienced an average annual drag on TFP growth of about 0.9 percentage point from declining allocative efficiency. For the median advanced economy, this drag was 0.5 percentage point. Given that the median advanced economy saw TFP growth of only 0.5 percent during this period, this suggests that increased misallocation of capital and labor may have halved its TFP growth. A notable exception is the United States,

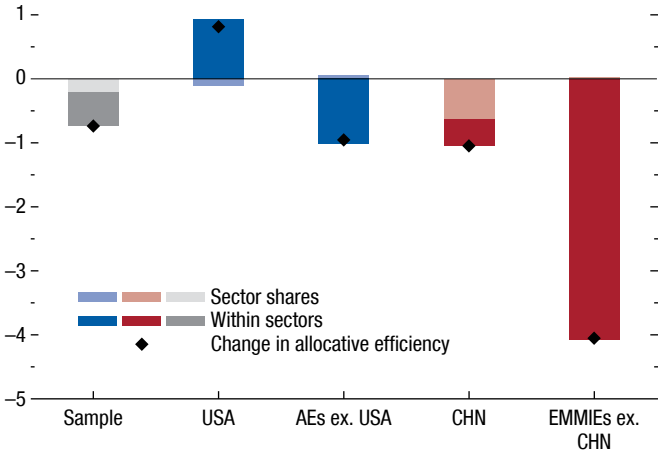
Figure 3.11. Contribution of Allocative Efficiency to Annual TFP Growth, 2000–19
(Percentage points)



Sources: Bureau van Dijk Orbis; EU KLEMS database; Organisation for Economic Co-operation and Development, Trade in Value Added; and IMF staff calculations.
Note: Sample comprises 13 goods and 6 services sectors and 20 economies: AUT, BEL, BGR, CHE, CHN, CZE, DEU, ESP, EST, FRA, ITA, JPN, KOR, POL, PRT, ROU, RUS, SVK, SVN, and USA. See Online Annex 3.2 for details. The black lines in the bars represent the median, the bars the interquartile range, and the whiskers the minimum and maximum values across samples in the group. Country list uses International Organization for Standardization (ISO) country codes. AEs = advanced economies; EMMIEs = emerging market and middle-income economies; TFP = total factor productivity.

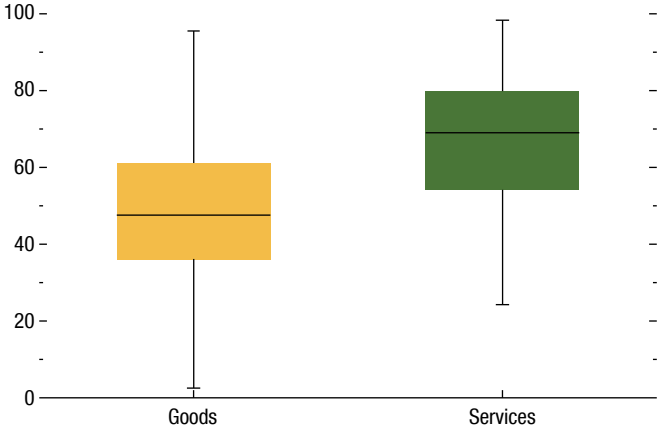
[7]Allocative efficiency measures, approximately, the extent to which value added per factor input varies across firms in a given sector. If the variation is large, there are potentially large gains from reallocating capital and labor among firms, and allocative efficiency is low; if the variation is small, allocative efficiency is high. For each sample economy, allocative efficiency is computed at the level of 19 broad sectors, using data from Orbis. The data cover the whole economy, including both goods- and service-producing sectors, but the analysis excludes predominantly nonmarket sectors (such as health care, education, and public administration). Sector-level allocative efficiency is then aggregated using sectors' shares in whole-economy value added. See Online Annex 3.2 for details. See G20 (2021) for a discussion of the possible impact of the COVID-19 pandemic on allocative efficiency in the post-2019 period.

Figure 3.12. Contribution of Allocative Efficiency to Annual TFP Growth, 2000–19
(Percentage points, decomposed)



Sources: Bureau van Dijk Orbis; EU KLEMS database; Organisation for Economic Co-operation and Development, Trade in Value Added; and IMF staff calculations.
Note: Sample comprises 13 goods and 6 services sectors and 20 economies: AUT, BEL, BGR, CHE, CHN, CZE, DEU, ESP, EST, FRA, ITA, JPN, KOR, POL, PRT, ROU, RUS, SVK, SVN, and USA. The darker shade of colors denotes "within sectors," while the lighter shade of colors denotes "sector shares." Country list uses International Organization for Standardization (ISO) country codes. AEs ex. USA = advanced economies excluding United States; CHN = China; EMMIEs ex. CHN = emerging market and middle-income economies excluding China; TFP = total factor productivity.

Figure 3.13. TFP Loss from Misallocation, by Sector Type, 2019
(Percent)



Sources: Bureau van Dijk Orbis; EU KLEMS database; Organisation for Economic Co-operation and Development, Trade in Value Added; and IMF staff calculations.
Note: The figure shows the distribution of calculated total factor productivity (TFP) losses relative to a benchmark of no misallocation (see Online Annex 3.2) for all sample countries and sectors in 2019, grouped by sector type. The black lines in the bars represent the median, the bars the interquartile range, and the whiskers the minimum and maximum values across samples in the group. Sample comprises 13 goods and 6 services sectors and 20 economies: AUT, BEL, BGR, CHE, CHN, CZE, DEU, ESP, EST, FRA, ITA, JPN, KOR, POL, PRT, ROU, RUS, SVK, SVN, and USA. Country list uses International Organization for Standardization (ISO) country codes.

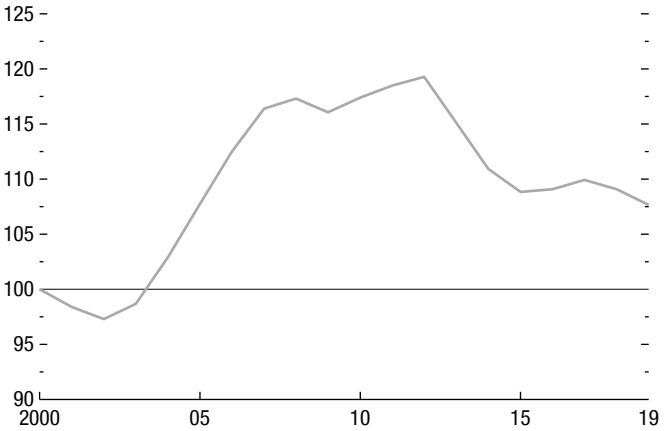
where improvements in allocative efficiency helped boost annual TFP growth by 0.8 percentage point over the period.

What explains the decline in allocative efficiency across a large group of economies? The observed drag on TFP growth could reflect either decreased efficiency within sectors or a growing share of already-misallocated sectors in an economy. Analysis for the 20 economies shows that changing sector shares in GDP contributed only about 30 percent of the annual drag on TFP, with the rest attributable to within-sector developments (Figure 3.12). The shift in sectoral GDP shares is an important factor for just a few economies—most significantly for China, for which it contributes 60 percent of the allocative-efficiency impact on TFP growth. The reason the sectoral composition of the economy affects aggregate allocative efficiency is that sectors differ systematically in the measured extent of their misallocation. Specifically, Figure 3.13 shows that service sectors display more inefficiency than goods-producing sectors. This may reflect structural differences between goods and service sectors or measurement challenges with regard to productivity and inputs in services.[8] As a result, an economy—such as China's—experiencing structural transformation from goods to services will register a decline in overall allocative efficiency.

A large part of the observed decline in allocative efficiency *within* sectors can be traced to uneven firm productivity growth during some of the 2000–19 period. As Figure 3.14 shows, the dispersion of firms' real productivity in the 20 sample economies rose significantly leading up to the global financial crisis and, despite some subsequent reversion, remains elevated. This aligns with the decline in allocative efficiency, most of which also occurred in the first decade of the 2000s.

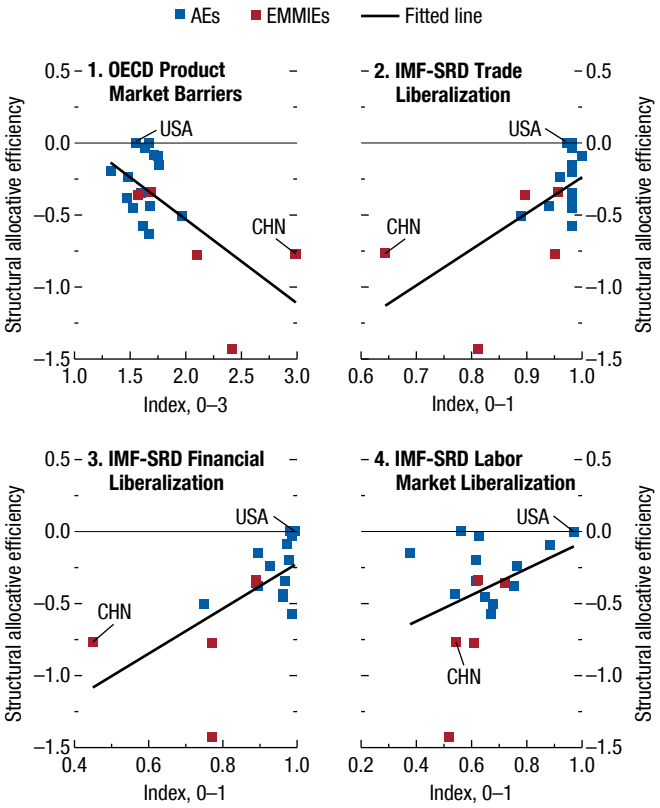
[8]Several studies have documented this pattern, using firm-level data for a range of countries, such as Hsieh and Klenow (2009), Busso, Fazio, and Algazi (2012), Devries and others (2011), Dias, Marques, and Richmond (2016), and Chapter 2 of the April 2017 *Fiscal Monitor*. The literature has tended to attribute these patterns to differences in market structure and firm dynamics in goods and service sectors. Online Annex 3.2 uses a method proposed by Bils, Klenow, and Ruane (2021) to show that there is little evidence that additive measurement error is more prevalent in service sectors than in goods sectors, but this still leaves room for other types of measurement errors to explain some of the difference.

Figure 3.14. Dispersion of Firm Productivity, 2000–19
(Index, 2000 = 100, weighted average)



Sources: Bureau van Dijk Orbis; EU KLEMS database; Organisation for Economic Co-operation and Development, Trade in Value Added; and IMF staff calculations.
Note: Following Bils, Klenow, and Ruane (2021), productivity dispersion is computed at the sector level as the ratio of the power mean to the geometric mean of firm output-based total factor productivity (TFPQ)—a measure of the technical efficiency of a plant. Productivity dispersion is aggregated to the country level using sector GDP shares. Line shows the three-year moving average, aggregating across sample economies using GDP in purchasing power parity in international dollar weights. Value for the year 2000 normalized to 100. Sample comprises 20 economies: AUT, BEL, BGR, CHE, CHN, CZE, DEU, ESP, EST, FRA, ITA, JPN, KOR, POL, PRT, ROU, RUS, SVK, SVN, and USA. Country list uses International Organization for Standardization (ISO) country codes.

Figure 3.15. Countries' Structural Allocative Efficiency and Policies
(Log points, USA = 0)



Sources: Organisation for Economic Co-operation and Development (OECD); and IMF staff calculations.
Note: The country-specific structural component of allocative efficiency is obtained as a country fixed effect from the dynamic regression described in Online Annex 3.2. Sample comprises 20 economies: AUT, BEL, BGR, CHE, CHN, CZE, DEU, ESP, EST, FRA, ITA, JPN, KOR, POL, PRT, ROU, RUS, SVK, SVN, and USA. Country list and data labels in the figure use International Organization for Standardization (ISO) country codes. AEs = advanced economies; EMMIEs = emerging market and middle-income economies; IMF-SRD = IMF Structural Reform Database.

A widening of the distribution of firms' real productivity has implications for allocative efficiency. Ideally, firms with rapidly increasing real productivity should attract capital and labor from those growing more slowly, with marginal revenue products kept equalized. However, firm-level evidence points to frictions that slow this adjustment process (see Online Annex Table 3.2.7). This leads to an initial decline in allocative efficiency, as faster-growing firms operate with less capital and labor than optimal. Consistently, sector-level evidence shows that a rise in a sector's dispersion of real firm productivity is accompanied by a decline in its allocative efficiency.

However, this phenomenon is transitory. As time passes, firms that have improved productivity faster than the rest can scale up their capital and labor input, and allocative efficiency once again improves. Yet this recovery is slow; firm and sector data suggest that it takes 9–11 years for allocative efficiency to return halfway to its long-term fundamental level, which is shaped by sector characteristics and a country's economic and institutional environment (see Online Annex Table 3.2.8). Consequently, evidence from sector-level analysis shows that recent shifts in the firm productivity distribution, along with ongoing structural transformation in some countries, will likely continue to affect medium-term TFP growth.

The analysis so far implies that the extent of an economy's overall misallocation has two components at any one time: a transitory component that reflects an incomplete adjustment by firms to recent shocks and a longer-lasting, structural component that reflects the efficiency of markets and quality of institutions that govern them. Evidence from firm-level analysis suggests that, for the economies analyzed, about one-third of measured misallocation is attributable to transitory factors, and two-thirds has structural roots (see Online Annex 3.2).

Figure 3.15 shows wide cross-country variation in one measure of structural allocative efficiency (along

the vertical axes and based on the analysis in Online Annex 3.2), which rises with market entry and competition, trade openness, financial access, and labor market flexibility. While some of these indicators of market efficiency and barriers broadly improved during the 2000–19 period (notably, trade and financial liberalization), others worsened for some countries in the sample, with no systematic evidence that changes in structural policies are behind the observed decline in allocative efficiency over the past two decades.

However, the large cross-country differences in structural allocative efficiency suggest that there is potential to raise TFP growth through reforms. Analysis of the 20 sample economies shows that if countries whose allocative efficiency is currently lower than that of the United States were to reduce their gaps in structural policies by 15 percent over 10 years, it could boost medium-term TFP growth by 0.7 percentage point. While historical instances of such significant policy catch-up are not common, they are not unprecedented, representing an ambitious yet achievable policy objective.

Improving market efficiency may also make it easier for firms to adapt to future shocks. Firm data provide some evidence that the US avoided an overall decline in allocative efficiency during the 2000–19 period because resources relocated across firms faster as firms' productivity dispersion increased. This led to a faster reversal of the transitory rise in misallocation that has continued to weigh on TFP for most other sample economies.

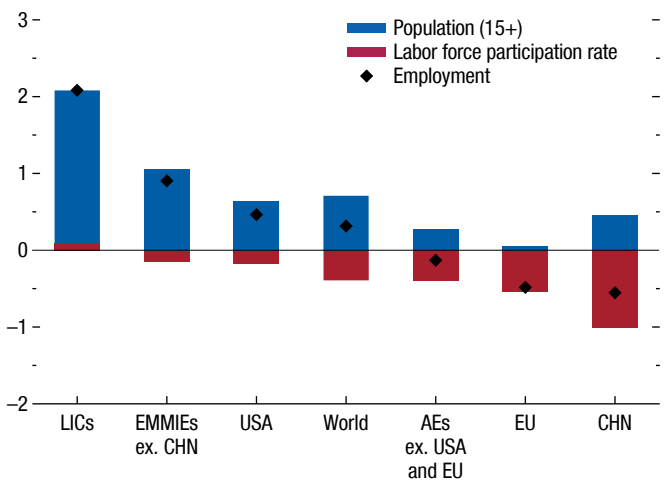
Where Is Growth Heading?

This chapter's focus so far has been on analyzing historical trend growth and the factors behind its decline. New tailwinds and headwinds could yet further affect growth trajectories. This section shifts the focus to a forward-looking question: What are the likely medium-term growth trajectories, and can annual global growth return to the 3.8 percent average for 2000–19?

Baseline Scenario

This section assesses the prospects of labor, capital, and TFP in the medium term, defined as the year 2030, drawing on analyses in earlier sections (projection methods are detailed in Online Annex 3.3). Specifically, labor force participation forecasts use a cohort-based approach, considering life-cycle, generational, and structural impacts on labor supply. These, along with United Nations demographic projections, provide estimates of potential employment growth, with stable employment rates assumed. Capital growth projections merge WEO public investment forecasts with this chapter's estimates of the medium-term private investment rate. Finally, TFP growth is projected by assuming that sectoral allocative efficiency is moving gradually toward its estimated long-term level and reaching its half-life in the medium term, whereas *efficient* TFP growth—net of misallocation—follows the historical trend.

Figure 3.16. Medium-Term Growth Projections of Potential Employment
(Percent)



Sources: International Labour Organization (ILO); United Nations, World Population Prospects; and IMF staff calculations.
Note: Sample comprises 140 countries. Estimation for labor force participation rate is based on a cohort model (Online Annex 3.3) using data from ILO for 83 countries. The remaining 57 countries follow the 2014–19 average growth rate in the participation rates. AEs = advanced economies; CHN = China; EMMIEs = emerging market and middle-income economies; EU = European Union; ex. = excluding; LICs = low-income countries; USA = United States.

- *By 2030, the annual contribution of labor supply to global GDP growth is expected to decrease to 0.2 percentage point, only a quarter of its 2000–19 average contribution.* This reflects a modest 0.3 percent projected growth of potential labor supply in 2030 (Figure 3.16). The slowdown reflects falling participation rates, which dampen the effect of population growth on labor supply. However, trends in labor supply vary widely by region. Low-income countries are expected to experience robust 2.1 percent growth in labor supply, highlighting the need for job creation to translate this supply growth into employment. Meanwhile, labor supply in emerging market economies, excluding China, will grow by

0.9 percent, and in the US by 0.5 percent, whereas a sharp reduction in participation will cause labor supply to contract by 0.6 percent in China and by 0.5 percent in the EU.

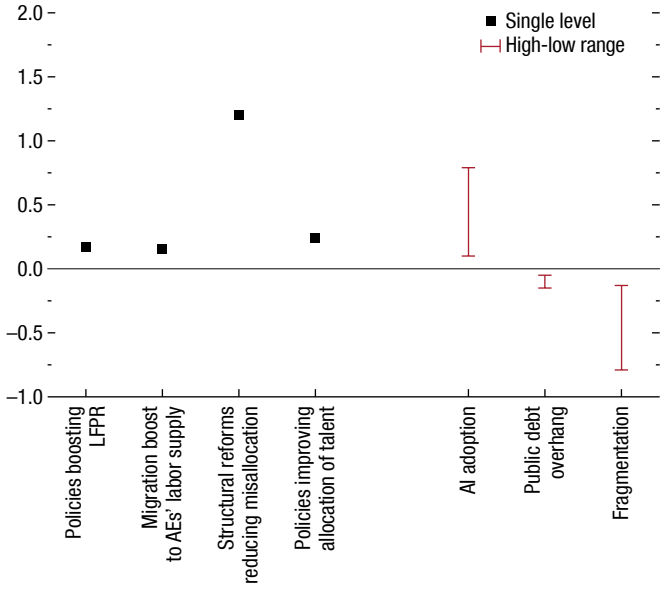
- *Capital's contribution to growth is expected to be 1.7 percentage points, compared with the 2000–19 average contribution of 2.1 percentage points.* Continued high public debt will likely constrain future public investment in emerging market and developing economies, which accounts for 30 percent of these countries' overall capital. Advanced economies are expected to see a modest increase in public investment, but its growth impact will be minimal given its small share in overall investment. In addition, private investment rates are expected to remain low in both country groups, owing to subdued economic prospects and the anticipated lower employment and TFP growth.
- *The TFP growth contribution is expected to decline to 0.9 percentage point by 2030, down from the 2000–19 average of 1.0 percentage point.* The ongoing decrease in allocative efficiency is expected to slow TFP growth to a lesser degree. Meanwhile, the growth in efficient TFP, which reflects the rate of technological progress, is expected to slow in the baseline scenario, following its long-term trend. Factors such as the increasing difficulty of generating new ideas (Bloom and others 2020), slower growth of research employment (Jones 2023), a plateau in educational attainment, and the slower catch-up process are expected to play a role. The net effect is a decline in the TFP growth rate by 0.1 percentage point from its two-decade average prior to the pandemic. However, major technological advances, particularly in AI, could increase TFP growth substantially.

When the contributions of the three factors are summed, the world's growth rate is projected at 2.8 percent in 2030 under the baseline scenario. This suggests that global growth could fall even more, below the current WEO medium-term forecast (see Chapter 1). This would represent a significant slowdown relative to the historical (2000–19) annual average of 3.8 percent.

Alternative Scenarios

What factors could elevate growth or pose emerging risks? This section compares various scenarios against the baseline medium-term growth projection.

Figure 3.17. Impact of Various Factors on Global Medium-Term Growth
(Relative to the baseline, percentage points)



Source: IMF staff calculations.
Note: The estimated impact on medium-term growth is presented relative to the baseline projection for each scenario described in the labels on the horizontal axis. See Online Annex 3.3. The scenarios include policy interventions—aiming at increasing labor force participation, supporting AEs' labor supply through migration, reducing misallocation, and improving talent allocation in emerging market and developing economies—and scenarios in which artificial intelligence is widely adopted, there is a persistent public debt overhang, and geopolitical blocs are emerging ("fragmentation"). AEs = advanced economies; AI = artificial intelligence; LFPR = labor force participation rate.

These scenarios assess the effects of policy changes related to labor supply and resource allocation and of economic tailwinds and headwinds—positive impacts of AI and negative effects of public debt overhang and geoeconomic fragmentation. To gauge the feasibility of the policy scenarios, large and ambitious—but not unprecedented—policy shifts are considered.

Overall, the medium-term growth effects range from 1.2 percentage points above to 0.8 percentage point below the baseline (Figure 3.17). Larger effects are possible if these scenarios occur simultaneously. However, given high uncertainty surrounding these estimates, the figures should be viewed as indicative of the potential impacts (see Online Annex 3.3 for details).

- *Policies to increase labor force participation:* This scenario assumes that countries increase their labor force participation rates by 3.2 percentage points, the median increment in participation if all countries converged to the best policies. This could increase

labor supply growth by about 0.3 percentage point, contributing 16 basis points to global growth.

- *A migration boost to labor supply in advanced economies:* Migrant workers have supported growth in advanced economies by filling labor gaps. This scenario assumes higher flows, along with enhanced labor market integration for migrant workers, that translates into an increase in labor supply equivalent to 1 percent of advanced economies' projected labor force in 2030. The resulting increase in labor supply could add 20 basis points to global growth.
- *Structural reforms for improving allocative efficiency:* Building on the previous section, this scenario assumes that countries close 15 percent of their policy gap with the United States in areas such as product and labor market policies, trade openness, and financial deepening over the medium term. These structural reforms are expected to greatly reduce the drag from misallocation and enhance TFP growth by 0.7 percentage point, which, in turn, could stimulate investment and add 1.2 percentage points to global growth.
- *Improved talent allocation in emerging market and developing economies:* Although gaps in occupation and earnings between men and women have been narrowing in advanced economies, they remain significant elsewhere. Closing these gaps could lead to substantial productivity gains, especially if jobs are filled based on innate talent and comparative advantage, not skewed by social norms, barriers, or discrimination (Berg and others 2018; Hsieh and others 2019; Jayachandran 2021). Should talent allocations in emerging market and developing economies follow the trend in the United States over past decades, global growth could be boosted by a quarter of a percentage point.
- *AI technologies:* AI technologies stand at the brink of transforming many aspects of the world economy (Cazzaniga and others 2024). Their impact on economic growth is highly uncertain but potentially substantial. Generally, AI's enhancement of labor productivity is expected to outweigh its negative effects on labor demand. Depending on how widely it is adopted and whether it replaces or augments workers, the estimated global growth impact varies from 10 to 80 basis points in the medium term (see Box 3.3 for more details).
- *Legacy of high public debt:* Persistent elevated public debt raises global economic growth concerns, potentially reducing medium-term growth by an estimated 5 to 15 basis points. The projection simulates growth outcomes in three scenarios—one scenario in which debt continues to increase with stable public deficits and two debt-stabilization scenarios in which increased interest payments are offset either by reducing transfers or public investment. The overall impact is considered moderate because the scenario does not assume extensive fiscal consolidation aimed at significant debt reduction or additional channels through which public debt could affect growth (Pattillo, Poirson, and Ricci 2004; Woo and Kumar 2015).
- *Geoeconomic fragmentation:* The emergence of geoeconomic blocs leading to international trade and foreign direct investment fragmentation could reduce capital and knowledge flows significantly and suppress growth (Chapter 3 of the October 2023 *Regional Economic Outlook: Asia and Pacific*). The April 2023 WEO provides reasonable scenarios analyzing the effects of heightened trade barriers. These vary from limited cases in which a "US bloc" and a "China bloc" engage in some "friend-shoring," reducing growth by 10 basis points, to a more extensive scenario in which all regions reshore some trade, potentially lowering medium-term growth by 80 basis points. A greater loss could result from a reduction in trade-associated knowledge spillovers (Ahn and others, forthcoming) and productivity loss, but it is not accounted for in this simulation.

The scenario impacts underscore a clear message: regaining historical growth will demand substantial policy efforts and, possibly, harvesting net positive benefits from AI. Structural reforms to resolve misallocation are key to restoring growth to historical averages.

Conclusions and Policy Recommendations

The chapter's analysis suggests that the global economy's declining actual growth and waning growth expectations largely reflect persistent headwinds. A significant slowdown in TFP has emerged as a key factor, with that slowdown driven by increased resource misallocation and slower growth in efficient TFP. A shrinking working-age population in major economies, coupled with lackluster business investment, has also contributed. For the most part, the implications of the analysis here are sobering for medium-term global growth prospects. Absent timely policy interventions and a boost from emerging technologies, global growth is likely to remain well below its prepandemic historical average in the medium term.

How could policies help elevate growth? The chapter's findings suggest that interventions should focus on reforms that promote market competition, trade openness, financial accessibility, and labor market flexibility. These could significantly boost TFP growth by alleviating institutional and financial barriers that impede the efficient allocation of capital and labor across firms. Such reforms offer substantial gains for growth and can be complemented by governance and external sector reforms (Budina and others 2023). Industrial policies targeted to specific sectors, if poorly designed, may impede resource allocation to more productive firms or sectors (see the April 2024 *Fiscal Monitor* on industry policy for innovation).

At the same time, policies designed to facilitate the flow and integration of migrant workers, alongside measures to boost labor force participation among older workers in advanced economies—through retirement reforms and labor market programs—could mitigate the increasing demographic pressures on labor supply. Encouraging the participation of women in emerging market economies, by expanding education enrollment and childcare support, could unlock their untapped potential. These efforts should be complemented by policies that reduce social barriers and gender discrimination to ensure talent is optimally allocated across jobs.

Investment in human capital, especially in low-income developing countries, is essential to leverage their demographic dividend. In regard to capital formation, since higher corporate leverage has held back business investment in emerging market economies, reforming mechanisms for restructuring and insolvency and eliminating debt bias in corporate tax policies can also help support medium-term growth (Chapter 2 of the April 2022 WEO). To lessen the negative growth impact from increased geoeconomic fragmentation, it is important to steer clear of damaging unilateral trade and industrial policies.

The global medium-term prospects are not all doom and gloom. Resilience amid various shocks (Chapter 1) and the emerging promise of technologies such as AI could prove transformative for medium-term global growth. To fully harness this potential, countries must strengthen their regulatory frameworks, including intellectual property protection, and revisit redistributive and other adjustment programs to ensure that the benefits from AI are shared fairly and widely (Cazzaniga and others 2024). Looking beyond the medium term, policies geared toward promoting innovation play a crucial role in defining the path of future global growth.

Box 3.1. Allocative Efficiency: Concept, Examples, and Measurement

Not only is total factor productivity (TFP) growth driven by well-known factors such as technological innovation and novel business practices that enhance *within-firm* productivity, it is also propelled by how well the allocation of capital and labor *across firms* reflects their relative productivity—known as "allocative efficiency." Consider an example of two firms, one with high and one with low productivity. If too much capital and labor are tied up in the relatively unproductive firm, average productivity will be low—a case of poor allocative efficiency. TFP would rise if capital and labor moved to the more productive firm, correcting the initial misallocation.

A variety of frictions can cause capital and labor to be allocated to the "wrong" firms. Some frictions may do so only temporarily. In the two-firm example, the productive firm may be looking to expand, but its search for new workers may take time. In this case, allocative efficiency may be low for a while but will rise as the productive firm gradually attracts new employees from its less-productive competitor. However, other frictions may weigh on allocative efficiency more permanently. For example, the unproductive firm may be politically connected and receiving subsidies or tax breaks that allow it to operate on a larger scale than its profits merit.

Measuring the extent of allocative (in)efficiency in practice is challenging. One influential approach, developed by Hsieh and Klenow (2009) and used throughout this chapter, measures it indirectly by comparing the marginal revenue product of capital and labor across firms—that is, the additional revenue that one more unit of capital or labor could earn in any given firm. If marginal revenue productivity is high in one firm and low in another, more economic value would be created by moving resources from the second firm to the first. This approach tells us that an economy's allocative efficiency is improving if marginal revenue productivity across firms is becoming more similar and that it is worsening if it is becoming more dispersed.[1]

Achieving lasting improvements in allocative efficiency requires tackling the frictions that slow firms' ability to change their scale of operations as needed or that permanently favor or penalize some firms irrespective of their productivity. Many studies have identified the structural sources of these frictions. These include size-dependent tax, labor, and social insurance policies (Levy 2018; Ulyssea 2018); informality and corruption (Misch and Saborowski 2018); weak property rights (Adamopoulos and Restuccia 2020); regional barriers (Tombe and Zhu 2019); restrictive trade policies (Khandelwal, Schott, and Wei 2013; Edmond, Midrigan, and Xu 2015); uneven firm markups (Peters 2020); and financial frictions (Song, Storesletten, and Zilibotti 2011; Midrigan and Xu 2014; David, Hopenhayn, and Venkateswaran 2016; Gopinath and others 2017; Libert 2017). Several country case studies have highlighted specific policies that successfully reduce misallocation, such as removing barriers to international trade (Ha and Kiyota 2016) and reforms aimed at correcting distortions in credit access (Chen and Irarrazabal 2015).

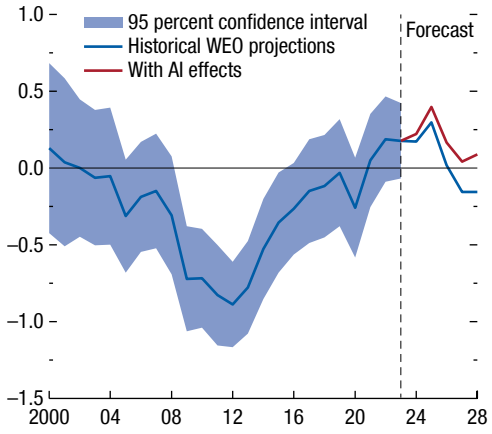
The authors of this box are Nan Li and Robert Zymek.

[1]This is related to, but distinct from, an earlier measure of allocative efficiency developed by Olley and Pakes (1996). Operationalizing the latter requires information on *real* productivity (quantity total factor productivity) at the firm level, which is difficult to measure for a large sample of countries and firms. The approach of Hsieh and Klenow (2009) requires only information on relative *revenue* productivity, which is easier to obtain.

Box 3.2. Distributional Implications of Medium-Term Growth Prospects

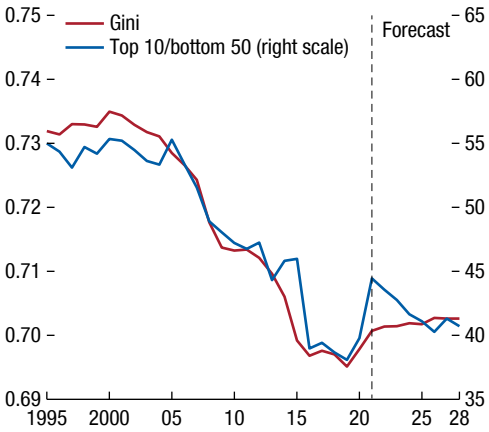
The medium-term growth slowdown could affect global income inequality and convergence between countries. A slower growth environment makes it challenging for poorer countries to catch up with those that are richer. Slower GDP growth can also lead to higher inequality, reducing average welfare. This box examines the implications in three areas: between-country convergence, global inequality, and welfare convergence. Between-country convergence has been sustained since the global financial crisis. One way to measure it is to compare countries' initial GDP with their subsequent growth. When this rate is negative, countries with lower levels of income are growing faster than those with higher levels, implying convergence. Cross-country convergence took place during 2008–19 (Figure 3.2.1) and was fastest during 2008–12. However, the rate turned positive after the pandemic. Current projections point to no convergence over the medium term.

Figure 3.2.1. GDP Convergence between Countries, 2000–28
(Rate at which gap to frontier is closed, negative = convergence)



Source: IMF staff calculations.
Note: The convergence rate for year t corresponds to the β_t coefficient in the following regression: $\Delta\log(GDPpc_{it}) = \alpha_t + \beta_t \log(GDPpc_{it-5}) + \varepsilon_{it}$, in which $\Delta\log(GDPpc_{it})$ is average year-over-year GDP per capita growth in the five-year period between t and $t-5$ and $\log(GDPpc_{it-5})$ is GDP per capita at the beginning of the period. See Box 3.3 for effects of artificial intelligence (AI effects) on growth. AI = artificial intelligence; WEO = *World Economic Outlook*.

Figure 3.2.2. Global Inequality, 1995–2028
(Gini points, 0 = perfect equality; times)



Sources: World Inequality Database; and IMF staff calculations.
Note: On the left scale, the Gini index calculates how the global income distribution deviates from a perfectly equal distribution. Income is measured before taxes. "Top 10/bottom 50" compares the average income of the top 10 and bottom 50 of the global income distribution. On the right scale, "times" refers to the number of times the average income of the top 10 of the income distribution is larger than the average income of the bottom 50 of the distribution. For example, a value of 40 on the right scale means the average income of the top 10 is 40 times larger than that of the bottom 50.

The previous computation does not consider how the gains from convergence are distributed within a country, only country averages ("between-country" inequality). Milanovic (2002) and Chancel and Piketty (2021) estimate measures of global income distribution and inequality, the comparison of the income position of a group of people in one country with those of other groups in the world. These measures show that although inequality has decreased since the mid-2000s, the pandemic reversed some of the gains (Figure 3.2.2; World Bank 2022). While between-country convergence has driven the reduction in global inequality in the past two decades, most of this inequality now stems from differences within countries.[1]

[1]Sovereign governments usually engage in policies that affect within-country inequality. The analysis presented here uses pretax data to focus mainly on changes in inequality derived from economic trends before government intervention.

The authors of this box are Gabriela Cugat and Carlos van Hombeeck.

Box 3.2 *(continued)*

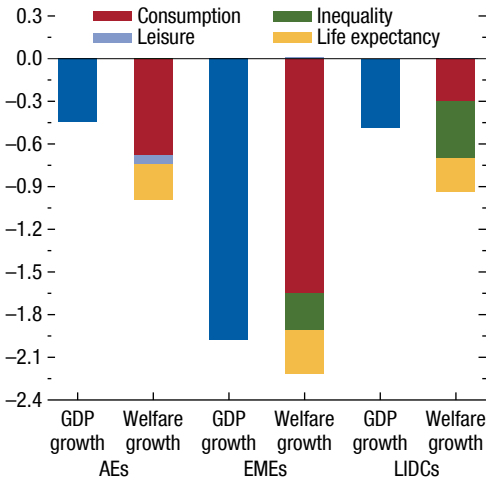
To assess the impact of the medium-term outlook, a projection for global inequality is created by combining within-country and between-country inequality projections derived from the *World Economic Outlook* (WEO).[2] Depending on the measure analyzed, there is either no or only a modest expected recoupment in the medium term (Figure 3.2.2). Small within-country inequality improvements are not sufficient to offset the expected slowdown in between-country inequality convergence.

The results use GDP as a proxy for welfare, but this association could be flawed (Coyle 2017), since it does not include unpaid household work or the environmental cost of economic growth, for example. Jones and Klenow (2016) propose a welfare measure, based on lifetime expected utility, that complements consumption (highly correlated with GDP) with life expectancy, leisure, and (less) inequality. Welfare growth historically has exceeded GDP growth, driven mostly by life expectancy improvements (see Box 1.2 of the October 2020 WEO). Across the board, both GDP and welfare growth are predicted to fall in the postpandemic period (Figure 3.2.3). Welfare growth is expected to deteriorate more than GDP growth, driven by stalled dimensions such as life expectancy and within-country inequality, leading to welfare divergence between countries.

The growth slowdown has grim implications for the distribution of income between countries, of global income, or of a more general welfare measure. Based on results from Box 3.3, the expected skewed effect of artificial intelligence on growth would increase between-country divergence (the "with AI effects" line in Figure 3.2.1). Inasmuch as other factors, such as geoeconomic fragmentation, worsen the distribution of income between countries, they will likely worsen global inequality and the distribution of welfare, unless they significantly improve income distribution within countries and other dimensions of welfare, such as life expectancy.

[2]Within-country inequality projections are based on how GDP growth is distributed within a country. See Cugat, Li, and van Hombeeck (2024) for more details on how the distribution of growth within countries is estimated.

Figure 3.2.3. GDP Growth and Welfare Drivers before and after the COVID-19 Pandemic
(Percentage points)



Sources: Penn World Table version 10.01; United Nations Population Division; World Bank, World Development Indicators; and IMF staff calculations.
Note: This figure shows the difference in average annualized GDP growth and welfare growth between 2010–19 and 2024–28. The components of the difference in welfare growth are listed in the legend. AEs = advanced economies; EMEs = emerging market economies; LIDCs = low-income developing countries.

Box 3.3. The Potential Impact of Artificial Intelligence on Global Productivity and Labor Markets

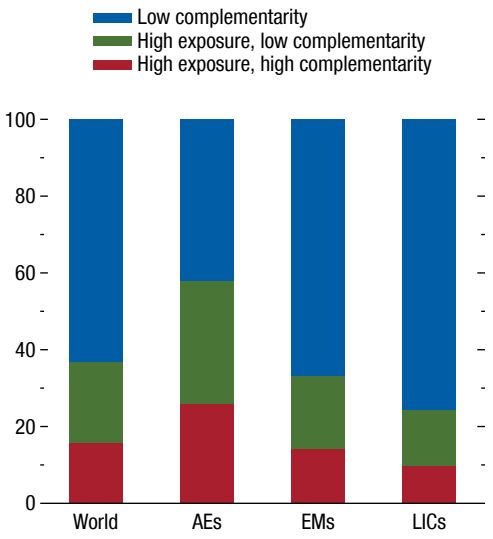
Artificial intelligence (AI) stands at the forefront of a transformative wave, often equated with a new industrial revolution, with the potential to reshape the global economy. While its profound and far-reaching economic and social consequences are not yet fully understood, AI's impact on the global economy exhibits a clear dichotomy. On one hand, AI holds the promise of enhancing productivity. On the other, it poses a formidable challenge, with the potential to replace humans in certain jobs and fundamentally alter the nature of others.

Building on AI's potential diverse impacts, IMF staff have advanced a nuanced framework to assess AI's influence on productivity and the labor market. This approach, based on the concept of AI "exposure" (Felten, Raj, and Seamans 2021, 2023), is extended by the AI complementarity concept (Pizzinelli and others 2023), which delivers new insights into the likelihood of jobs' either benefiting from AI or being at risk.

There is significant disparity in AI exposure between country groups—approximately 60 percent of jobs in advanced economies are susceptible to changes as a result of AI, compared with 40 percent in emerging market economies and 26 percent in low-income countries (Figure 3.3.1; Cazzaniga and others 2024). In advanced economies, AI is expected to enhance productivity in half of these exposed jobs, signaling a positive impact. For the other half, AI integration could automate tasks, potentially reducing labor demand and wages and even leading to job obsolescence. In contrast, emerging market and developing economies are less likely to experience immediate disruption but may also see fewer benefits from AI. Many lack the necessary infrastructure and skilled workforce to effectively leverage AI technology, raising concerns that, over time, AI could exacerbate inequality across countries.

A model-based analysis gauges AI's potential impact on productivity. In this model, AI affects productivity through three critical channels: labor displacement, AI complementarity with skills, and productivity gains. First, AI adoption may shift tasks from humans to AI-driven systems, enhancing the efficiency of task completion. Second, AI integration could benefit tasks that are highly complementary with AI. Third, AI adoption may lead to broad-based productivity gains, boosting investment and increasing overall labor demand. The model is calibrated to the United Kingdom, a country highly exposed to AI adoption and for which data on households' asset holdings are available.

Figure 3.3.1. Employment Shares by AI Exposure and Complementarity
(Percent of employment)



Sources: Cazzaniga and others 2024; International Labour Organization; and IMF staff calculations.
Note: Share of employment within each country group is calculated as the working-age-population-weighted average. AEs = advanced economies; AI = artificial intelligence; EMs = emerging markets; LICs = low-income countries; World = all countries in the sample.

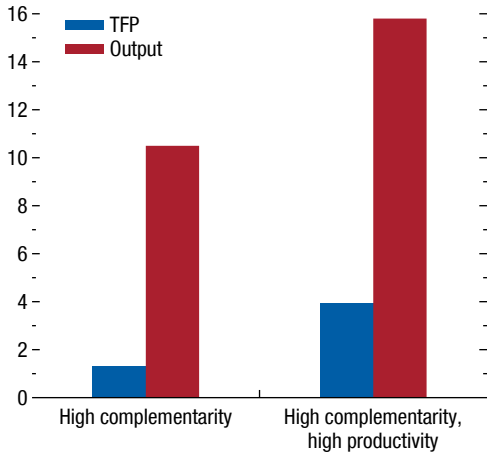
The impact of AI on productivity is analyzed through two scenarios. In the first (high complementarity), AI significantly enhances roles with strong complementarity. The second scenario (high complementarity and high productivity) expands this complementarity by having AI also boost overall productivity, enhancing the high-complementarity role (see Rockall, Pizzinelli, and Tavares 2024 on the modeling analysis and Cazzaniga and others 2024 for more information about the distributional implications.)

In the first scenario, AI use leads output to increase by almost 10 percent as the UK economy adjusts to the new steady state through a combination of capital deepening and a small increase in total factor productivity (Figure 3.3.2). In the second scenario, when the productivity impact is also considered, output expands by 16 percent and total factor productivity increases by almost 4 percent. These gains take place primarily in the first decade of transition. Incomes

The author of this box is Marina M. Tavares.

Box 3.3 *(continued)*

Figure 3.3.2. Impact of AI on TFP and Output in the United Kingdom
(Percent)



Sources: Cazzaniga and others 2024; and IMF staff calculations.
Note: The figure shows the change in TFP and output between the initial and final steady state. For more details on the model, see Rockall, Pizzinelli, and Tavares 2024.
AI = artificial intelligence; TFP = total factor productivity.

for all workers increase, ranging from 2 percent for low-income workers to almost 14 percent for high-income workers, leading to higher income inequality.

Productivity gains from AI are expected to range from 0.9 to 1.5 percent a year, thanks to the United Kingdom's robust digital infrastructure, skilled labor force, innovation ecosystem, and regulatory framework. Conversely, many emerging market and developing economies lag in AI preparedness, with potential gains less than half those estimated for the United Kingdom. This disparity stems largely from a smaller proportion of workers in high-exposure and high-complementarity occupations. While in advanced economies these roles are occupied by 27 percent of workers, this drops to 16 percent in emerging markets and 8 percent in low-income countries. This variance in the initial distribution of workers across occupations reveals their reduced potential for AI benefits.

For the global economy, the estimates suggest that AI could boost productivity gains by 0.1 percent to 0.8 percent annually over a decade. However, uneven distribution of these gains across regions underscores the need for international cooperation to improve AI readiness and integration in less-prepared nations. Initiatives along these lines can help reduce global inequalities, ensuring that AI benefits reach a wider array of nations.

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