GROUP OF TWENTY

G20 BACKGROUND NOTE ON THE IMPLICATIONS OF AGING AND MIGRATION ON GROWTH AND PRODUCTIVITY

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CONTENTS

EXECUTIVE SUMMARY

Demographic forces are a fundamental driver of economic outcomes. Population growth, age structure, and migration jointly influence the size of the labor force, savings and investment patterns, and the demand for goods and services. As the world undergoes significant shifts in fertility and aging, understanding their impact—and the role of migration—on growth and living standards is crucial.

Fertility rates have declined across all regions, especially in G20 emerging market economies, where they have recently converged to G20 advanced economies. At the same time, life expectancy has steadily increased. G20 emerging market economies have experienced a sharp drop in dependency ratios, while G20 advanced economies have faced faster rising old-age dependency and shrinking workforces. The African Union, by contrast, has the highest youth dependency ratio, and the transition to a larger working-age population will be vital for growth prospects. Migration has helped offset demographic pressures in advanced economies, with net inflows of migrants from emerging market and developing economies contributing to labor supply and raising global output. Healthy aging is also contributing to increased labor force participation and enhanced productivity.

Aging societies often face productivity declines due to diminished effort and innovation among older workers. In parallel, aging can impact capital accumulation as savings increase and investment falls, in turn driving interest rates lower. Declining investment can directly affect labor productivity, through a reduction in capital input, or can impact total factor productivity (TFP) through slower technological diffusion. However, automation, AI adoption, and healthier aging can help overcome labor shortages and mitigate the productivity declines associated with an aging population.

Recent trends show a weakening growth contribution of the working-age population across most regions, except the African Union. Looking ahead, the share of working-age adults, as well as the total population, is expected to decline in most parts of the world. While most members of the African Union will continue to benefit from a demographic dividend, its positive contribution to output growth is projected to diminish over time. Moreover, these projections may be too optimistic, underestimating fertility decline and mismeasuring migration, implying a more severe demographic drag on future growth.

With demographic shifts reshaping global growth prospects, differentiated policy responses are required. Important strategies to tackle decreasing labor force participation include active labor market policies that boost workforce engagement and incentivize longer working lives, pro-natalist initiatives to raise fertility rates where needed, and policies that better integrate immigrants and alleviate congestion. Furthermore, investment in new technologies and structural reforms, such as encouraging female labor force participation, ensuring labor markets function efficiently, and pro-competition policies can help boost productivity and long-term growth, alongside investing in digital and physical infrastructure and human capital.
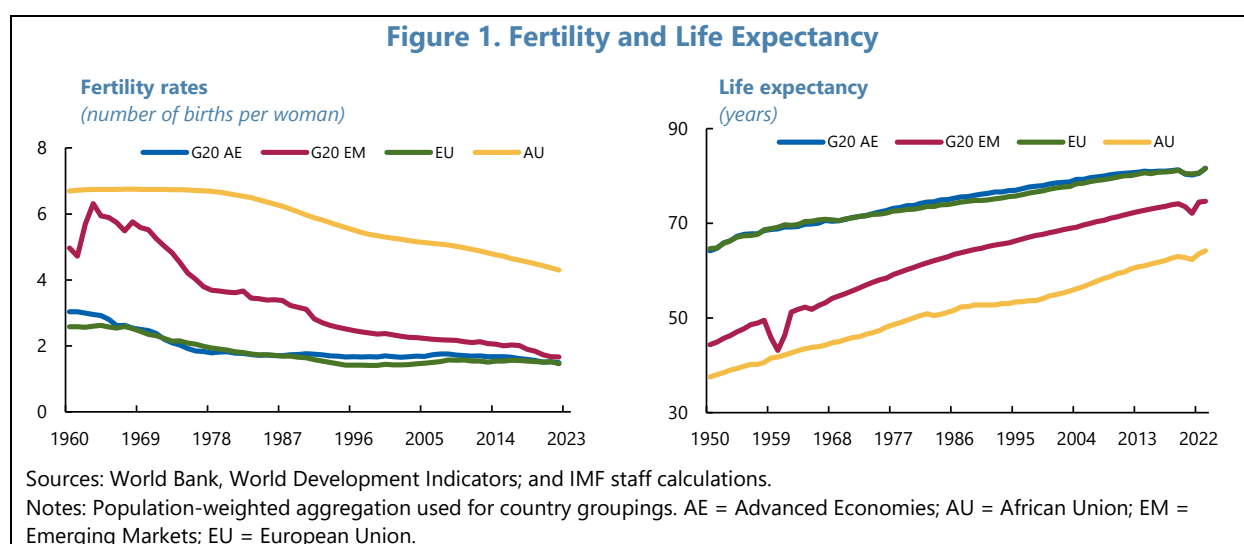

GLOBAL DEMOGRAPHIC TRENDS[1]

Advanced and emerging market economies are experiencing rapid aging as fertility rates fall below replacement levels and life expectancy rises, increasing old-age dependency. These trends are expected to accelerate in the coming decades. In contrast, many economies in Africa host younger populations, but have also begun a gradual demographic transition.

1.   In the last 50 years, fertility rates—defined as births per woman—have been declining uniformly across all regions. Over this period, African Union (AU) members have maintained the highest fertility rates, starting above 6 births per woman in 1960 and gradually declining to around 4.3 by 2020 (Figure 1, LHS). G20 emerging market economies also started the period with high fertility rates not far from those in the AU (around 6 in the early 1960s). However, these economies experienced a steep decline in the 1970s followed by a more gradual fall to below 2 births per woman by 2023, converging to the same average rate as G20 advanced economies. The fertility rates of China and India have declined from around 6 in the 1970s to 1 and 2, respectively. Among G20 advanced economies, fertility rates are now as low as 1.2 (Italy, Japan) and 0.7 (Korea). Overall, the decline of fertility rates in G20 advanced and emerging market economies below the replacement level—absent migration—of 2.1 implies that the total population in these regions will shrink in the long run.

Figure 1. Fertility and Life Expectancy

Sources: World Bank, World Development Indicators; and IMF staff calculations.
Notes: Population-weighted aggregation used for country groupings. AE = Advanced Economies; AU = African Union; EM = Emerging Markets; EU = European Union.

2.   Contrary to the downward trend in fertility, life expectancy has shown a clear upward trend across all regions. While the populations of G20 advanced economies have experienced higher life expectancies over the past 70 years—rising from an average of around 67 years in the 1950s to

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[1] In this note, "G20 economies" is used to refer to the 19 individual member countries (*Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom,* and *United States*). G20 advanced economies comprise *Australia, Canada, France, Germany, Italy, Japan, Korea, United Kingdom,* and *United States,* and the G20 emerging market economies are *Argentina, Brazil, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa,* and *Türkiye*. While the European Union and African Union are members of the G20, they are referenced explicitly when included in figures and aggregates. The information used in this note is as of June 16, 2025, and IMF, *World Economic Outlook* figures correspond to the April 2025 release.

just under 82 years by 2023—G20 emerging market economies and AU members have larger increases of around 30 and 27 years, respectively (Figure 1, RHS). Despite this strong improvement, however, life expectancy in the AU remains consistently lower than other regions (at 64 years on average), even though the gap between average life expectancy in G20 advanced economies and the AU has decreased by 9 years.

3.   **Divergent trends in age dependency ratios highlight the different demographic challenges and opportunities facing each region.** The average total age dependency ratio, which is generally considered a good measure of the potential strain on public finance and social security, has been decreasing for G20 emerging market economies and the AU, but started increasing in G20 advanced economies since the 2000s (Figure 2, LHS). The AU consistently exhibited the highest dependency ratio, peaking around 95 percent in the 1980s and gradually declining to about 80 percent by 2020. Meanwhile, the G20 emerging market economies countries saw a sharp decline in dependency from approximately 85 percent in 1960 to around 45 percent by 2010. Both the G20 advanced economies and the European Union (EU) maintained relatively low and stable ratios until around 2000, after which their ratios began to rise again—reaching roughly 55 percent by 2020. Among G20 advanced economies, Japan and France exhibit particularly high dependency ratio in 2023, at 70 and 63 percent, respectively, while Korea stands out as the only country with a ratio below 50 percent, at 41.

Figure 2. Age Dependency Ratios

Sources: UN, Department of Economic and Social Affairs; and IMF staff calculations.
Notes: The age dependency ratio is defined as the dependent population (aged below 14 or over 65) over the working-age population (aged 15–64). Population-weighted aggregation used for country groupings. AE = Advanced Economies; AU = African Union; EM = Emerging Markets; EU = European Union.

4.   **When broken down by age, the drivers of dependency become clearer for each group.** The higher average total age dependency ratio for the AU reflects a larger proportion of youth dependents due to higher fertility rates, for example, in Chad, Democratic Republic of Congo, Niger, and Somalia, where women give birth to more than six children on average (Figure 2, RHS). In parallel, the young age dependency ratio for G20 emerging market economies has been declining over time due to the sharp decline in fertility, which helps explain the sharp drop in total dependency for these economies as the youth population rapidly transitioned into working-age population—the "demographic dividend" (Figure 3). The old age dependency ratio, on the other hand, has been growing in all regions except the AU, primarily due to longevity and an increasing share of elderly dependents.

5. **Migration flows can help alter demographic patterns.** G20 advanced economies and the EU have experienced cumulative net immigration between 1995 and 2020, while G20 emerging market economies and the AU experienced persistent net emigration (Figure 4). Some G20 members host a large stock of migrants, also as a share of their total population (over 40 percent in Saudi Arabia and close to 20 percent in Germany), while others lost millions of people to large migration flows (Figure 5). Globally, migrants and refugees are usually younger than natives in the destination economy, on average (Chapter 3 of the April 2025 *World Economic Outlook*).

6. **G20 advanced economies remain an important destination for migrants in the past 5 years, particularly from G20 emerging market economies, although these inflows have decreased over time** (Figure 6, LHS). Pull factors in advanced destination economies—such as better economic opportunities and stronger institutions—are the driving force attracting migrants, while the cost of migration and demographic factors—in particular, the share of young population in the source country—represent a significant determinant of emigration rates (Mayda 2010). In fact, migration flows tend to target countries with youth-intensive industries and skill shortages driven by an aging population (Box 3.2 of the April 2025 *World Economic Outlook*). Notable patterns also include substantial and increasing intra-group migration within the AU, and a rise in migration from the AU to G20 advanced economies and the European Union since the 2000s (Figure 6, RHS).

Figure 3. Share of Working-Age Population in Total Population *(percent)*
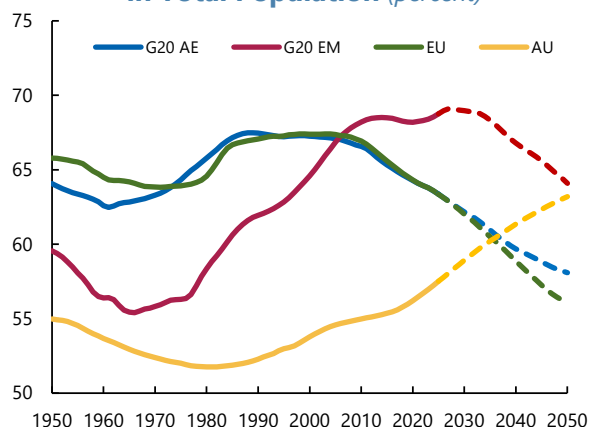
Sources: UN, Department of Economic and Social Affairs, and IMF staff calculations.
Notes: Population data by five-year age group. De facto population as of 1 July of the year indicated classified by five-year age groups (0–4, 5–9, 10–14, …, 95–99, 100+). Data are presented in thousands. Data for 2025–50 (dashed lines) is probabilistic median population prediction interval.
AE = Advanced Economies; EM = Emerging Markets; EU = European Union; AU = African Union.

Figure 4. Cumulative Gross Migration Flows *(millions)*
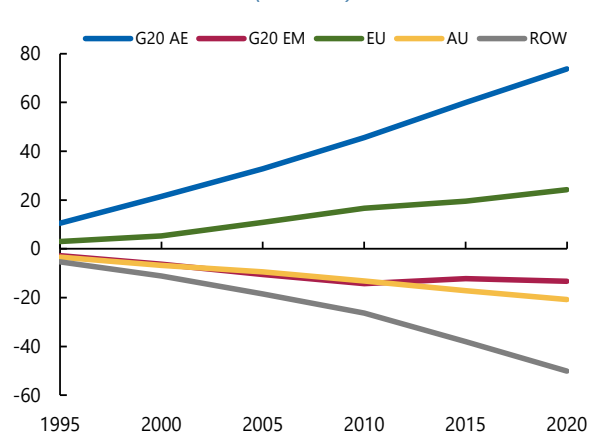
Sources: Abel and Cohen (2019); and IMF staff calculations.
Notes: AE = Advanced Economies; AU = African Union; EM = Emerging Markets; EU = European Union.

7. **The rise in intra-African human mobility reflects a broader trend of increasing migration and refugee flows between emerging market and developing economies**. During 2020–24, most gross flows were also between economies within the same region and income group, highlighting the fact that migration and refugee journeys are frequently undertaken only over short distances (Chapter 3 of the April 2025 *World Economic Outlook*). These recent developments reflect a significant increase in the flows of refugees who have been forcibly displaced or pushed from their homes by political instability, conflict, violence, persecutions, human rights violations, and natural disasters. Refugee journeys and instances of forced displacement are frequently

Figure 5. Stock of Migrants in 2020, Top 10 Destination and Origin Countries
(top axis: percent; bottom axis: millions)
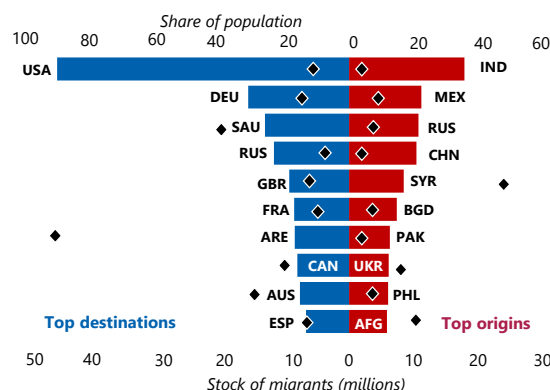
Sources: UN, Department of Economic and Social Affairs; IMF, World Economic Outlook; and IMF staff calculations.
Notes: Diamonds are share of population (top axis); bars are stock of migrants (millions; bottom axis).

undertaken across short distances with displaced migrants relocating to nearby countries. About two-thirds of the stock of refugees are hosted in neighboring countries, with four out of the top five hosts being emerging market and developing economies. For instance, at the end of 2024, 3.8 million individuals were forcibly displaced in the Sahel region due to escalating conflicts and severe weather events, leading many to seek refuge in neighboring countries (UNHCR 2024).

Figure 6. Bilateral Migration and Refugee Flows by Country Group Pairs
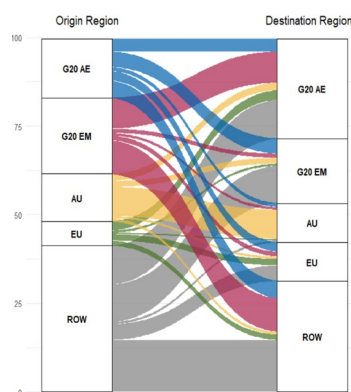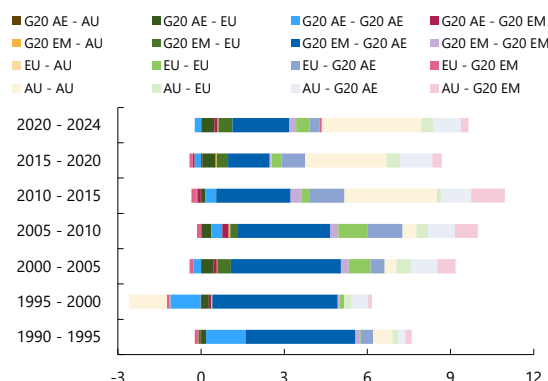
Sources: Abel and Cohen (2019); UN, Department of Economics and Social Affairs; and IMF staff calculations
Notes: LHS figure shows the average gross flows over the 2020–24 period. AE = Advanced Economies; AU = African Union; EM = Emerging Markets; EU = European Union; ROW = rest of world.

8. **Demographics trends are playing out against a backdrop of historically weak global growth prospects.** The growth rate of real GDP per capita—a simple measure of living standards—has been declining for most economies since the global financial crisis. For G20 emerging market economies, GDP per capita growth has fallen from an average of 4 percent between 2008 and 2013 to under 3 percent in 2023 (Figure 7). The decline in AU members has left average per capita real GDP

growth close to zero as of 2023. Following recovery from the global financial crisis, per capita growth in G20 advanced economies and the EU has also slowed. Weak output growth would continue to erode living standards and threaten social stability.

9. **Looking forward, demographic projections point to continued aging in G20 advanced and emerging market economies at much faster rates than in the AU.** Populations in G20 advanced economies and the EU show clear signs of aging, with shrinking bases (younger cohorts) and expanding tops (older cohorts), indicating low birth rates and

Figure 7. Global Growth Slowdown

GDP per capita growth
(annualized %)

Sources: World Bank, World Development Indicators, and IMF staff calculations.
Notes: AE = Advanced Economies; AU = African Union; EM = Emerging Markets; EU = European Union.

Figure 8. Population Dynamics

1. G20 AE population pyramid
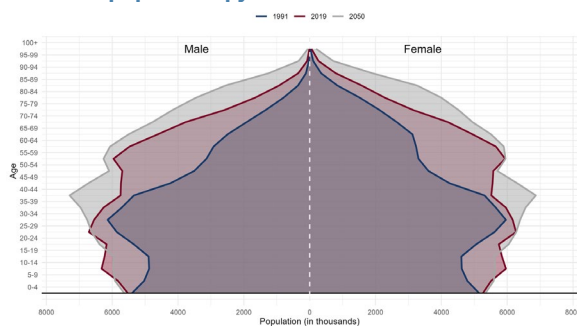
2. G20 EM population pyramid
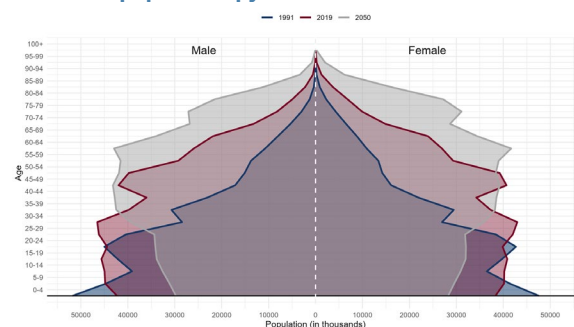
3. EU population pyramid
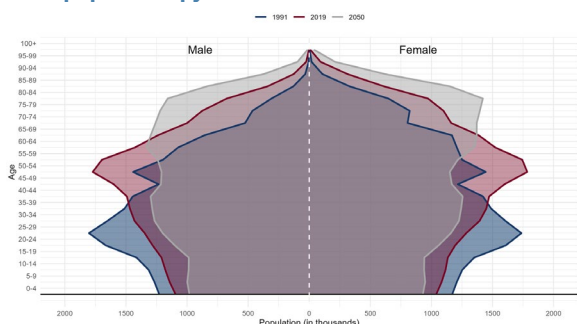
4. AU population pyramid
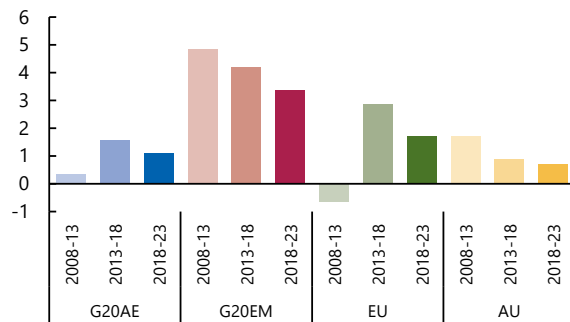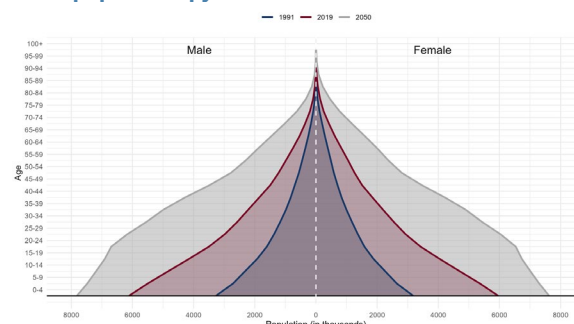
Sources: UN, Department of Economic and Social Affairs; and IMF staff calculations.
Notes: Population data by five-year age group. De facto population as of 1 July of the year indicated classified by five-year age groups (0-4, 5-9, 10-14, ..., 95-99, 100+). Data are presented in thousands. Year 2050 data is probabilistic population projections. Median (50 percent) prediction interval. AE = advanced economies; AU = African Union; EM = emerging markets; EU = European Union.

increasing life expectancy (Figure 8, panels 1 and 3). G20 emerging market economies display a more balanced structure but a narrowing base by 2050 (Figure 8, panel 2). In contrast, the AU population pyramid retains its wide base up to 2050, reflecting high fertility rates and a younger population, with total population continuing to expand rapidly across all age groups (Figure 8, panel 4). These trends indicate contrasting demographic paths: advanced economies and EU members face aging

populations and potential labor shortages, as evidenced by negative population growth in Bulgaria, Germany, Hungary, Japan, and Poland in 2023. Conversely, certain emerging market economies and the AU will see expanding populations, with growth rates exceeding 3 percent in Chad, Democratic Republic of Congo, Niger, Saudi Arabia, and South Sudan.

10.   Rapid population growth can be a challenge for some regions. With half of all new entrants into the global labor force coming from sub-Saharan Africa by 2030, the continent will need to create up to 15 million new jobs annually. For instance, Niger, with a population of 26 million people and a youth population share that is not expected to peak until 2058, will require 650,000 new jobs annually for the next 30 years (October 2024 _Regional Economic Outlook for Sub-Saharan Africa_). As population continues to expand in the AU, capacity challenges in essential services, food, and water supply may arise caused by interconnected factors such as conflict and political instability, extreme weather events, and lagging agricultural and food production systems (FSIN and GNAFC 2025).

DEMOGRAPHICS AND PRODUCTIVITY

Labor supply and productivity tend to decline in aging societies, the latter due to reduced effort and slower innovation among older workers. Aging also affects the demand and supply of capital, typically as savings increase and investment decreases, putting downward pressure on interest rates. Healthy aging, automation, and migration can help counterbalance productivity and output losses.

11.   Reduced effort and slower innovation in aging workforces have coincided with a drop in productivity over time. The broad-based decline in GDP growth and output per worker has underpinned by declining contributions of labor and total factor productivity (TFP) (Figure 9). The latter has accounted for more than half of this decline, driven in part by the increased misallocation of capital and labor among firms within sectors (Chapter 3 of the April 2024 _World Economic Outlook_). Lower TFP growth appears to be an important driver through which population aging lowers output growth (Aiyar and others 2016; Lee and Shin 2021). The input intensity of workers could decline after a certain age, through health deterioration or skill obsolescence, particularly in physically strenuous occupations. Slower population growth has also been associated with lower risk appetite and innovation (Aksoy and others 2019; Jones 2022; Kotschy and others 2024). Whereas increases in the share of workers aged 40 to 49 are associated with higher productivity growth, echoing results showing that workers' earnings peak in their 40s (Feyrer 2007; Guénette and Shao 2025; Murphy and Welch 1990), older societies are likely to generate fewer ideas, lowering productivity growth in the long run (Jones 2022).[2] Further research shows that aging societies reduce entrepreneurial activity (Karahan and others 2024; Liang and other 2018). Nevertheless, recent work by the OECD highlights how the relationship between age and productivity might vary by sector or occupation, and points to potential measurement errors in assessing workers' productivity (André and others 2024).

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[2] For instance, estimates for the United States show that a 10 percent increase in the share of the population aged 60 and older results in a 5.5 percent drop in GDP per capita, with two-thirds of this decline directly linked to reduced labor productivity and the remainder to slower employment growth (Maestas and others 2023).

Figure 9. Contribution of Components of GDP Growth, 1995–2023

World: contribution of components of GDP growth *(percent)*
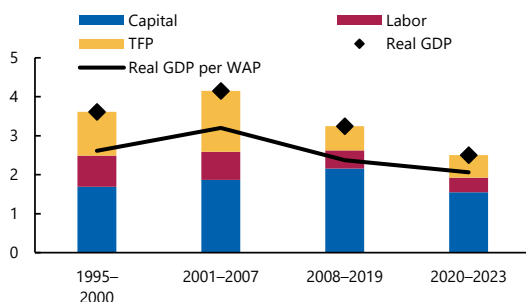
Legend: Capital | Labor | TFP | Real GDP | Real GDP per WAP

Categories: 1995–2000, 2001–2007, 2008–2019, 2020–2023

G20 AE: contribution of components of GDP growth *(percent)*

Legend: Capital | Labor | TFP | Real GDP | Real GDP per WAP

Categories: 1995–2000, 2001–2007, 2008–2019, 2020–2023

G20 EM: contribution of components of GDP growth *(percent)*
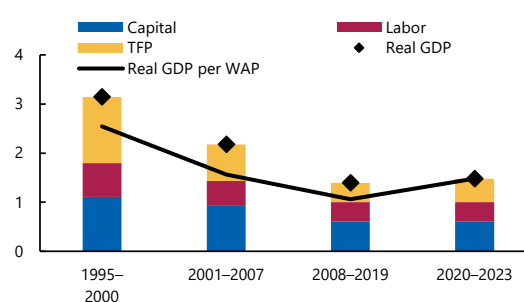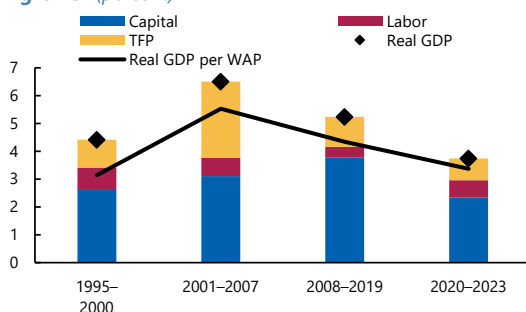
Legend: Capital | Labor | TFP | Real GDP | Real GDP per WAP

Categories: 1995–2000, 2001–2007, 2008–2019, 2020–2023

AU: contribution of components of GDP growth *(percent)*

Legend: Capital | Labor | TFP | Real GDP | Real GDP per WAP

Categories: 1995–2000, 2001–2007, 2008–2019, 2020–2023
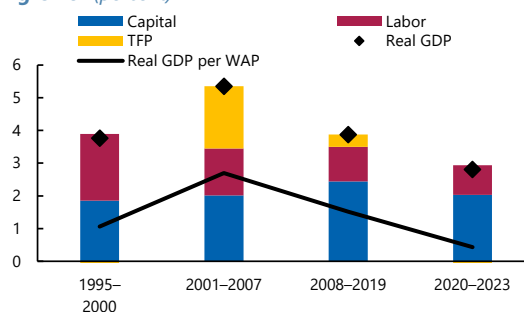
Sources: International Labor Organization; Penn World Table version 10.01; UN, World Population Prospects; and IMF staff calculations.

Notes: WAP=working-age population; growth decomposition sample comprises 140 countries. Contributions of capital growth and labor growth reflect output share of respective factor inputs and their growth rates. AE = Advanced Economics; AU = African Union; EM = Emerging Markets, EU = European Union.

12.   Changes in fertility can influence growth through multiple channels. Increases in fertility can decrease female labor force participation as women are more likely to reduce their labor supply after having a child (Bloom and others 2009).[3] However, higher fertility rates contribute to population growth and the generation of new ideas and innovation (Jones 2022), and stronger domestic demand and investment, although this link is stronger when institutions and macroeconomic conditions are stable (Bloom and others 2003; Summers 2014). Over time, fertility rates have been positively associated with TFP growth, the effects of which take about 10–15 years to materialize. New workers only slowly enter the labor force but an increase in fertility rates of 1 child per woman is associated with an increase in TFP growth of about 1.3 percent 15 years later (Figure 10, LHS). This suggests important productivity losses from lower fertility and lower population growth more generally.

13.   Aging and declining population can also have implications for the aggregate capital stock. Aging societies tend to save more therefore putting downward pressure on equilibrium interest rates (Auclert and others 2021; Chapter 2 of April 2023 *World Economic Outlook*). In some cases, lower interest rates are unable to stimulate investment demand as slow population growth translates into a

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[3] In some countries, such as China and India, declining female labor force participation (FLFP) accompanies declining fertility, suggesting that changes in fertility rates are not necessarily driving changes in FLFP—see Li (2019). Liu and others (2025) and Deshpande and Singh (2024) discuss some of the reasons behind the declining FLFP in China and in India, respectively.

lack of profitable investment opportunities and economic stagnation (Hansen 1939; Summers 2014). The decline in investment can directly affect labor productivity—through a reduction in capital input— or can impact total factor productivity—through slower technological diffusion. A 1-year increase in life expectancy has been associated with slower capital accumulation by 0.1 of a percentage point 15 years later (Figure 10, RHS). Indeed, the lower contribution of labor in output growth has coincided with declining capital formation among advanced and emerging market economies (Figure 9). Furthermore, differences in demographic structures between countries can generate capital flows from older economies to younger ones and influence current account dynamics (Feroli 2003; Henriksen 2005; Krueger and Ludwig 2007; Backus and others 2014; Ikeda and Saito 2014; Carvalho and others 2016). In addition, as demographic cycles affect aggregate demand, savings behavior, and labor supply, long-run trends in inflation and global real interest rates will also evolve (Juselius and Takáts 2016).

Figure 10. Lagged Fertility vs TFP Growth and Life Expectancy vs Capital Accumulation

Life expectancy and subsequent capital accumulation *(regression coefficients)*

Fertility and subsequent TFP growth *(regression coefficients)*

Sources: Penn World Table Version 10.01; World Bank, World Development Indicators; and IMF staff calculations.
Notes: The figure plots the coefficients from panel regressions of lagged fertility rates (1–15 years) on TFP growth (left) and lagged life expectancy (1–15 years) on capital accumulation (right). Regressions include country fixed effects and standard errors are clustered at the country level. See Annex I for more details.

14.   **Healthy aging—improvements in physical and cognitive skills of the elderly—has likely been an important moderating factor of aging by extending working lives and boosting productivity gains among older workers.** Individuals are not only experiencing longer lifespans but also healthier aging, although substantial disparities persist, both across countries and socioeconomic groups (Scott 2021, 2023; Kotschy and Bloom 2023; Chapter 2 of the April 2025 *World Economic Outlook*). Significant increases in physical and cognitive abilities over the past decades have translated into improved labor outcomes among older workers. These gains are reflected in higher total earnings, increased labor productivity, and positive employment outcomes—both in terms of greater workforce participation (extensive margin) and more hours worked (intensive margin) (Figures 11 and 12). In addition, better health is also associated with later retirement, working more weeks per year, and a lower probability of being unemployed. IMF estimates show that improved labor market outcomes for people aged 50 and older, thanks to better health, could contribute about 0.4 percentage point annually to global GDP growth in 2025–50 (Chapter 2 of the April 2025 *World Economic Outlook*).

Figure 11. Healthy-Aging Trends by Cohort
(year by birth fixed effect)

Figure 12. Effect of Healthy Aging on Labor Market Outcomes *(regression coefficients)*
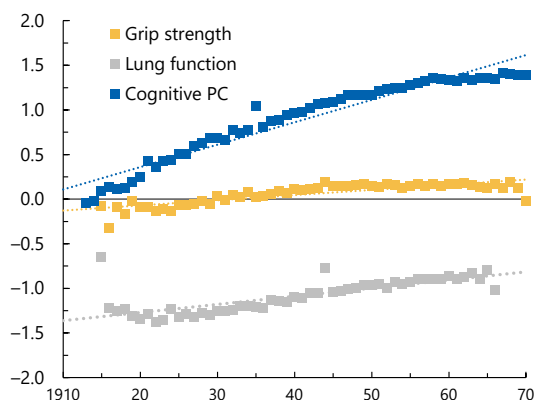
Sources: Chapter 2 of the IMF April 2025 World Economic Outlook.
Notes: The RHS figure shows estimates from two-stage least squares regressions of labor market outcomes of individuals ages 50 and older on health indicators (one at a time, instrumented by chronic disease), controlling for individuals' age, gender, educaion, wealth, and country fixed effects. Squares represent point estimates, whereas surrounding bars represent 90 percent confidence intervals. The coefficients are rescaled to reflect the estimated impact of "healthy aging" (health trends) over 10 years. See Chapter 2 of the April 2025 World Economic Outlook for more details on the data analysis. PC= Principal Components; LFP = Labor Force Participation.

15.   Automation may also have helped to counteract productivity losses typically associated with aging. The lack of a negative relationship between an increasingly older population and labor productivity across advanced economies constitutes a counterintuitive finding given the preceding discussion (Figure 13). Acemoglu and Restrepo (2017, 2021) study this empirical anomaly and suggest that those countries that experienced more pronounced demographic changes between 1990 and the mid-2010s were more likely to adopt robots (Figure 14). They estimate that aging explains 35 percent of the variation in robot adoption among OECD countries. Hence, some countries successfully mitigated the demographic challenges posed by labor shortages by deepening capital and investing

Figure 13. GDP per Capita vs Population Aging
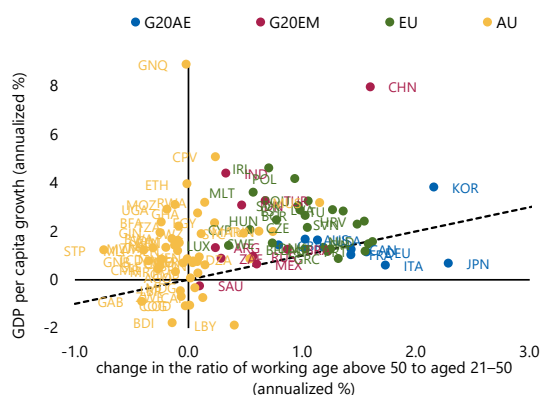
Figure 14. Population Aging vs Robot Adoption
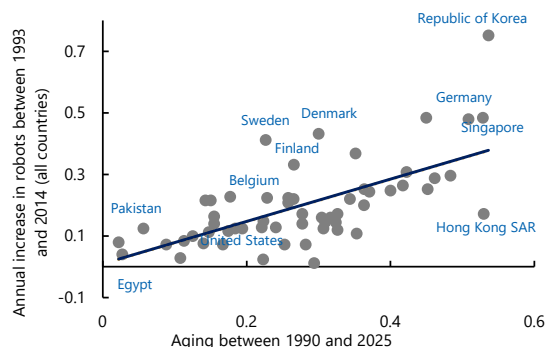
Sources: Acemoglu and Restrepo (2021); ILOSTAT; World Bank, World Development Indicators; and IMF staff calculations.
Notes: AE = Advanced Economics; AU = African Union; EM = Emerging Markets; EU = European Union.

in automation.[4] The widespread diffusion and adoption of AI could also mitigate the headwinds of the aging workforce. Job complementarity with AI could enhance productivity in certain professions and potentially enable some workers to stay in certain occupations for longer. However, existing research indicates the risk that AI-driven changes will have unequal effects across workers (for instance depending on gender and age) and countries, with emerging and developing countries less prepared to take advantage of AI (Cazzaniga and others 2024b; Filippucci and others 2024).

16.   **Immigration can deliver "double dividends" for productivity in both destination and origin economies.** Migration from countries with large youth populations can ease labor shortages and help relocate labor to destinations with higher productivity (Blanc and Wacziarg 2025; Clemens 2011; Dustmann and Preston 2019; Grabowski and others 2023; Peri 2012).[5] For example, recent immigration flows to Europe helped accommodate strong labor demand while native unemployment remained at historical lows (Caselli and others 2024). Immigrants not only increase the working-age population but also raise TFP growth through a faster pace of innovation within a diverse workforce, especially in the case of skilled migration (Kerr and others 2016; Peri 2012; Ortega and Peri 2014; Trax and others 2015). In parallel, origin economies can also benefit from emigration through remittances, knowledge transfers, and investment via diaspora networks and returning migrants (Dos Santos and Postel-Vinay 2003; Doucquier and Rapoport 2012; Dustmann and Kirchkamp 2022, Yang 2008). Migrants' remittances, for instance, account for 3.3 percent of GDP in India, 4 percent in Mexico, 8 percent in Morocco and above 10 percent in several low-income countries, including in the AU (The Gambia, Lesotho, Liberia), and could significantly contribute to investment, other than sustaining consumption (Adams 1998; Woodruff and Zenteno 2007; Yang 2008). In terms of network externalities, the role of the Indian diaspora has often been indicated as a primary factor of the rise of the IT industry in India (Nanda and Khanna 2010).

17.   **However, migration can present short-term costs in destination economies and trade-offs for origin economies.**

- Destination economies can face short-to-medium term costs from accommodating a larger population that strain local resources ("congestion") before the longer-term benefits of a larger workforce set in ("agglomeration") and lead to higher total factor productivity from, for example, knowledge spillovers and increased entrepreneurship (Chapter 3 of the April 2025 *World Economic Outlook*; Saiz 2007; Melo, Graham, and Noland 2009; Kline and Moretti 2013; Dinkelman and Schulhofer-Wohl 2015; Colas and Sachs 2024; OECD 2024). Increased congestion of public services, infrastructure, and rising housing costs can be particularly acute when migration flows are sudden and large, labor markets are less flexible, or migrant workers are concentrated in specific skills or sectors (Peri 2014). Productivity gains are likely to materialize faster when the skills of migrants and refugees are complementary to those of the native population in destination economies. Significant and unexpected migration and refugee inflows can exacerbate social tensions, especially in areas with limited capacity to absorb.

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[4] While robot adoption can lead to productivity gains and complementarity with some workers, automation can still cause important distributional consequences for the workforce (see, for example, Acemoglu and others 2020 and Acemoglu and Restrepo 2020).

[5] An inflow of younger workers can also alleviate fiscal pressures in aging societies, as well as raise global output per capita (Auerbach and Oreopoulos 1999; Clemens 2011; Dustmann and Frattini 2014; Storesletten 2000).

Addressing the social concerns associated with the short terms costs of migration is crucial in order to capitalize on the long-term gains of immigration (Chapter 3 of the October 2024 *World Economic Outlook*).

- In origin economies, benefits from remittances materialize over time and are contingent on their absorptive capacity and labor market conditions.[6] In many emerging market and developing economies, remittances are mostly used to smooth consumption, while only indirectly supporting welfare and human capital formation, such that their immediate impact on productivity can be limited. The loss of skilled workers can also come at cost, which can be more severe if migration to the destination country is permanent or if not offset by positive diaspora network effects (Commander and others 2004; Docquier and others 2007; Agrawal and others 2011). Emigration can also lead to talent gaps in key domestic sectors, such as education, health, and technology, hindering the provision of important services, as well as innovation and productivity over the long term (Mullan 2005; Hazans and Philips 2011; Docquier and Rapoport 2012).

GROWTH IMPLICATIONS OF SHIFTING WORKING-AGE DEMOGRAPHICS

The growth impact of demographic shifts is multifaceted, encompassing factors related to labor supply, productivity, savings decisions, and the sustainability of public finances. Among G20 advanced economies, aging and shrinking working-age populations have dampened growth, while migration inflows provided partial relief. Meanwhile, G20 emerging market economies experienced a demographic shift that led to a sustained increase in the share of the working-age population—a "demographic dividend". Looking ahead, however, population growth is expected to diminish globally, with population decline intensifying among some G20 advanced economies and the EU.

18.   Higher total age dependency ratios could dampen output growth given that a smaller share of the population is available to be part of the labor force.[7] They also place strain on public finances due to a diminished tax base and higher social security expenditures, as both younger and older generations tend to consume more public services. Fertility has a strong negative correlation with income per capita and countries with "lowest-low" fertility rates have seen rapid economic growth per capita after stagnation (Goldin 2025).[8] Furthermore, a declining share of working-age population

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[6] In the case of destination economies in the Gulf Cooperation Council, remittances tend to be large and sustained over time.

[7] This note does not examine the fiscal implications of aging. The adverse effects of population aging on growth are likely to be compounded by mounting direct and indirect fiscal pressures. As populations age, spending on pensions and healthcare is expected to rise, placing pressure on public finances. Indirect channels include how changes in productivity and shifts in demand patterns for goods and services could undermine firm performance and tax revenues. Without substantive reforms to entitlement programs, the rising costs associated with aging—particularly in healthcare and social security—are projected to place significant strain on public finances (see the April 2024 *Fiscal Monitor*). This could, in turn, crowd out public investment in areas more conducive to long-term economic growth.

[8] "Lowest-low" refers to total fertility rates of less than 1.3 births per woman. While they modernized quickly, citizens' beliefs and traditions changed slowly as men often remain attached to traditional family structures while women embrace new economic opportunities, leading to generational and gendered conflicts that may reduce fertility rates (Goldin 2025).

not only reduces labor supply but could also impinge on economic growth through lower productivity and fewer innovations (Aksoy and others 2019; Jones 2022). Therefore, economies with lower dependency and higher shares of working-age population will benefit from a temporary boost, while others—such as G20 advanced economies and the AU—face pressures from larger elderly and youth populations, respectively.
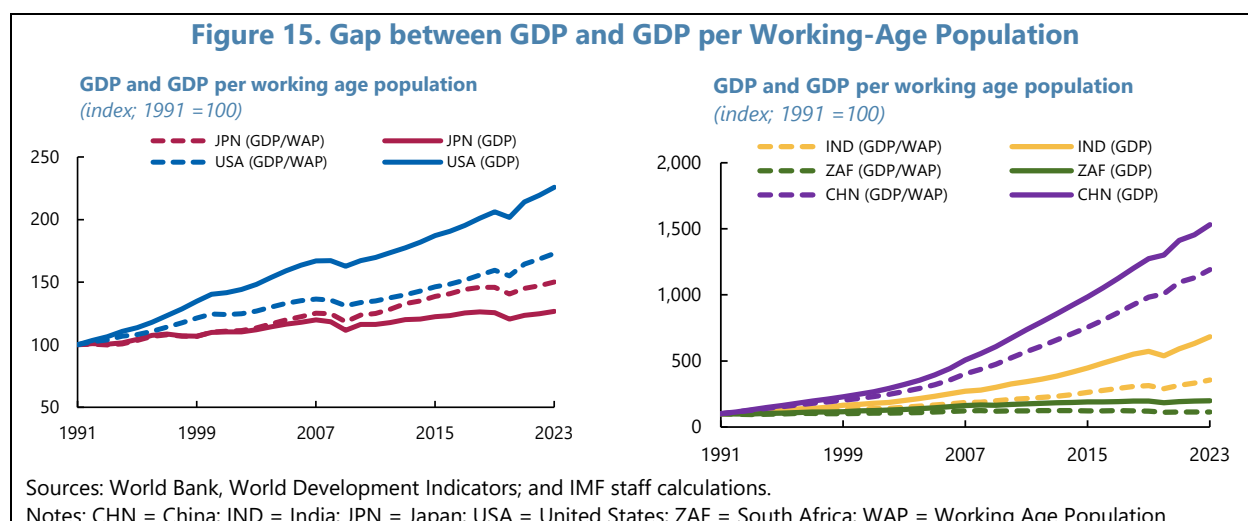
19.   Accounting for demographic shifts offers a different perspective on growth performance for aging advanced economies. Assessing macroeconomic performance only through the lens of GDP growth and GDP per capita growth can hide important dynamics in GDP per working-age population—a proxy for labor productivity—making it an unreliable proxy for productivity growth (Fernandez-Villaverde and others 2025).[9] For example, while Japan has recorded relatively modest GDP growth over the past three decades, its performance in terms of GDP per working-age adult has been strong—outpacing most G7 countries and even approaching U.S. levels (Figure 15, LHS). Between 1991 and 2023, Japan's total GDP increased by just 27 percent, compared to 126 percent in the United States. However, when adjusted for changes in the working-age population, the gap narrows significantly, with Japan's GDP per working-age adult rising nearly in step with that of the United States—a difference of only 23 percent. This discrepancy is fully accounted for by different demographic trends in the two countries. During the same period when Japan experienced rapid population aging and limited inflows of migrants, population aging in the United States has been less severe and the country has attracted a significant influx of migrants.

20.   Growth among some G20 emerging market economies has been supported by sustained increases in working-age population. China's economy expanded approximately 15-fold from 1991 to 2023 alongside a significant increase in the working-age population, such that GDP growth and GDP growth per working-age population have been broadly keeping pace with one another over time (Figure 15, RHS). India's remarkable economic growth, resulting in a 700 percent increase in GDP over three decades, was also bolstered by a rise in the working-age population, but to a lesser extent, accounting for around half of the GDP growth. As the younger population transitions into the labor force, it would provide an even greater boost to activity, and the two measures should move more closely. For South Africa, where performance over the same period has been less impressive, demographic factors nonetheless play an important role as more than 85 percent of its doubling GDP can be explained by the expansion of the working-age population.

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[9] An alternative growth measure to reflect the demographic changes is output per hour worked (Fernandez-Villaverde and others 2025). However, this metric has two limitations:(i) reliable data for hours worked in many countries is unavailable and existing data are subject to considerable measurement challenges (Eldridge and others 2022), and (ii) interpreting output growth per hour worked is difficult since hours worked are an endogenous variable influenced by many factors such as business cycle fluctuations.

Figure 15. Gap between GDP and GDP per Working-Age Population

GDP and GDP per working age population
(index; 1991 =100)

GDP and GDP per working age population
(index; 1991 =100)

Sources: World Bank, World Development Indicators; and IMF staff calculations.
Notes: CHN = China; IND = India; JPN = Japan; USA = United States; ZAF = South Africa; WAP = Working Age Population.

21.   However, the growth contribution of the working-age population has been weakening over time for most advanced and emerging market economies. Comparing the average contribution of the working-age population to GDP growth between the 1990–2008 and 2008–23 highlights how aging led to shrinking workforce participation among G20 advanced and emerging market economies (Figure 16, LHS). In contrast, just over half of AU members have experienced an increase in the average contribution of the working-age population to output growth since the global financial crisis, as younger cohorts entered the labor market.

22.   With population growth expected to continue to slow until at least 2050, the outlook for GDP growth is even weaker. This trend is likely to be particularly severe for many G20 advanced economies and the EU where population has peaked and declines are expected to accelerate, including Germany, Italy, Japan, Korea, Poland, and Balkan countries (Figure 16, RHS). Even among the AU, while population growth is expected to remain positive in the majority of countries, it will grow less rapidly than in the previous two decades, with a marked slowdown expected in some central and west African economies (Central African Republic, Lesotho, Sao Tome and Principe, Zimbabwe).

Figure 16. Average Working-Age Population Growth over time and Historical vs Projected Population Growth

Average growth of the working age population - pre 2008 vs post 2008 *(percent)*

Historical vs projected population growth
(percent)

Sources: World Bank, World Development Indicators; UN, World Population Projections; and IMF staff calculations.
Notes: The dotted line is a 45-degree line. AE = Advanced Economics; AU = African Union; EM = G20 Emerging Markets, EU = European Union.
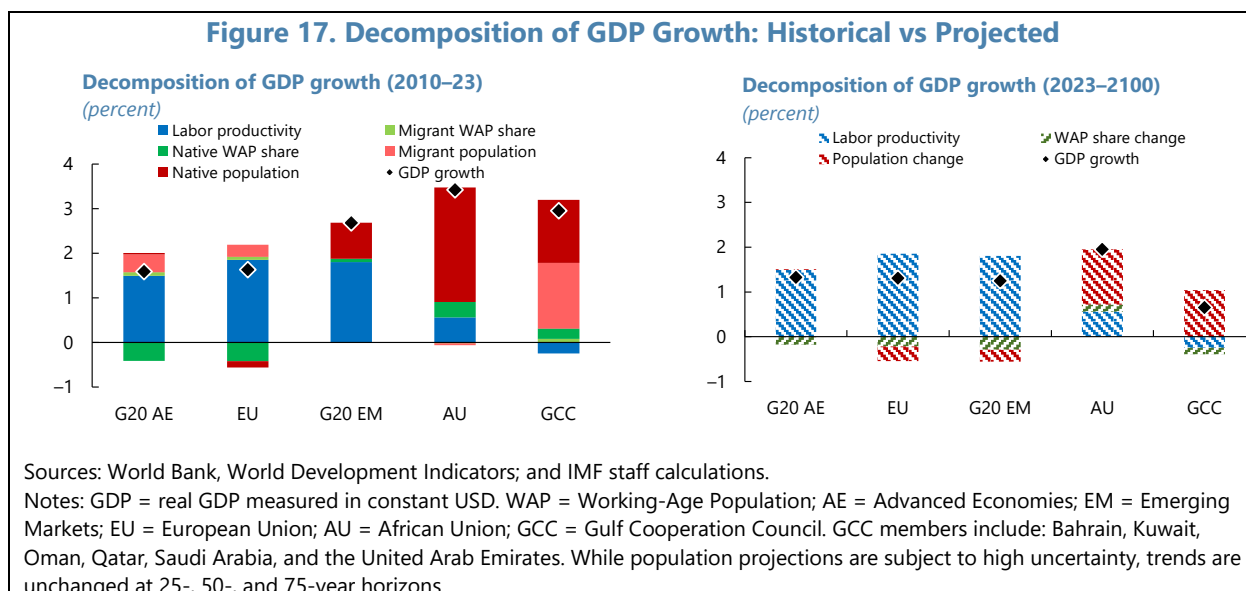
23. **Demographic shifts have stifled GDP growth in G20 advanced economics while supporting growth in G20 emerging market economies and the AU.** GDP growth can be decomposed into labor productivity (GDP per worker), population growth, and changes in the working-age population share, with each factor further divided into contributions by natives and immigrants (Figure 17; see Box 1 for underlying calculations).[10]

- **Immigration helped offset adverse demographic trends in G20 advanced economies and the EU.** Between 2010 and 2023, output growth in G20 advanced economies and the EU was primarily driven by labor productivity, while demographic changes among native populations exerted a negative influence (Figure 17, LHS). In both groups, the share of working-age natives declined, and in the EU the native population itself also shrank. These adverse demographic shifts were offset by increases in the migrant population and in the share of working-age migrants, resulting in overall GDP growth rates that closely mirrored labor productivity gains.

- **Native population dynamics supported growth in G20 emerging market economies.** Labor productivity again served as the main engine of growth, complemented by positive contributions from native demographic dynamics. Population growth among natives provided a substantial boost, with a modest increase in the share of working-age natives further enhancing output. In contrast, migration flows played a limited role in these economies.

- **In the AU, a substantial increase in the native population accounted for approximately 75 percent of total output growth.** Although labor productivity gains were relatively modest compared to other groups (as indirectly shown also in Figure 9), the strong demographic momentum translated into the highest GDP growth among the regions.

- **Immigration has been a critical contributor to growth for members of the Gulf Cooperation Council alongside native population dynamics.** Given the reliance on foreign expatriate labor, for example, in the hydrocarbon, construction, and services sectors, immigrants account for 75 percent of the population on average in Qatar and the UAE, and over 50 percent in Kuwait and Bahrain, though migrant integration and duration of stay are limited. GDP growth was driven largely by population increases, evenly split between natives and migrants. Negative labor productivity growth underscores the dominant role of demographic change—particularly through migration—in shaping the region's economic trajectory.

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[10] The growth decomposition reported in Figure 17 is different from that used in Figure 9. The former does not take any stance on the production function and does not use information on capital growth. Labor productivity includes any factor that cannot be explained by working-age population, such as TFP and capital growth.

Figure 17. Decomposition of GDP Growth: Historical vs Projected

Decomposition of GDP growth (2010–23)
(percent)

Legend: Labor productivity, Migrant WAP share, Native WAP share, Migrant population, Native population, GDP growth

Decomposition of GDP growth (2023–2100)
(percent)

Legend: Labor productivity, WAP share change, Population change, GDP growth

Categories (both charts): G20 AE, EU, G20 EM, AU, GCC

Sources: World Bank, World Development Indicators; and IMF staff calculations.
Notes: GDP = real GDP measured in constant USD. WAP = Working-Age Population; AE = Advanced Economies; EM = Emerging Markets; EU = European Union; AU = African Union; GCC = Gulf Cooperation Council. GCC members include: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. While population projections are subject to high uncertainty, trends are unchanged at 25-, 50-, and 75-year horizons.

24.   Demographic decline will likely slow down output growth globally over the course of the 21st century. Under baseline projections from the 2024 revision of the UN's World Population Prospects (WPP)—which assume that global population reaching its peak around the mid-2080s—and assuming that labor productivity growth keeps the same pace as in the past 15 years, output growth decomposition projections for G20 advanced economies and the EU suggest that working-age population share will continue to contribute negatively to growth. In addition, the growth contribution of population will decline further, turning negative in the EU (Figure 17, RHS). G20 emerging market economies are also expected to lose the demographic tailwinds from population growth. Both total population and the working-age share are projected to decline, as these economies begin to align with the demographic profile of richer economies. While the AU is projected to maintain positive growth in both population and its working-age share, the pace will moderate. The members of the Gulf Cooperation Council will likewise face slower population growth and a shrinking working-age population share. Importantly, these WPP-based projections may reflect an overly optimistic scenario (Fernández-Villaverde and others 2025).[11] Moreover, compared to the 2019 vintage, the 2024 vintage of the WPP projects much lower fertility rates and higher old age dependency ratios for some countries, especially China (see Chapter 2 of the April 2025 *World Economic Outlook*). If these revisions persist in the future, the outlook for projected growth will appear even weaker.

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[11] Fernández-Villaverde and others (2025) point to significant discrepancies between WPP estimates and official vital statistics in many countries, which question the plausibility of a rebound in fertility rates—particularly in countries like South Korea, Chile, and China. They also note inconsistencies in migration patterns and census-based population levels. See also a recent lecture by Fernandez-Villaverde at the 7th EBRB-CEPR Research Symposium in May 2025. After adjusting for these issues, the WPP baseline may in fact align more closely with a pessimistic trajectory.

Box 1. Decomposing GDP

GDP can be decomposed into the following three components:

$$GDP = \underbrace{\frac{GDP}{WAP}}_{labor\ productivity} \times \underbrace{\frac{WAP}{P}}_{share\ of\ working-age\ pop.} \times P$$

where *WAP* is the working-age population (defined as the share of 15- to 64-year-olds in the total population) and P is total population. The first term—GDP per working-age adult—can be interpreted as a measure of labor productivity. In turn, GDP growth can be decomposed into the growth rate of labor productivity, the change in working-age population, and the growth rate of population:

$$\Delta lnGDP = \Delta ln\left(\frac{GDP}{WAP}\right) + \Delta ln\left(\frac{WAP}{P}\right) + \Delta lnP$$

The change in total population can be further decomposed as:

$$\Delta lnP = lnP_t - lnP_{t-1} = ln\left(P_{t-1} + \Delta P_{nat} + \Delta P_{mig}\right) - lnP_{t-1}$$

where ΔP_{nat} and ΔP_{mig} are the changes of native and migrant populations respectively.

For small changes, the growth rate of variable X can be approximated using a first-order Taylor approximation as: $\Delta lnX \approx \frac{\Delta X_{nat}}{X_{t-1}} + \frac{\Delta X_{mig}}{X_{t-1}}$. Furthermore, assuming that 80 percent of the total migrant population is of working age, ($\Delta WAP_{mig} = 0.8 \cdot \Delta P_{mig}$), GDP growth can be decomposed into the following five components (Figure 17):

$$\Delta lnGDP = \underbrace{\Delta ln\left(\frac{GDP}{WAP}\right)}_{labor\ productivity} + \underbrace{\left(\frac{\Delta WAP_{nat}}{WAP_{t-1}} - \frac{\Delta P_{nat}}{P_{t-1}}\right)}_{change\ in\ native\ WAP\ share} + \underbrace{\left(\frac{0.8 \cdot \Delta P_{mig}}{WAP_{t-1}} - \frac{\Delta P_{mig}}{P_{t-1}}\right)}_{change\ in\ migrant\ WAP\ share} + \underbrace{\frac{\Delta P_{nat}}{P_{t-1}}}_{native\ pop.\ growth}$$

$$+ \underbrace{\frac{\Delta P_{mig}}{P_{t-1}}}_{migrant\ pop.\ growth}$$

To obtain the different country group-level decompositions, the formula is first applied to the annual GDP growth for each country during 2010–23. Then, each component across years and countries is aggregated within a region using GDP-weights for labor productivity and population-weights for other population-related variables.

POLICIES TO BOOST LABOR FORCE PARTICIPATION AND PRODUCTIVITY

Future demographic changes are expected to slow growth globally. Therefore, the implementation of policies to enhance labor force participation, increase productivity, and mitigate the economic impact of demographic shifts has become increasingly critical. Key strategies involve pro-natalist policies to help increase fertility rates, promote female labor force participation, and active labor market policies to incentivize longer working periods. In the AU, policies should be directed at creating jobs to fully benefit from the population boom. Well-managed immigration can also yield a "double dividend," enhancing growth in both destination and origin economies, while increasing the working-age population and potentially boosting total factor productivity in receiving economies. Additionally, structural reforms and investments in infrastructure and human capital can offset the demographic burden. International cooperation should remain a priority where shocks and domestic policies can generate large spillovers.

25.   Policies aimed at increasing labor force participation play a crucial role in bolstering growth. In the first instance, labor markets need to function efficiently by minimizing underemployment and avoiding hysteresis effects that can arise following economic crises. Policies aimed at increasing the workforce may include measures to boost fertility rates, encourage female labor force participation by identifying and reducing barriers, incentivize longer working periods, prevent a drop in work participation before retirement age, and attract immigrants—the latter three policies tend to yield results in a relatively shorter timeframe than efforts aimed at increasing fertility rates.

26.   For countries that seek to raise fertility, a number of policy combinations are available. Policies related to paid parental leave, affordable childcare, tax benefits, and family allowances have been shown to be successful in several OECD countries (OECD 2024b; Lalive and Zweimüller 2009; Bick and Fuchs-Schündeln 2017). As research has shown that higher house prices and lack of access to affordable and quality housing lead to a decline in fertility rates, the supply of better and more affordable housing is an important policy level (Dettling and Kearney 2014; Fazio and others 2024). Doepke and others (2023) also highlight the central role of women's career-family compatibility to boost natality—as female labor force participation has increased—and identify four determinants: family policies, in particular, childcare policies, a more equal division of childcare between parents, social norms, and flexible labor markets. Although they can have a significant impact on households' reproductive decisions, changes in norms and intra-household bargaining tend to be long-run phenomenon that take time to change and are less elastic to policy changes. Nevertheless, other instruments to increase both fertility and female labor supply remain available, such as the provision of subsidized or free childcare, which can lower the cost of having a child and free up mothers' time.[12]

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[12] For instance, Olivetti and Petrolongo (2017) document a positive correlation between public spending on childcare and childhood education and both fertility and women's employment. Bauernschuster and others (2016) document that the introduction of universal childcare in Germany had significant positive effects on fertility, which were more pronounced at the intensive margin. D'Albis and others (2017) provide further evidence that access to childcare services play a role in the decision to have a second child. Finally, Luci-Greulich and Thévenon find that family (continued)

In addition, improving overall labor market conditions can yield a double dividend via increased labor participation and natality gains. Women tend to postpone childbearing when permanent and stable jobs are hard to find or when labor market conditions worsen (Ahn and Mira 2002; Del Bono and others 2012, 2015). Providing more flexibility in the job has been shown to increase fertility (Goldin 2014; Guner and others 2020).

27.   Increasing female labor force participation can help offset some of the decline in participation caused by aging. Advanced economies have already managed to counter the effects of aging by substantially boosting labor force participation within age groups, primarily through remarkable increases in female participation (Chapter 3 of the April 2024 *World Economic Outlook*). Similar patterns have been highlighted in Latin America, although participation rates have plateaued since 2010, with parenthood identified as a key driver of participation gaps (October 2024 *Regional Economic Outlook* for the Western Hemisphere). Saudi Arabia has also increased its female labor force participation by more than 10 percentage points over 5 years, reaching 35 percent by 2023.

- Family policies and the marketization of the care sector can help, as women tend to bear an unequal share of caregiving responsibilities for children (Buzard and others 2025) and the elderly (Skira 2015; De La Vega and Federman 2024). In particular, the provision of public childcare has been highlighted as a successful policy to increase both female labor force participation and fertility in Scandinavian and European countries, Canada, Costa Rica, Korea and Singapore (Baker and others 2008; Gu and others 2024). In Japan, the 2000 introduction of the Long-Term Care Insurance system which covers the cost of formal care for the elderly, has been shown to significantly increase female labor force participation (Sugawara and Nakamura 2014)

- Flexible work arrangement and remote work can also play a role, as well as retraining and reskilling of long-term unemployed women, and removing tax provisions that discriminate against secondary earners (Fabrizio and others 2020; Gu and others 2024; Chapter 3 of April 2024 *World Economic Outlook*).

- Among emerging market and developing economies, boosting girls' education levels, removing legal barriers that prevent female labor participation, strengthening property rights for women, and increasing their access to finance can help to close the gender gap and foster economic development (Duflo 2012; Fabrizio and others 2020; Gu and others 2024). As education investments take time to impact growth, low-income countries should adopt gender-responsive human capital policies now to ensure the future labor force is well-balanced.[13]

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policies do influence fertility decision in OECD countries, with greater impact from cash benefits covering childhood after the year of childbirth and the provision of childcare services for children under the age of three. Nevertheless, the impact of these policies can nonetheless fail to overcome other socioeconomic factors—such as the decision to delay parenthood or have only one child—which can continue to undermine fertility, for example, in Nordic countries, where childcare provision and parental leave is generous.

[13] IMF reports have analyzed gender-related policy options to improve women's economic opportunities in the context of high population growth (see, for instance, the country reports for The Gambia, Mali, Niger, Nigeria, Senegal, and Sierra Leone). IMF research also highlights the large economic benefits from more gender diversity, making policies to boost female labor force participation particularly cost effective (Ostry and others 2018).

28.   Policies that encourage longer working lives can help reduce the costs of aging by lowering the age dependency ratio and increasing the size and quality of the active labor force.

- Changes to statutory retirement ages, reductions in early retirement benefits, but also incentives to postpone or phase out retirement can support the continued participation of older workers in the labor market. Projected future levels vary from 62 years in Luxembourg and Slovenia to 70 years or more in Denmark, Estonia, Italy, the Netherlands, and Sweden (OECD 2023). However, many countries are already legislating higher retirement ages, with the average age in the OECD set to increase by 2 years to 66.3 years for labor market entrants after 2022. Some countries, such as Saudia Arabia, have also taken steps to anticipate aging issues by reforming their pension system while the system is balanced.

- Improving the human capital of older workers can enhance their productivity (Acemoglu and others 2022). Policies include upskilling and reskilling programs, especially in the face of increasing technological change.

- Health prevention policies can help prevent or slow cognitive and other health declines as well as address health inequalities (Chapter 2 of the April 2025 *World Economic Outlook*). Such policy actions help reduce health expenditures down the road and counteract the slow output growth and pressure on public finance coming from aging societies (McDaid and others 2015).

- Strengthening adaptability with flexible employment configurations and workplace changes to make jobs more age-friendly can further encourage longer careers. For instance, survey data from Spain indicates that older workers favor flexible work hours and a low stress environment, which is associated with higher average retirement ages (Barrela and others 2025).

- Finally, tackling biases and discrimination against older people is vital as those can contribute to early withdrawals from the labor force (Gaillard and Desmette 2010; Lamont and others 2015)

29.   In economies facing a booming population, policies should be directed at generating productive and quality jobs to fully harness the potential of the demographics dividend. Policies should be directed at addressing three major challenges. First, boosting productivity in the informal sector through investment in education, well matched skills training, better access to finance, and policies that encourage transitioning to formal employment would allow informal jobs to become a stepping-stone into formal employment (ILO 2025; OECD 2024a). Second, governments should create conditions that are conducive to jobs growth in high-productivity sectors like modern services and manufacturing. Given limited public finances, priority should be given to horizontal measures, such as improving market competition and making value-for-money infrastructure investments (André and Gal 2024; Moszoro 2024). Third, policies should be oriented at helping private business growth, by (i) cutting red tape and curbing corruption, (ii) prioritizing important infrastructure like electricity, internet, roads, and affordable public transport, and (iii) strengthening regional integration to ease the flow of goods and services and expand markets (October 2024 *Regional Economic Outlook* for Sub-Saharan Africa; World Bank 2023).

30.   Migration policies supporting the flow of younger workers to economies with high age dependency ratio can help alleviate demographic pressures.

- Addressing potential congestion from migration requires prioritizing public investment in infrastructure, housing, and health and education services. Where fiscal space is constrained, these efforts should be complemented by domestic reforms aimed at boosting private sector development to provide more opportunities.

- While openness to immigration is associated with an increase in per capita income in the destination economy, it can also yield growth dividends for the origin economy. This requires effectively absorbing migrants' surplus labor and leveraging diaspora spillovers through sound policymaking and robust governance for domestic investment in infrastructure, health, education, and other key development priorities (Batista and others 2025, Giuliano and Ruiz-Arranz 2009). Such measures are crucial to counteracting any negative impacts on labor supply in the origin country, especially when skilled workers emigrate (Carare and others 2024; Fackler, Giesing, and Laurentsyeva 2020; Leblang and Helms 2023; Williams 2024; Ortega and Peri 2009; Prato 2025). In addition, for these potential gains to materialize it is important to lower the cost of remittances through greater competition and financial innovation, as high fees[14] imply that a non-trivial fraction of remittances are "lost" (Kpodar and Imam 2024).

- Overall, migration policies can help manage long term demographic issues. However, they should be accompanied by integration policies, infrastructure investment, and active labor market policies to address short-term congestion costs and maximize gains for immigrant workers and destination economies. Building public support and social acceptability for such policies is also crucial as political backlash has become increasingly common despite the positive economic effects of immigration (Albrizio and others 2024; Alesina and Tabellini 2024; Dustmann and Preston 2019; Mayda 2006; Chapter 3 of the October 2024 *World Economic Outlook*).

31.   In parallel, countries should continue to pursue complementary reforms to stimulate investment and TFP growth.[15] Reforms include investing in human capital—such as increasing STEM graduates and promoting digital skills—to complement government initiatives to enhance digital infrastructure investment to harness the benefits of new technologies. In the case of AI, this is particularly important for those emerging market and developing economies that lack the infrastructure or skilled workforce to fully exploit the benefits of AI. For instance, an analysis of the U.K. and Brazil labor markets show that young, college-educated workers can move from occupations more likely to be negatively affected by AI to those where AI is more likely to boost productivity and wages. By contrast, non-college workers exposed to AI in Brazil are more likely to experience income losses and downward labor mobility (Cazzaniga and others 2024a). Furthermore, the risks that AI adoption could increase inequality within advanced economies mean that policymakers should enhance social safety nets, invest in workforce training, and prioritize the integration of AI (Cazzaniga and others 2024b). For emerging market and developing economies, "first-generation" structural reforms on governance, business regulations, and the external sector can alleviate the most critically binding constraints to economic activity (Budina and others 2023). Good governance and the rule of law are essential drivers of innovation and investment as they reduce uncertainty for firms and

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[14] According to the latest World Bank estimates, the global average fee is at 6.6 percent of the transaction, but for certain corridors and providers fees are closer to 10 percent and can be as high as 20 percent.

[15] Chapter 3 of the April 2024 *World Economic Outlook* provides a more comprehensive list.

entrepreneurs, while reduced barriers to firm entry and exit, trade openness, and financial accessibility can improve long-term productivity though better resource allocation and increased incentives for innovation.

32. **International cooperation should remain a priority.** On migration, international cooperation can help manage large unexpected forced displacement shocks and distribute the short-term costs of hosting refugees more evenly across countries, thereby reducing the burden on individual nations (Chapter 3 of April 2025 *World Economic Outlook* explores alternative scenarios). On AI, countries should collaborate globally to enhance regulation, safeguard against potential risks and abuses, and foster public trust in AI technologies (Cazzaniga and others 2024b).

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Annex I. Correlations Between Lagged Fertility and TFP Growth, and Lagged Life Expectancy and Capital Accumulation

1. Figure 10 shows the correlation between lagged fertility rates and TFP growth on the LHS and life expectancy and capital accumulation on the RHS, using a fixed-effects regression as follows:

- Annual growth in capital (capital accumulation) and in TFP are calculated using the Penn World Tables (version 10.01).

- Lagged fertility and lagged life expectancy variables up to 15 years are created, using data from the World Development Indicators (World Bank).

- The following regression for TFP growth, $\gamma_{i,t}^{TFP}$, is then estimated for each fertility rate of lag k in country i at time t as the primary independent variable:

$$\gamma_{i,t}^{TFP} = \alpha_{0,k} + \alpha_{1,k} Fertility\ Rate_{i,t-k} + \alpha_{2,k} TFP_{i,t-1} + \alpha_{3,k} \gamma_{i,t-1}^{TFP} + \delta_i + \varepsilon_{i,t}$$

TFPgrowth$_{i,t}$ = $\beta_{0,k}$ + $\beta_{1,k}$·FertLag$_{k,i,t}$ + $\beta_{2,k}$·TFP$_{i,t-1}$ + $\beta_{3,k}$·TFPgrowth$_{i,t-1}$ + γ$_i$ + $\epsilon_{i,t}$

where:
- TFPgrowth$_{i,t}$ is the growth in TFP in country i at year t
- TFP$_{i,t}$ is the level of TFP in country i at year t
- γ$_i$ are country fixed effects
- $\epsilon_{i,t}$ are the error terms which are clustered at the country level

- The following regression for capital accumulation is then estimated for each life expectancy of lag k in country i at time t as the primary independent variable:

$$\gamma_{i,t}^{K} = \beta_{0,k} + \beta_{1,k} Life\ Expectancy_{i,t-k} + \beta_{2,k} K_{i,t-1} + \beta_{3,k} \gamma_{i,t-1}^{K} + \delta_i + \varepsilon_{i,t}$$

CapitalAcc$_{i,t}$ = $\alpha_{0,k}$ + $\alpha_{1,k}$·LifeExpectancyLag$_{k,i,t}$ + $\alpha_{2,k}$·Capital$_{i,t-1}$ + $\alpha_{3,k}$·CapitalAcc$_{i,t-1}$ + γ$_i$ + $\epsilon_{i,t}$

where:
- CapitalAcc$_{i,t}$ is the growth in capital in country i at year t
- Capital$_{i,t}$ is the level of capital in country i at year t
- γ$_i$ are country fixed effects
- $\epsilon_{i,t}$ are the error terms which are clustered at the country level

- Figure 10 plots the coefficients α1,k and β1,k for every lag k between 1 and 15.