RESEARCH PUBLICATION

MOODY'S INVESTORS SERVICE

Demographics - Global

How demographics will shape labor markets and credit trends

SECTOR IN DEPTH

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Contents

Demographic shifts will induce profound changes in economic growth trajectories and sector priorities

Key messages

- Population aging will accelerate dramatically over the next two decades across the globe. Europe and North America will remain the greyest regions, but Asia and Latin America and the Caribbean regions will experience the fastest acceleration in aging. Demographic projections have tended to underestimate the pace of aging.
- Working-age population growth will slow by more than half over the next two decades. In the absence of productivity improvements, this can take away as much as 0.9pp off annual global growth over 2020-2025.
- Immigration has played a vital role in counteracting the shifting age structure and the reduction of the labor force in advanced economies, but political polarization has fueled risks to immigration policies.
- Increases in female labor force participation and delayed retirement have significantly boosted labor supply, especially in the countries facing greater demographic pressure. Female labor force growth will consistently surpass male labor force growth going forward, but wide gender gaps remain in many parts of the world.
- Nevertheless, the expansion in overall labor force participation has now reached a plateau. Gains in labor participation will likely be insufficient to completely counteract the effects of aging in advanced economies.
- Demographic headwinds will induce profound changes in government, industry and sector priorities. Policy choices, technology adoption and the balance of public and private investment in human capital will shape the credit implications of shifting demographics. Advancing technologies can mitigate the negative impact of aging but will require comprehensive labor retraining and prioritizing human capital development.

1

Population aging will accelerate dramatically over the next two decades

Many countries globally face a rapid demographic transition

- » The UN defines a society as 'aging' if the elderly (aged 65 and over) make up at least 7% of the population, 'aged' society at least 14%, and 'super-aged' at more than 20%.
- » By 2020, over 60% of Moody's-rated countries will be 'aging'. The number of 'super-aged' societies will increase from six in 2015 to 19 in 2020, and to 42 by 2030.
- » While countries in the higher rating categories face more demographic pressures, the speed of aging is accelerating in virtually all developing countries. Moreover, the pace of aging in a number of developing countries is more rapid than in developed economies.

Exhibit 1. More demographic pressures in the higher rating categories
(Aging by rating categories)

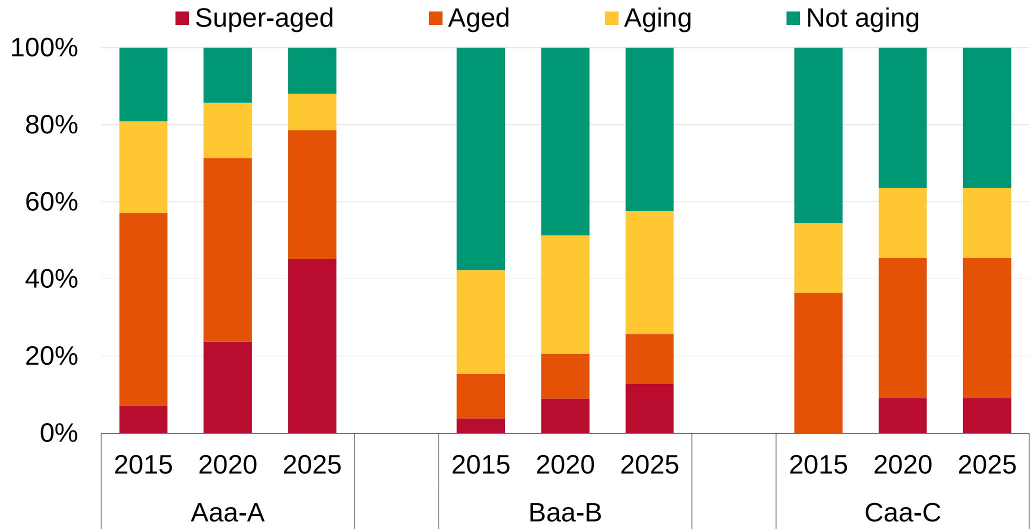
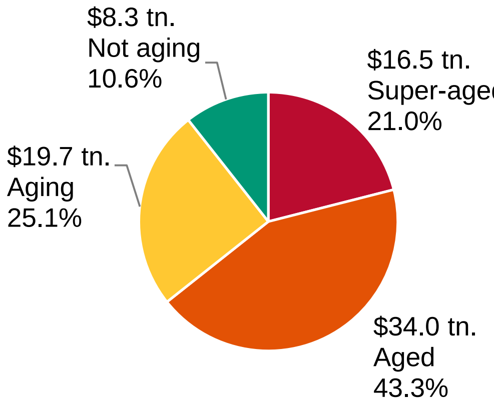


Exhibit 2. An aging global economy by 2020
(Share of global nominal GDP in 2017 by aging group, trillion US$)

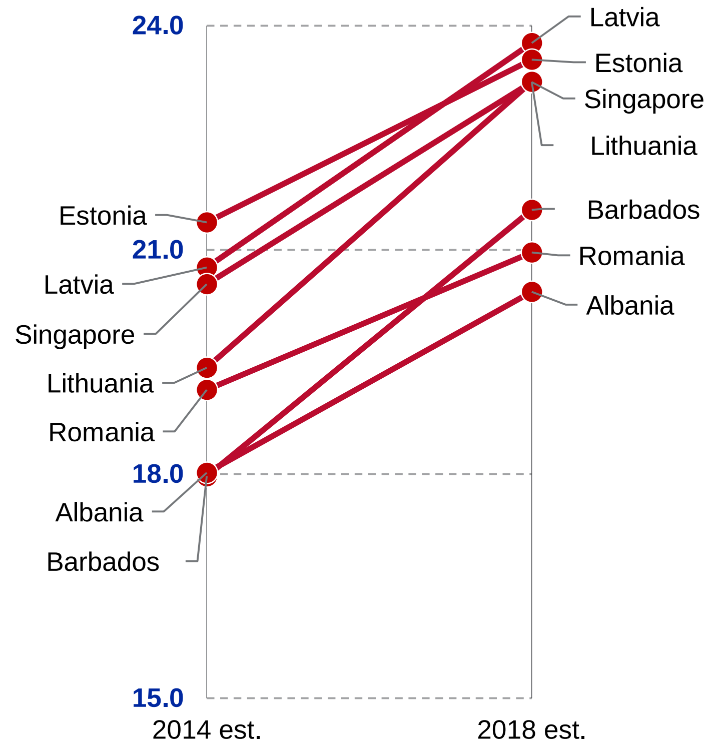


Note: Sample is 130 countries globally. Source: Moody's Investors Service, United Nations.

Projections have tended to underestimate the pace of aging

- Aging is at an accelerating speed compared to previous estimates in almost all regions, due to sharper declines in fertility and infant mortality rates, increased life expectancy, and large prime-age migration out of some regions, particularly Eastern Europe.
- Countries witnessing the largest revisions in the share of the elderly population include Estonia, Latvia, Singapore, Lithuania, Romania, Albania and Barbados.
- The upcoming downturn in labor supply will challenge the long term sustainability of fundamental welfare and entitlement programs, most of which were designed to be supported by a growing population.

Exhibit 3. Speed of aging is faster compared to previous estimates
(Countries with the largest increase in the share of the elderly to the total population in 2030, %)



Note: Reported population trends are based on population statistics and projections from the United Nations, under the medium variant scenario. Uncertainty remains in projections for individual countries, specific age groups and net migration.
Source: Moody's Investors Service, United Nations (Medium variant for projections).

Demographic changes will accelerate over the next two decades across the globe

- Europe and North America will remain the greyest regions globally. Europe will lead the trend, but aging in North America will speed up with the retiring of the baby boomers.
  - In Central and Eastern European (CEE) countries, 13% of the population is aged 65 years or over, and that share will reach 18% in 2030. Moreover, emigration from CEE countries has created labor shortages.
- Asia will experience one of the fastest increases in the median age.
  - East Asia will be the world's fastest-aging region in the decades ahead, with old-age dependency ratio roughly doubling by 2030.
- In Latin America and the Caribbean (LAC), only 8% of the population is aged 65 years or over in 2017; that number will climb to 12% by 2030.
- Even Africa, the youngest region globally, is projected to see faster growth of old-age population over the coming decades.

Exhibit 4. Europe will lead the aging trend
(% of aged 65+ per 100 population 15-64)

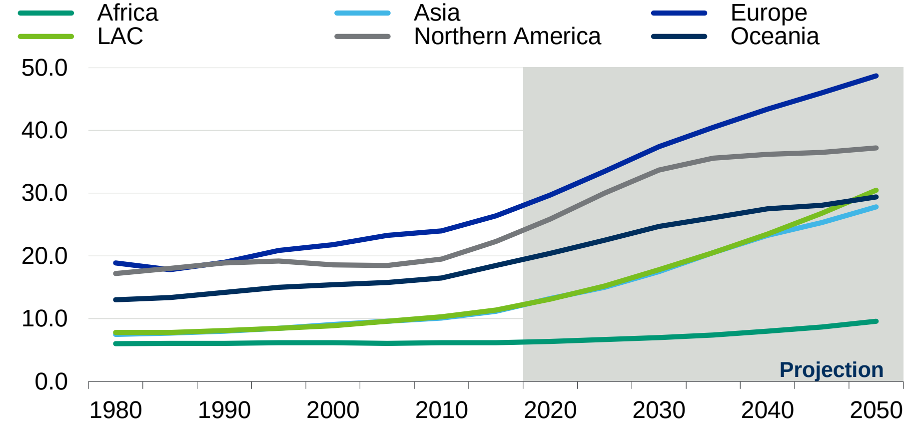
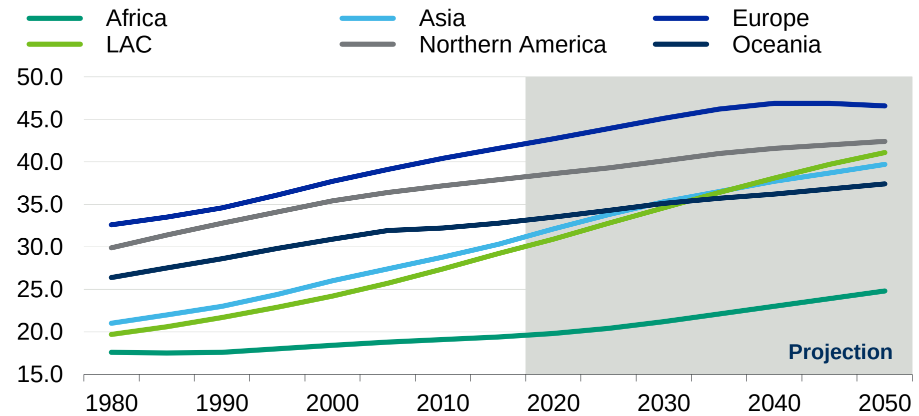


Exhibit 5. Asia will experience the fastest increase in the median age
(Median age of the total population, years)



Source: Moody's Investors Service, United Nations (Medium variant for projections).

Almost all countries will see slower growth in their working-age population

- » All countries, except a handful in Africa, will face either a slower-growing or declining working-age population, and corresponding pressures on labor supply.
- » Countries fall into three broad groups:
  1) The working-age population has declined in the past 15 years and will continue to face the same trend in the next 15 years. This group includes Latvia, Belarus, Bulgaria, Germany, Japan and Russia.
  2) The working-age population has hit a plateau and is projected to decline over the coming decades. This group includes China, Italy, Korea, Spain and Thailand.
  3) The size of the working-age population will continue to grow over the next decade but at a slower pace. This group includes the US, Brazil, India and Mexico.
- » Some large economies, such as China and Korea, that have benefited from demographic dividends in the past will transition to 'contracting working-age population' in the future.

Exhibit 6. World's population growth will continue to fall
(Average annual rate of population growth, %)

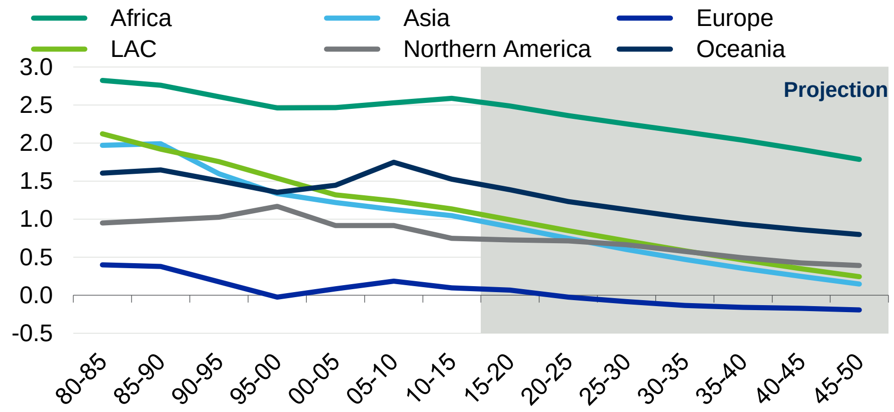
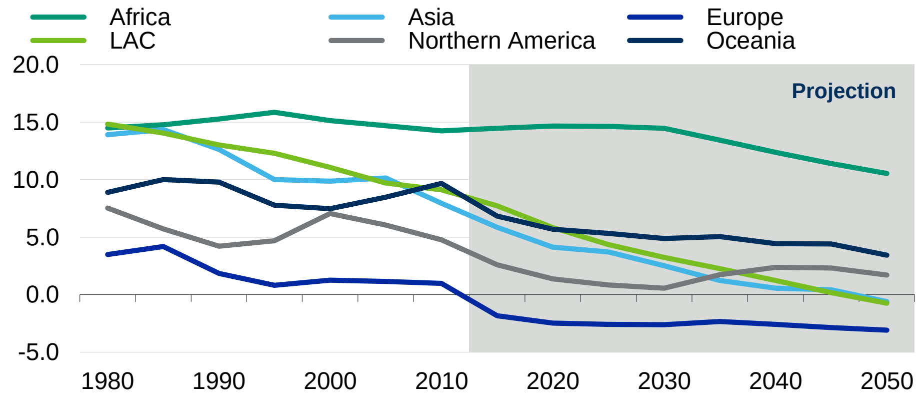


Exhibit 7. Slower working-age population growth globally
(Growth of working-age population, %)

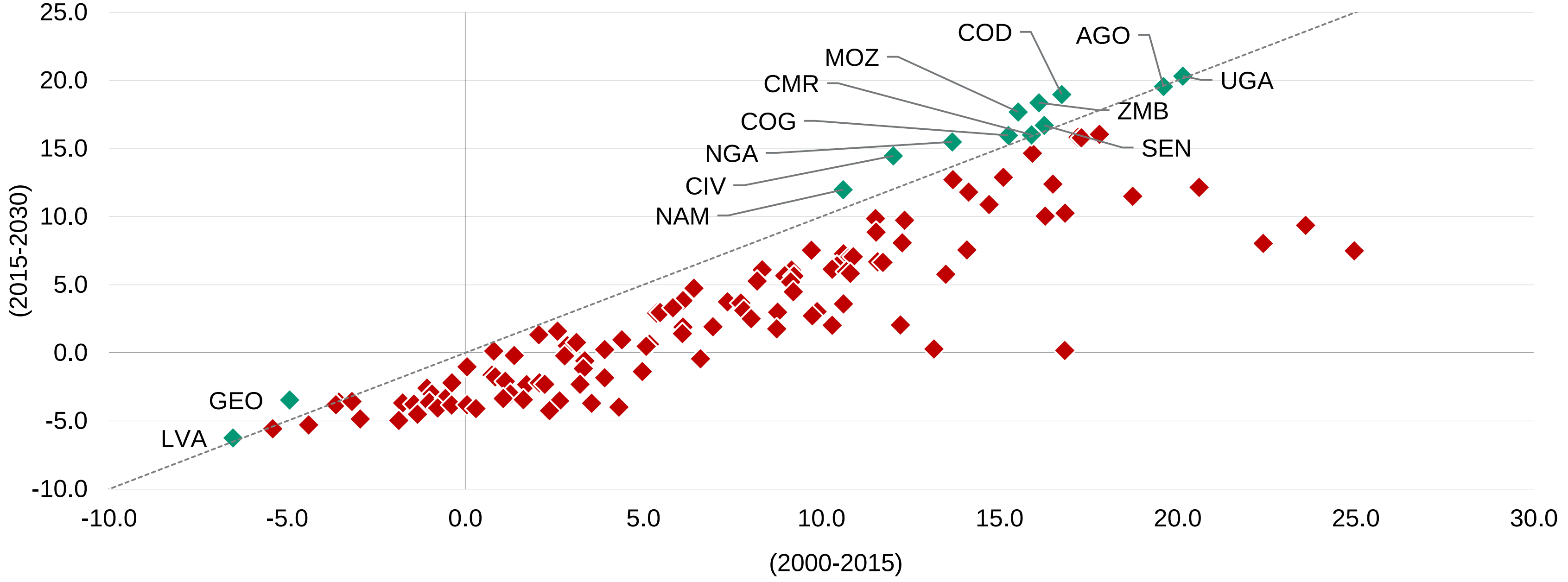


Source: Moody's Investors Service, United Nations (Medium variant for projections).

Contracting share of working-age population will pressure global labor supply

- Global working-age population growth will decelerate to 13.6% over 2015-2030 from 32.9% in 2000-2015, and corresponding pressures on labor supply.
- Only a few countries in Sub-Saharan Africa, e.g. Republic of the Congo, Cote d'Ivoire, Mozambique, Tanzania and Somalia, will see faster growth of their working-age population.

Exhibit 8. All countries, except a handful in Africa, will face either a slower-growing or declining working-age population
(Cumulative working-age population growth, %)

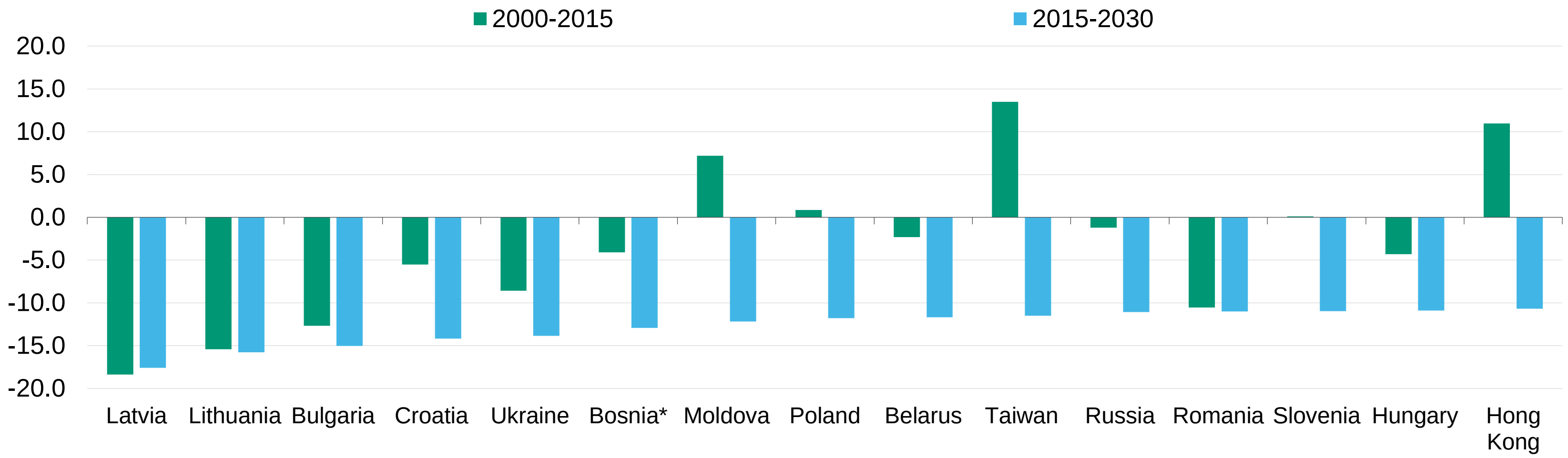


Source: Moody's Investors Service, United Nations (Medium variant for projections).

The unprecedented pace of aging will constrain economic growth

- 22 countries will see a decline of over 10% in their working-age populations during 2015-30, mainly concentrated in Central and Eastern Europe:
  - Latvia and Lithuania will experience the most severe decline in working-age populations, as large as 17.6% and 15.8%, respectively.
- Aging will constrain economic growth directly by reducing labor supply and indirectly by reducing the economy's savings rate and hence investment.
- The Conference Board estimates that aging could take away as much as an average of 0.9pp off annual global growth in 2020-2025*.

Exhibit 9. Top 15 countries with largest decline in their working-age population (cumulative, %)

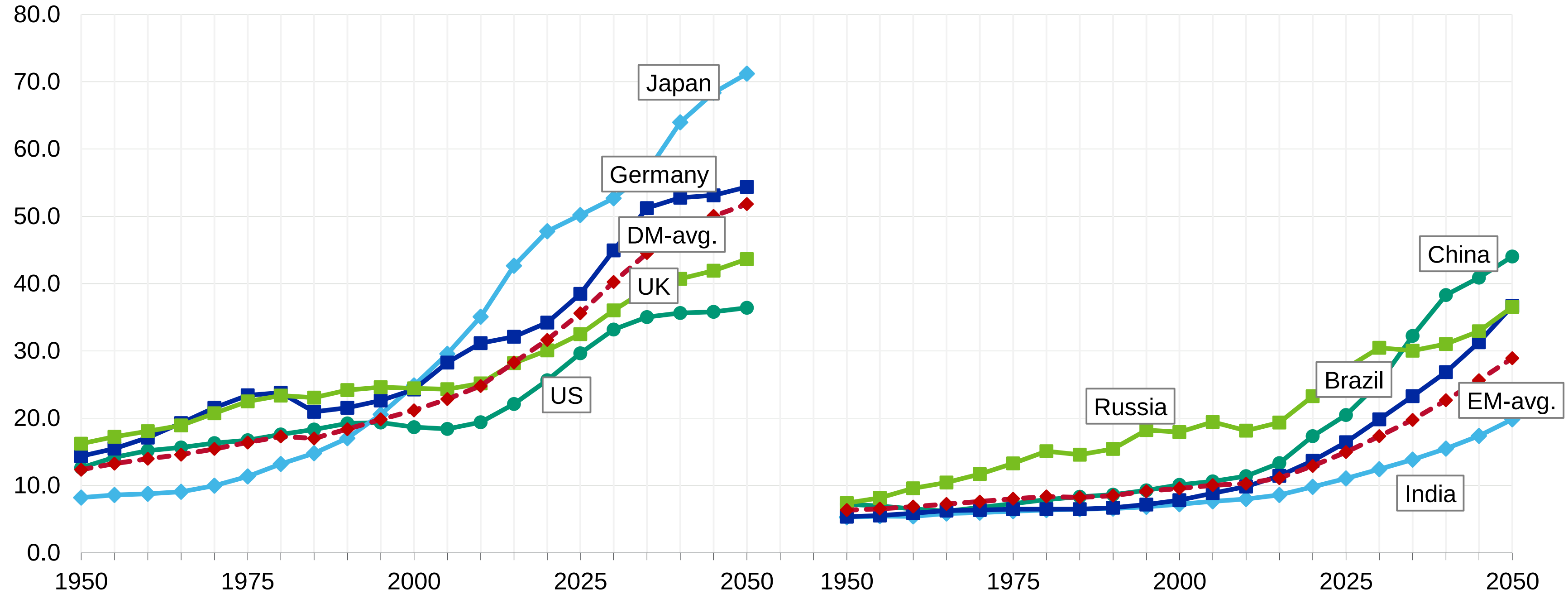


Note: Bosnia is short for Bosnia and Herzegovina. Source: Moody's Investors Service, United Nations.

G-20 snapshot: Regional aggregates mask country-specific differences (1)

- Japan and Germany already fall in the category of 'super-aged' societies, while the UK and the US are relatively younger compared to other advanced economies.
- China, Russia, and Brazil are also classified as 'aging'. Their pace of aging is considerably faster than in some of the advanced industrial economies.

Exhibit 10. Old-age dependency ratio for selected G20 countries (%)

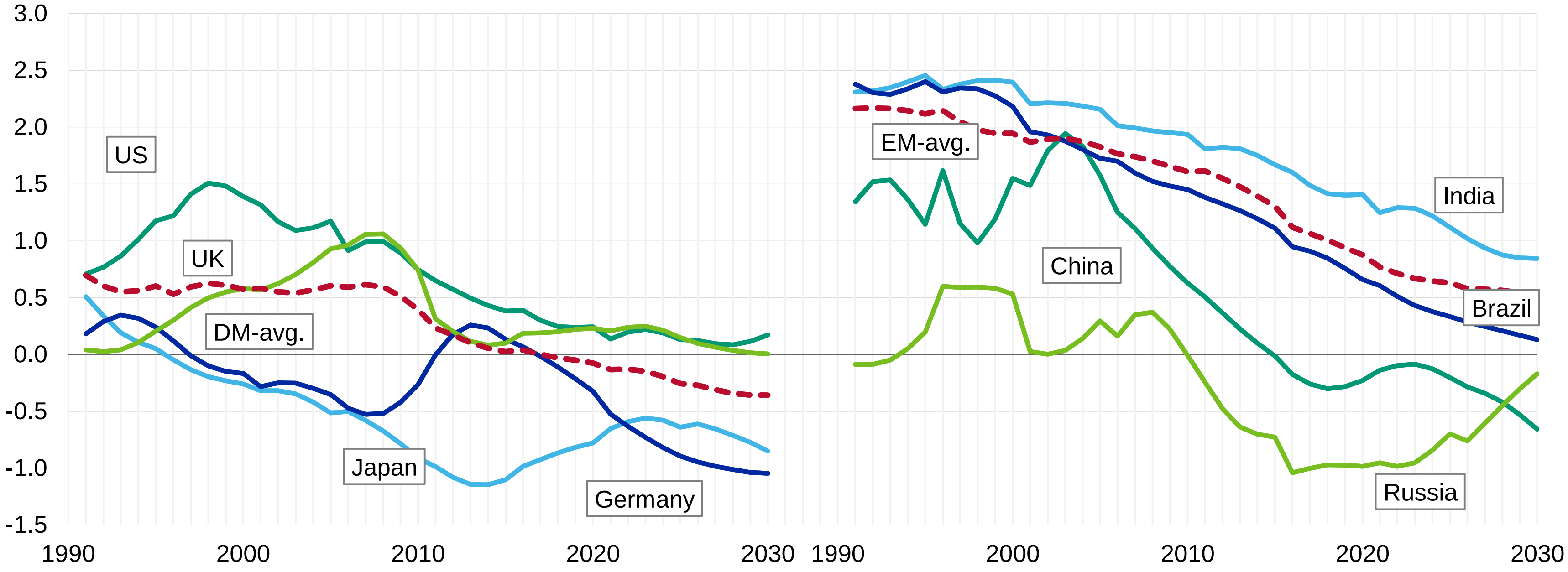


Source: Moody's Investors Service, United Nations (Medium variant for projections).

G-20 snapshot: Regional aggregates mask country-specific differences (2)

- » The size of the US and UK working-age populations will continue to grow but at a much slower pace, while Japan and Germany are facing declines in their working-age populations which will continue.
- » China and Russia are transitioning from growing to contracting working-age populations.
- » Countries with relatively higher unemployment rates and lower per capita incomes, such as Brazil and South Africa, will face greater challenges in providing for their aging populations.

Exhibit 11. Change in working-age population for selected G20s (%)



Source: Moody's Investors Service, United Nations (Medium variant for projections).

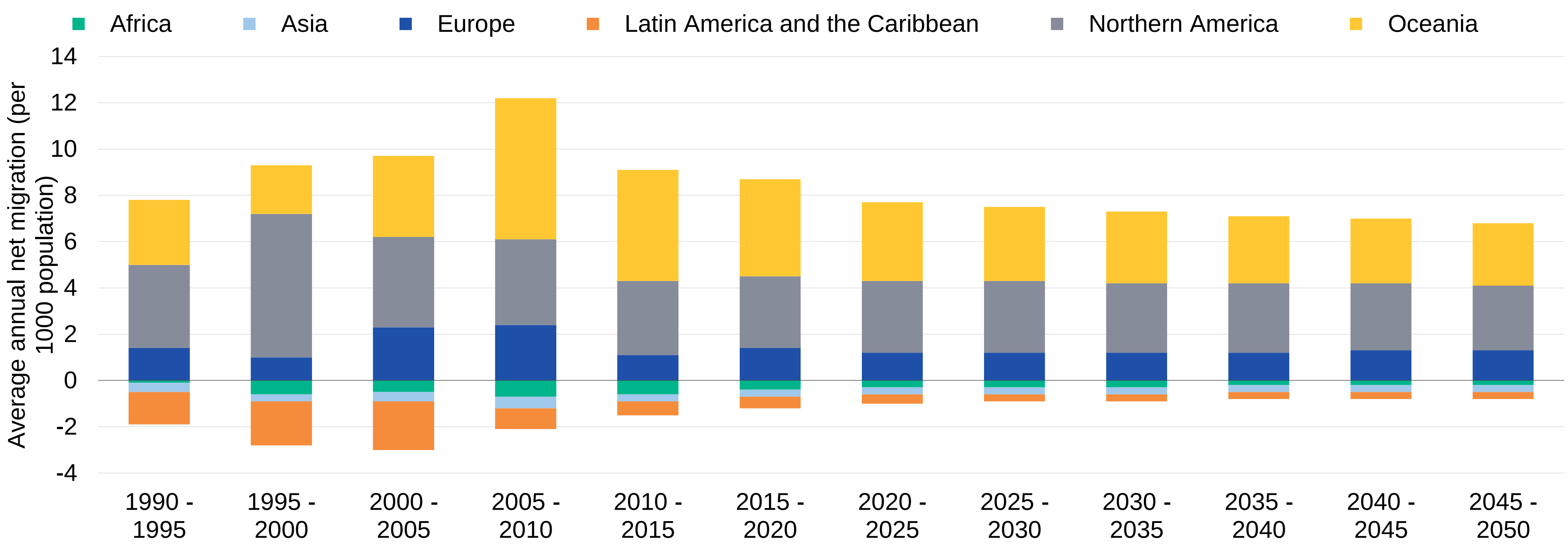
2

Migration is a main contributor to labor force growth in advanced economies, but is also posing challenges

Immigration has been a major driver of workforce growth in developed economies (1)

- The contribution of international migration to population growth in many countries is significant. On average, North America, Europe, and Oceania have been net recipients of migrants, while Africa, Asia, and Latin America have been the source. The large economic and demographic asymmetries between countries are likely to remain key drivers of future international migration.
- The dramatic decline in working-age populations in several CEE countries will be mainly driven by increasing migration out of the region.

Exhibit 12. Average annual net migration from 1990 to 2050 by region (per 1,000 population)



Source: Moody's Investors Service, United Nations (Medium variant for projections).

Immigration has been a major driver of workforce growth in developed economies (2)

» Immigration contributes to economic growth through various channels. Prime working-age immigration provides additional labor supply to offset the shrinking native working-age population, and also promotes innovation, competition and productivity, and attracts foreign investment to the recipient countries.

Exhibit 13. US: Share of prime working age population in each nativity cohort (%)

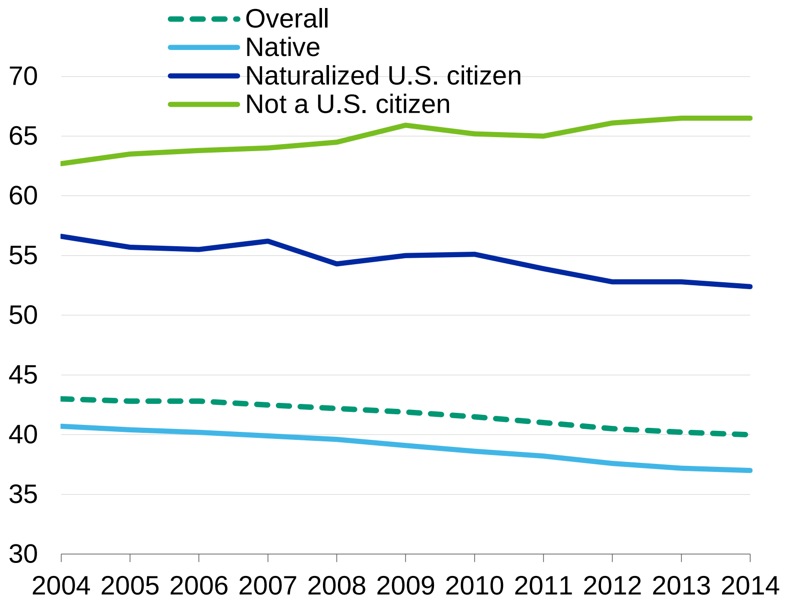
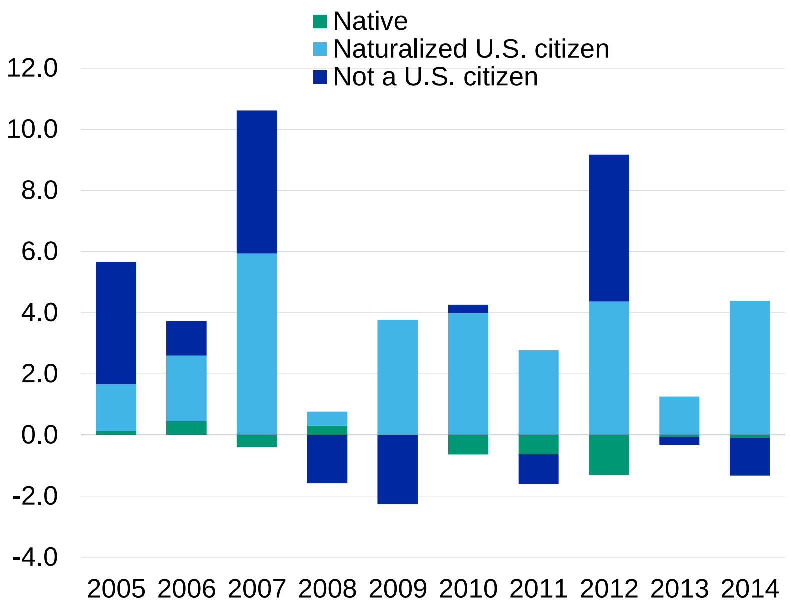


Exhibit 14. US: Annual population growth in prime working age by nativity (%)

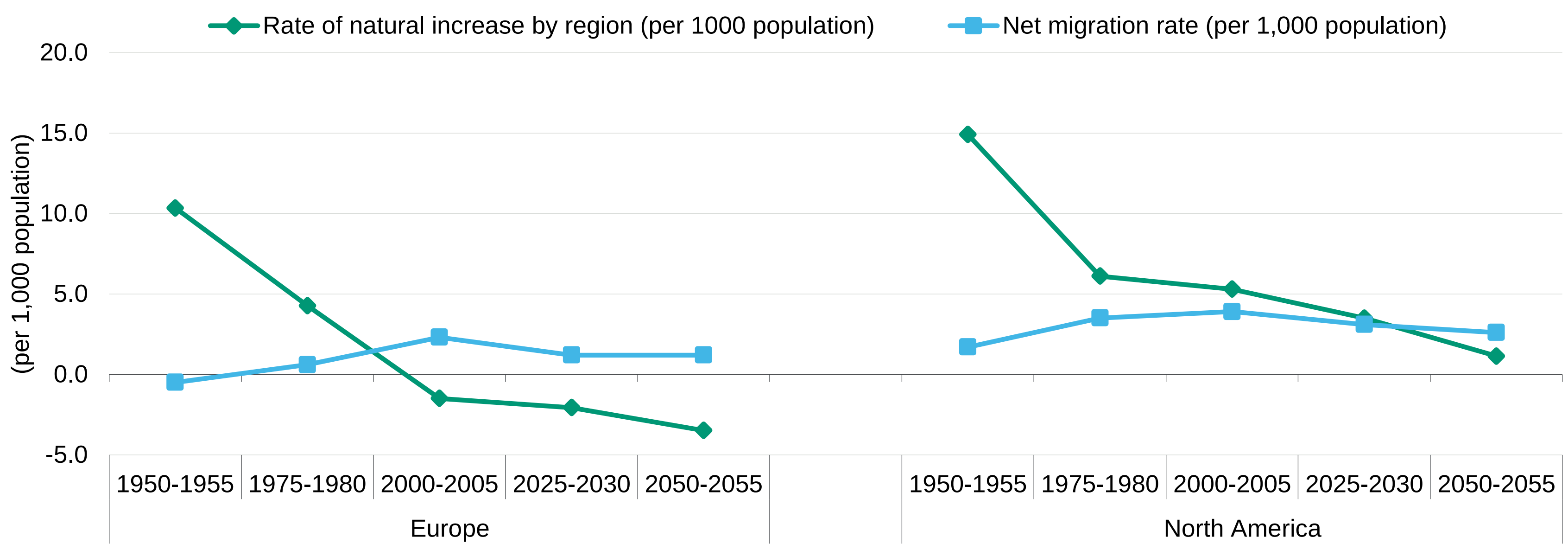


Source: Moody's Investors Service, US Census Bureau.

The current level of migration will not be able to compensate for the expected decline in working-age population, especially in Europe

» The dramatic demographic shifts will require countries to rethink immigration policies vis-à-vis boosting labor supply and productivity.

Exhibit 15. Net migration could mitigate the slower growth in natural population
(Net migration and natural increase in population, per 1000 population)

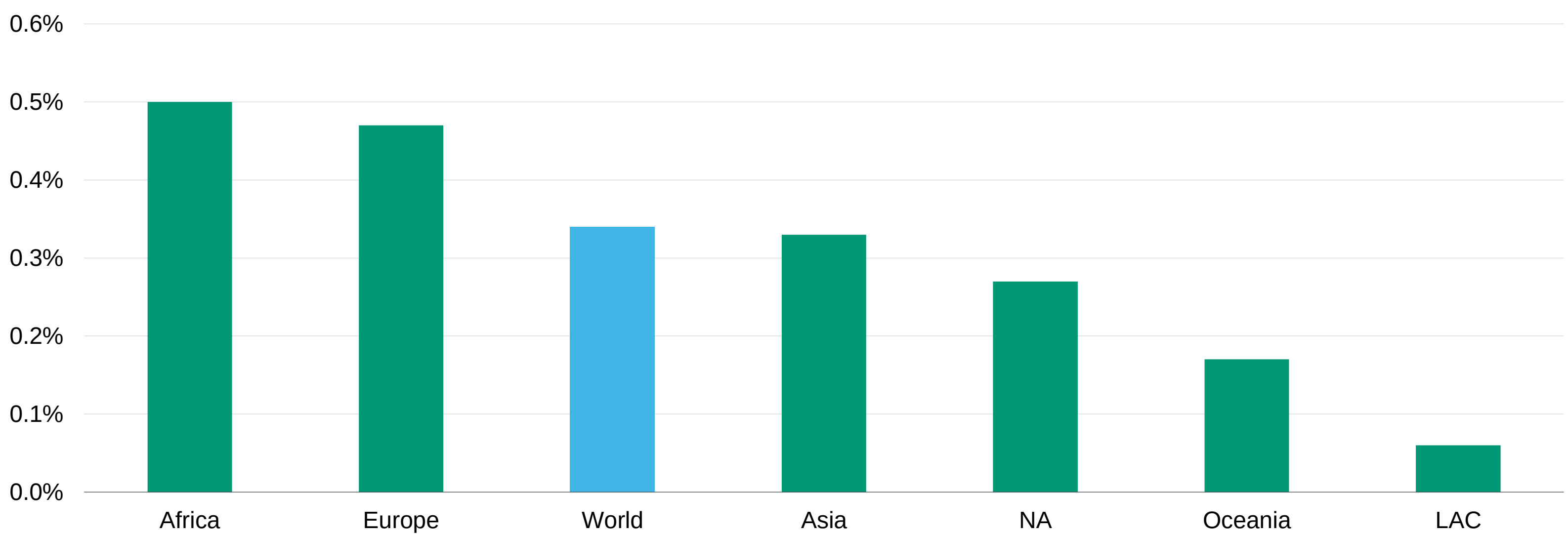


Source: Moody's Investors Service, United Nations (Medium variant for projections).

Immigration also poses challenges

- Immigration has played an important role in mitigating the effects of aging populations in advanced economies, but political polarization has fueled risks to immigration policies.
- The recent refugee crisis had major impact on several countries in the Middle East and Europe:
  - Large-scale refugee influx has created a tension between the long term benefits of immigration and the short term fiscal challenges from government administration and border protection.
- Low-skill immigration may also put short term downward pressures on wages and inflation.
- Integrating immigrants into the local labor markets would be key to harnessing the economic benefits of immigration.

Exhibit 16. Refugees and asylum seekers as a share of the total population (2017, %)



Source: Moody's Investors Service, United Nations.

3

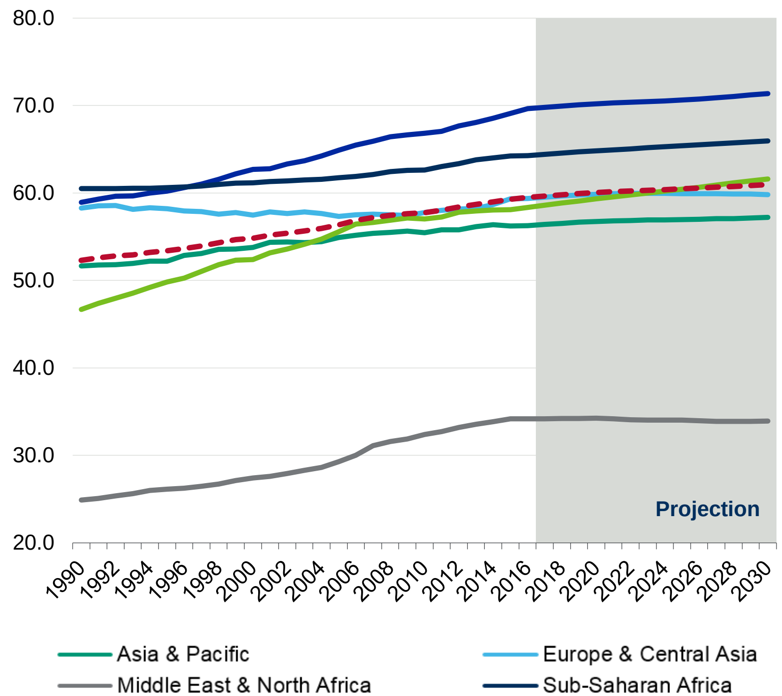
Labor participation rates have slowed and are unlikely to make up for aging in advanced economies

Labor force participation can partially offset the negative effect of aging

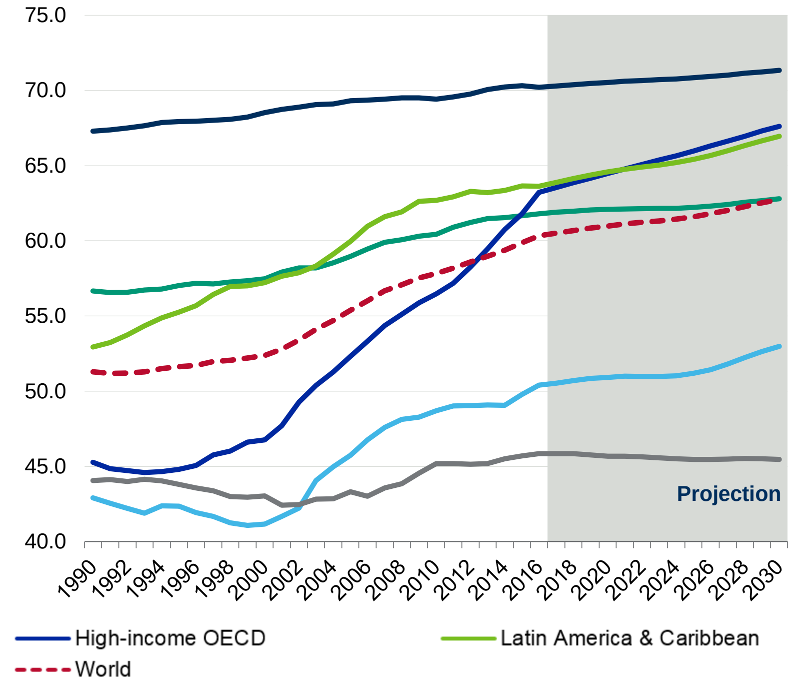
» Accelerating labor force participation, particularly among prime-age women and older workers has been an important source of economic growth, especially in the countries facing greater demographic pressures.

Exhibit 17. Female and older-worker labor force participation rates have increased across all regions (%)

17.a. Female, at prime working age (25-64)



17.b. Aggregate, at age 55-64



Source: Moody's Investors Service, International Labour Organization.

…however, the contribution to growth from expanding labor force participation is now fading

» The expansion in the overall labor force participation has now reached a plateau and is expected to remain stable in the decade ahead:
  – 54 out of 137 countries globally are expected to witness a drop in overall labor participation rates, including large economies such as China, Russia, Greece, Spain, UAE and the US.

Ex 18. Changing age structure will weigh on overall labor force participation

(Working-age labor force participation rates by region, %)

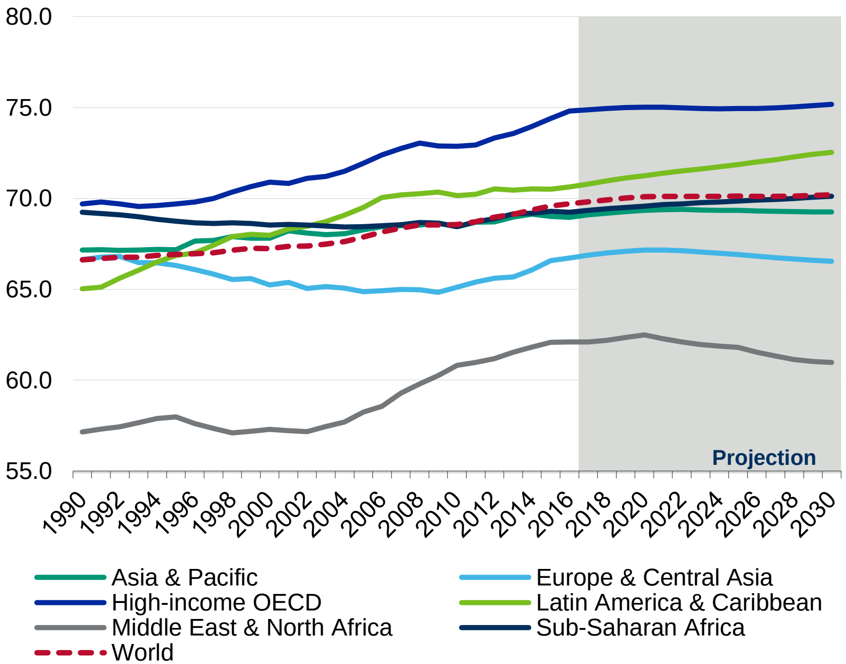
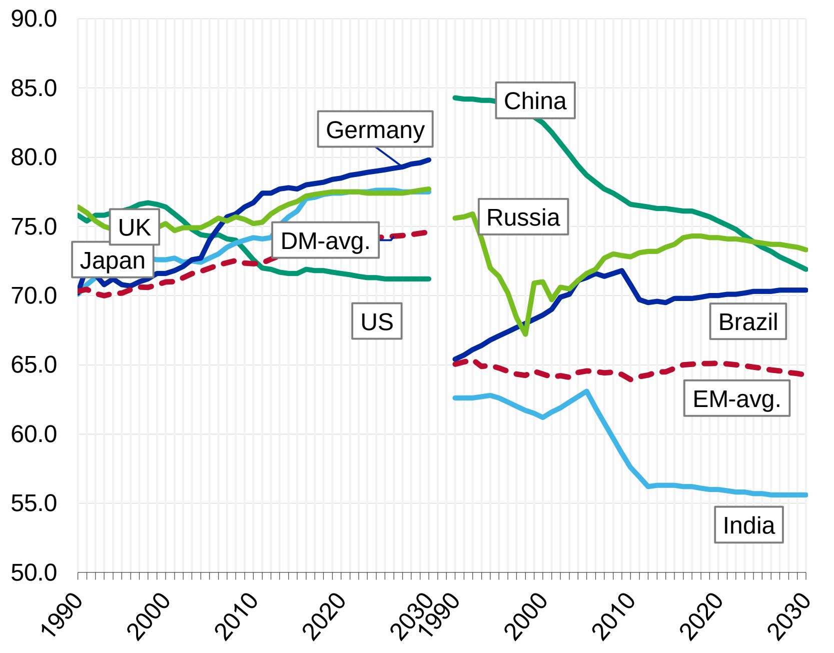


Exhibit 19. G-20: Prime-age labor force participation rates (%)



Source: Moody's Investors Service, International Labour Organization.

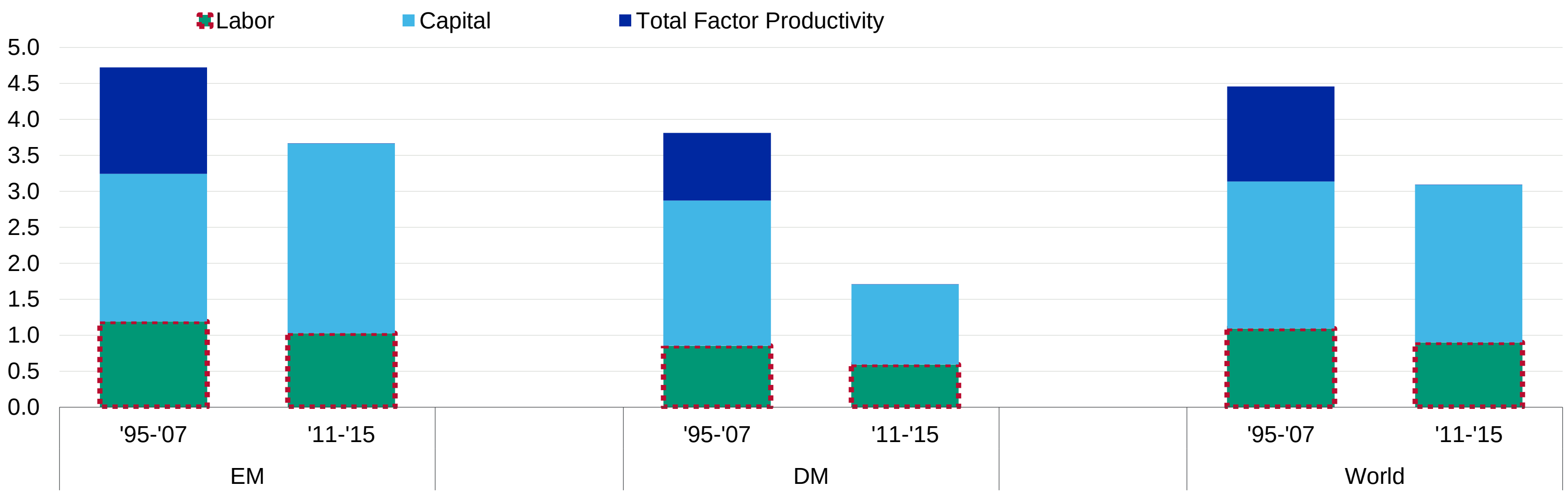
Changing age structure will further weigh on labor force participation rates, hence economic growth

» Even though there is still space for labor force participation rates to rise somewhat across different age and gender cohorts, the projected muted increase would generally be insufficient to counteract aging in developed economies.

» Both structural and cyclical factors affect labor force participation:

- The decelerating expansion in participation rates for most countries is driven by population aging.
- In addition, the severe financial crisis created structural changes in labor markets leading to elevated long-term unemployment and shifts in jobs - further intensified by advancing new workplace technologies.

Exhibit 20. Aging will directly constrain economic growth by reducing labor supply (Growth composition in %)



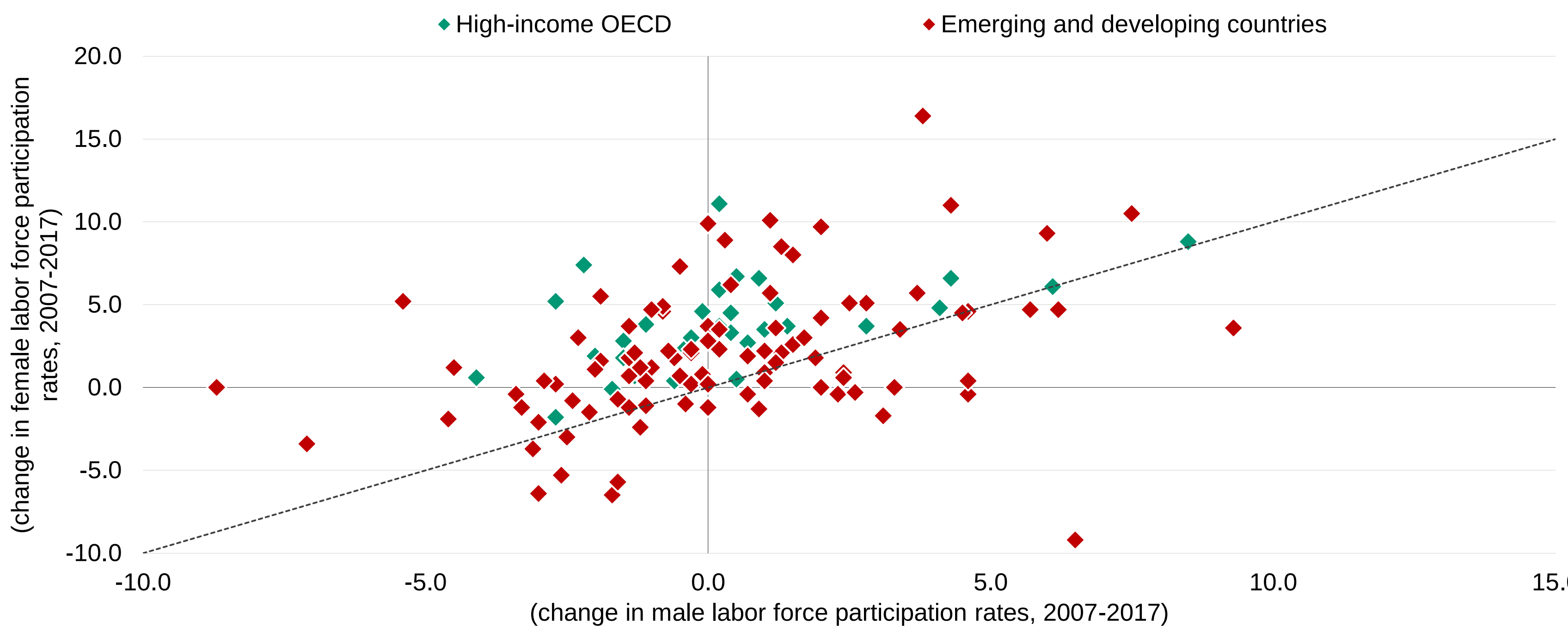
Source: Moody's Investors Services

Female labor participation rates have risen

» Most countries in the world have made great progress in boosting female labor participation over the past decades.

» From 1990 to 2017, the global working-age (age 16-64) female labor force participation rate increased on average by 0.27% annually, compared to a contraction of 0.04% of the working-age male labor force participation rate.

Exhibit 21. The pace of female labor force expansion has consistently surpassed the growth of male labor force participation
(Change in male and female labor force participation rates, 2007-17 %)



Source: Moody's Investors Services, International Labour Organization.

Gains in female labor participation rates will continue

- The pace of female labor force expansion is projected to decline, but will consistently surpass male labor force growth going forward.
- Despite significant progress in recent decades, the gender gap remains large in many parts of the world.
- Higher female labor force participation not only counteracts demographic headwinds but also helps support public finances by widening the tax base and easing future pension pressures*.

Exhibit 22. Female labor force participation rates will continue to rise across regions *(female labor force participation rate, %)*

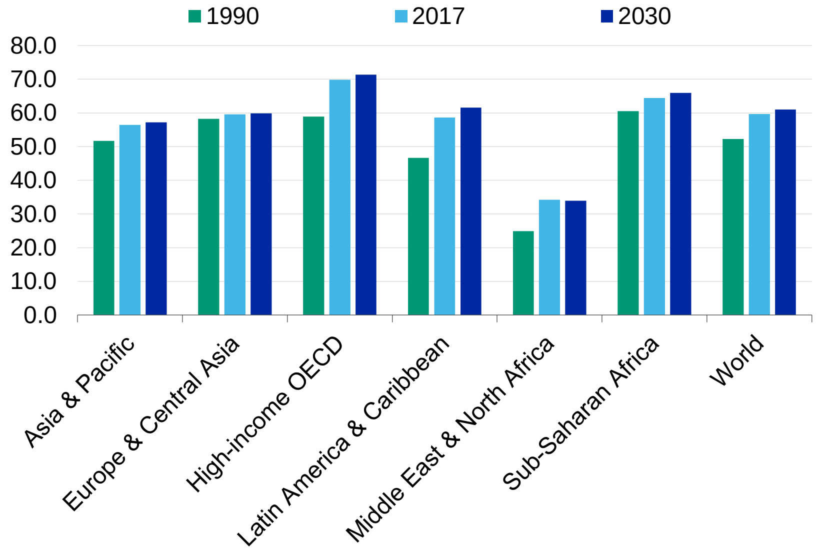
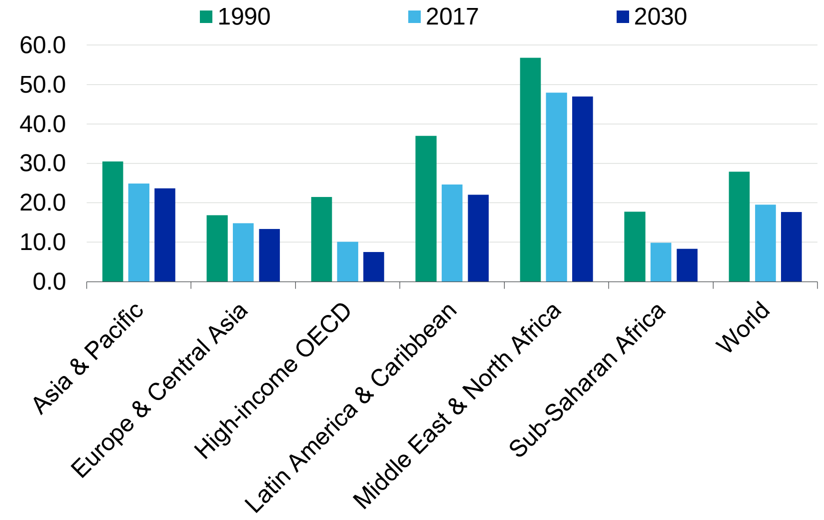


Exhibit 23. Gender gaps in labor force participation rates remain in many countries *(gender gap in labor force participation rate, %)*



Source: Moody's Investors Services, International Labour Organization.

Structural challenges in labor markets persist despite global economic recovery

» Structural frictions in labor markets persist and unemployment rates remain elevated in a number of countries. Africa continues to experience the highest rate of unemployment, mostly driven by rising youth unemployment rates.

» High structural unemployment persists in a number of countries, including South Africa, Greece, Spain and Italy.

Exhibit 24. Middle East and Africa continue to experience high youth unemployment rates
(Youth unemployment rate, 15-25 %)

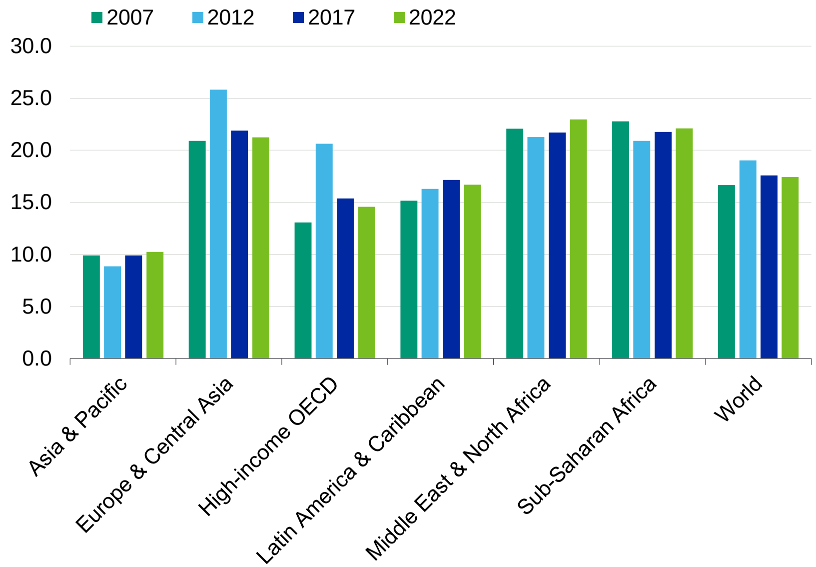
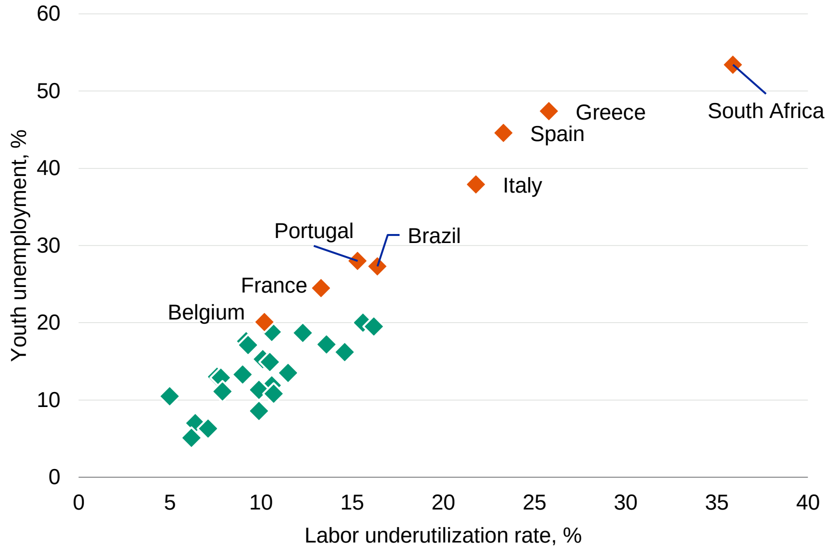


Exhibit 25. Unemployment is stubbornly high in some European countries, particularly youth unemployment (%)



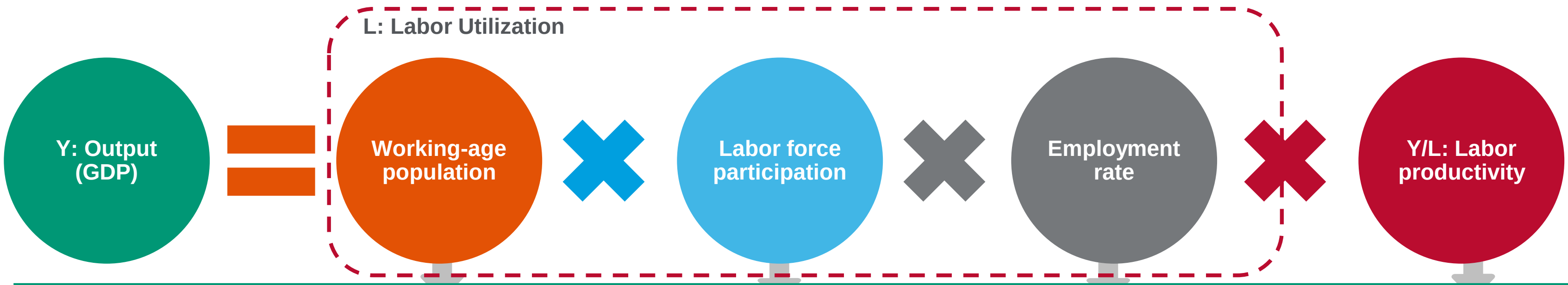
Source: Moody's Investors Services, International Labour Organization.

4

Advancing technologies will transform the workplace

Population aging will affect not only labor utilization but also labor productivity

- The demographic transition will have a direct impact on potential growth over the long run by affecting all three components of the labor utilization rate – the size of the working age population, labor force participation and the employment rate, - and by affecting labor productivity.
- Unless labor productivity significantly picks up, long-term growth will be meaningfully lower than pre-crisis levels due to the slower expansion in labor utilization.



Trends	Working-age population growth has been falling dramatically across most countries	Labor force participation can partially offset the negative effect of aging	Structural challenges in labor markets persist despite global economic recovery	Collapse of productivity growth poses a sizeable downside risk to global economic growth
− Negative Impact + Positive Impact	−	+ −	+ −	−
Mitigating Factors	• Immigration	• Higher female and older worker labor force participation	• Human capital investment	• Higher investment • Technology diffusion • Human capital investment

Source: Moody's Investors Services.

Advancing technologies can mitigate the impact of aging on growth

- Advancing technologies can mitigating the impact of aging on growth but may also transform global labor markets as they may increase demand for labor or labor displacement:
  - Advancing technologies typically increase the marginal product of labor, which, in turn, increases demand for labor as total production expands.
  - When certain types of technology act as substitutes to labor, they reduce labor demand.
- The risk of job losses at both an industry and individual level depends on the composition of tasks and the education/training levels of each individual worker.
  - Repetitive tasks performed by both low- and high-skilled workers will likely be automated, while demand for tech savvy workers will likely increase.
- According to McKinsey Global Institute, roughly 14% of the global workforce may need to switch occupational categories by 2030*.

Exhibit 26. Worldwide potential for automation *(wages)*

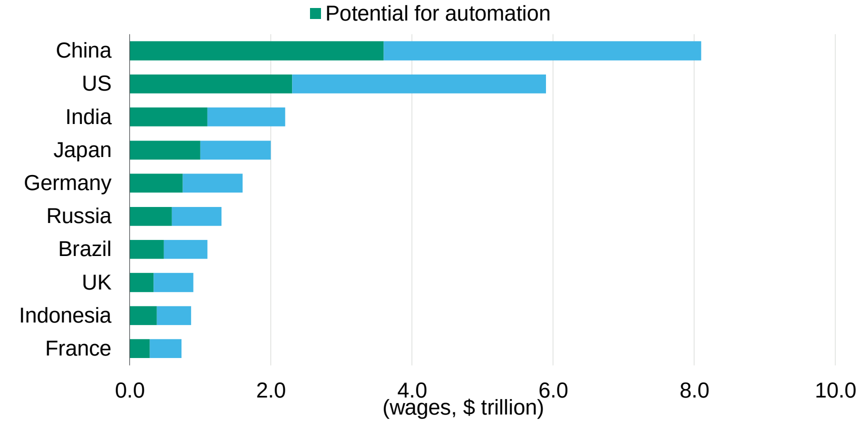
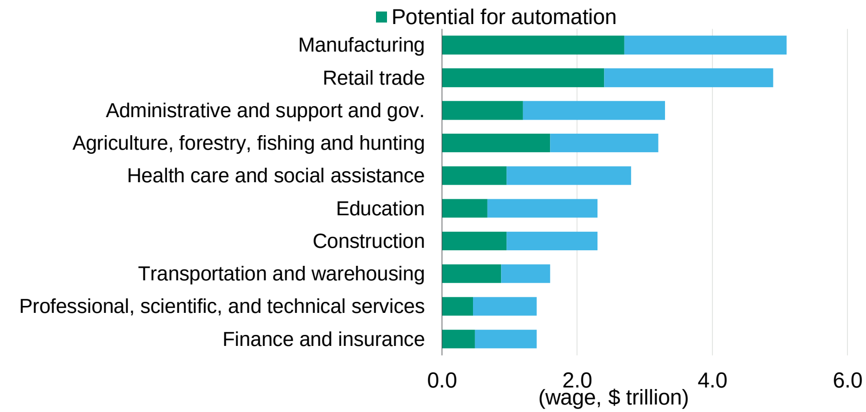


Exhibit 27. Variation in potential for automation by sector *(wages)*



Note: Percentage on time spent on activities with the technical potential for automation by adapting currently demonstrated technology. Source: McKinsey Global Institute.

5

Policy choices and technology adoption will shape the credit implications of shifting demographics

Demographic headwinds will induce profound changes in growth trajectories and public policy

- Changing demographics will likely affect the composition of growth by shifting consumption, savings, and investment decisions.
- By affecting the composition of output, changing age-cohort structure has the potential to affect the business cycle. The demographic shift will also have implications for inflation and monetary policy*.
- Shifting demographic trends will have a profound effect on public finances, pensions and health care systems*.
- The dramatic shift in demographics in many countries will highlight the need to encourage labor participation across different cohorts of workers, to address the long term sustainability of fundamental welfare and entitlement programs, and to rethink policies vis-à-vis immigration and income inequality.
- For emerging countries that are in the early stages of their demographic cycle and are still benefiting from the demographic dividend, ensuring long term sustainable growth will depend on efforts to achieve economic diversification, particularly among commodity exporters, and to create fiscal buffers for critical public spending, such as investment in public infrastructure, healthcare and education.

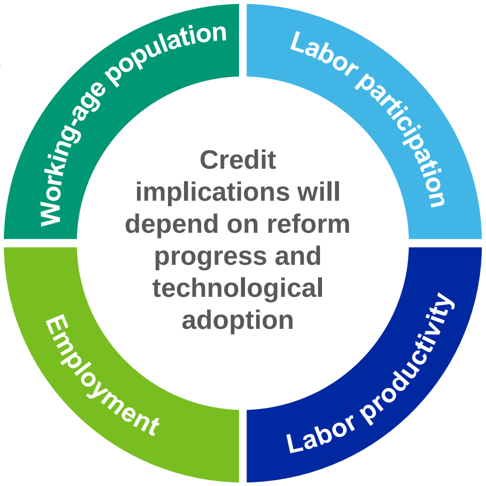
Profound changes in demographic structure will shift sector priorities

Government	• The rise in age-related spending will force policymakers to address the long term sustainability of fundamental welfare and entitlement programs, most of which were designed to be supported by a growing population. • Public pension funds will need to consider adjusting their asset allocation strategies to provide pension disbursement over a longer horizon due to increased longevity of policy holders.
Infrastructure	• Demographic trends vary by region and country, affecting both the amount and type of social infrastructure spending. • Aging populations in Europe and Japan, for instance, will require additional healthcare facilities and age-appropriate housing, while as urbanization continues in emerging markets, there will be a growing demand for public transportation, housing, and schools, etc.
Finance	• Shifting customer demographics and expectations are driving the need to develop innovative financial products and services. • In advanced economies, customers are likely to focus more on savings and investments instead of consumption; while increasing appetite for consumer credit will continue to drive household credit growth in developing economies.
Manufacturing	• Demographic trends in general will favor services and weigh on the manufacturing sector. Rising labor costs have resulted in shifting global supply chains, continued drive towards automation, and strong demand for retraining. • In the face of a changing demographic landscape, companies may substitute toward more capital-intensive technologies, thus allowing labor resources to be utilized more efficiently.
Health care	• As longevity increases and the proportion of retirees rises, there will be a growing demand for health care services and health-related products. • Amid higher government deficits from increased age-related spending, preventative care and transitioning care to lower-cost settings will increase in popularity.
ESG	• As nations advance demographically and economically, there is a consumption shift towards services, such as travel and leisure, and towards lifelong education. • Increasing interest in supporting sustainable growth will provide ample opportunities in environmental, sustainable and governance (ESG) related sectors.

Policy choices, technology adoption and public and private investment in human capital will shape the credit implications of shifting demographics

- » Credit impact of demographic headwinds over the medium term will depend on policy reforms that stimulate labor force participation (female and older workers in particular), spur immigration, promote human capital development, and encourage financial inflows.
- » Credit impact on particular sectors will also depend on the pace of technology adoption to serve an aging population (e.g., healthcare and autonomous vehicles).
  - – Advancing technology can help addressing the needs of an aging society by expanding new markets and creating new products and services, hence increasing job opportunities and promoting future growth.
- » Demographic change will also create opportunities and will be credit positive for "silver" industries that cater to an expanding elderly population.

- Policies to help immigrants integrate into the local labor markets
- Reinvigorating labor markets through vocational training and lifelong education
- Prioritizing human capital development



- Policy reforms that promote female labor participation and encourage older workers to postpone retirement
- Boost financial inflows, which could fill a domestic savings-investment gap
- Investment in innovation and technology to enhance labor productivity growth in the long run

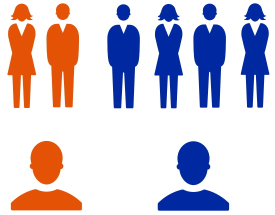
Appendix: Global population snapshot in 2017

» Global population distribution: 60% in Asia, 17% in Africa, 10% in Europe, 9% in Latin America and the Caribbean, remaining 6% in Northern America and Oceania.

» More than half of the global population growth between now and 2050 is expected to occur in Africa. Asia is expected to be the second largest contributor to future population growth. Future population growth is highly dependent on the projected fertility.

» From 2017 to 2050, half of the world's population growth will be concentrated in 9 countries: India, Nigeria, DR Congo, Pakistan, Ethiopia, Tanzania, the US, Uganda and Indonesia (ordered by their expected contribution to total growth).

» At the global level, the male population is slightly larger than the female population. Children under 15 represent 26% of the world's population, while the elderly (60 or over) account for 13%. 61% of the population is in working age (15-59).



By 2050 there will be only two working adults for every adult over 65 in developed countries and four working adults for every adult over 65 in the developing world

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