CHAPTER 2

THE RISE OF THE SILVER ECONOMY: GLOBAL IMPLICATIONS OF POPULATION AGING

As the global population ages, economies worldwide face significant demographic shifts with far-reaching implications. This chapter explores the rise of the "silver economy," focusing on three key areas: the extent of healthy aging and its impact on labor markets, the broader economic implications of demographic changes, and the role of targeted policies in mitigating the adverse effects of aging. The analysis reveals that although population aging poses challenges such as slower growth and increased fiscal pressures, healthier aging trends offer a silver lining by boosting labor force participation, extending working lives, and enhancing productivity. The chapter underscores the importance of policies that support healthy aging, increase labor force participation among older individuals, and close gender gaps in the workforce. By leveraging strategies related to these policies, countries can harness the potential of the silver economy to boost growth and rebuild fiscal buffers amid demographic headwinds.

Introduction

Unprecedented demographic changes expected throughout this century are creating increasingly pressing issues for all countries to navigate. Global population growth will slow from 1.1 percent per year before the COVID-19 pandemic to basically zero in 2080–2100 (Figure 2.1). An ongoing decline in fertility and an increase in longevity are expected to bring sharp changes in the age structure of economies, with the average age of the world's population projected to increase by 11 years between 2020 and the end of the century. These forces are driving the rise of the "silver economy," as the share of the older population—ages 65 and older—is increasing rapidly throughout the world, with far-reaching implications for economies and societies.

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Population aging has often been linked to gloomy prospects for economic growth and public finances. The fall in the proportion of working-age individuals may depress labor supply and output growth (Gagnon, Johannsen, and López-Salido 2021; Maestas, Mullen, and Powell 2023). Slower population growth can also lead to fewer ideas and less innovation, and thus slower productivity growth (Aksoy and others 2019; Jones 2022). A higher dependency ratio, wherein fewer workers support more retirees, can strain public pension systems and increase health care spending (Lee 2016).

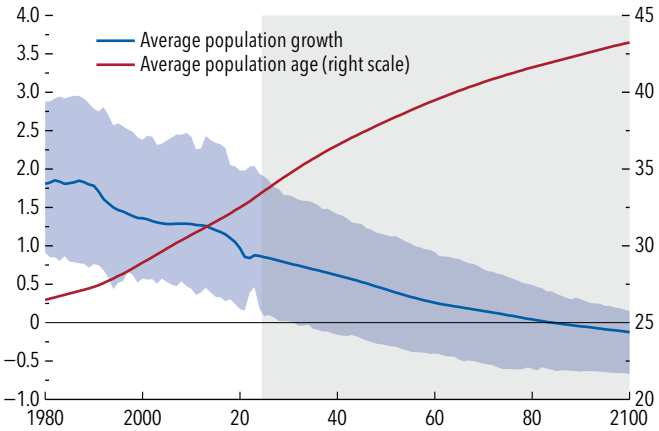
However, individuals are not only living for longer but generally also aging in better health (Scott 2021, 2023; Kotschy and Bloom 2023). Globally, life expectancy has increased by about 4½ years over the past two decades. Importantly, healthy life expectancy has increased at a similar pace, with additional years largely free from chronic illnesses. Recent studies have documented significant improvements in the physical and cognitive abilities of individuals over the age of 50 in some advanced economies, though with notable heterogeneity across socioeconomic groups (Freedman and others 2013; Abeliansky and Strulik 2019; Old and Scott 2023). Healthier aging could thus continue to boost labor supply by extending working lives and enhancing older workers' productivity, offering a bright spot amid the rise of the silver economy.

Against this backdrop, this chapter pursues the following intertwined objectives: (1) assessing the extent to which cohorts are aging in better health and its impact on labor market outcomes, (2) evaluating the global economic implications of demographic shifts and healthy-aging trends, and (3) exploring how targeted policies can help mitigate the negative effects of population aging.

To achieve these objectives, the chapter seeks to answer the following questions:

- *Global demographic transition:* How have demographic trends evolved globally? How fast and uneven is the pace of aging across different countries?

Figure 2.1. Global Population Aging
(Percent, left axis; years, right axis)



Sources: United Nations World Population Prospects; and IMF staff calculations.
Note: The area shaded in blue denotes the interquartile range for population growth across all countries.

- *Healthy aging:* Is there evidence that individuals in later-born cohorts are healthier than those in earlier-born cohorts at the same age? How do healthy-aging trends differ across countries and socioeconomic groups? Has healthy aging increased the labor market attachment and productivity of older individuals?
- *Economic implications of global population aging:* What are the likely implications of population aging for growth, interest rates, public finances, and external balances? How do these implications differ across countries given uneven demographic trends? To what extent can longer and more productive working lives as a result of healthy aging offset the economic and fiscal challenges of population aging?
- *The role of policies:* How can policies help generate growth tailwinds to mitigate the adverse economic impacts of demographic transitions?

To answer these questions, the chapter first relies on microsurvey data from approximately 1 million individuals from 29 advanced and 12 emerging market economies over 2000–22 to establish the extent of healthy-aging trends and their association with labor market outcomes. It then employs a multicountry, overlapping-generations general equilibrium model covering 69 economies—representing about two-thirds of global output and the world's population—to assess the economic implications of global aging through the end of the century. After baseline projections under current policies are established, the model is used to assess the potential impact of targeted progrowth policies to cushion against the growth and fiscal implications of aging.

The chapter's main findings are as follows:

- *Economies worldwide are aging rapidly as a result of declining fertility and rising life expectancy, with the pace of aging varying significantly across regions.* No longer confined to advanced economies, aging is accelerating in many emerging market and middle-income economies. Meanwhile, the window for reaping demographic dividends in younger, low-income countries is gradually closing.
- *In many countries, people not only are living longer but are also aging in better health, which is associated with longer and more productive working lives.* Alongside increases in longevity, the functional capacity of older individuals has improved over time. More recent cohorts of older individuals are physically stronger and cognitively abler than earlier cohorts at the same age. Notably, when cognitive capacities are the focus, "the 70s are the new 50s": Data from a sample of 41 advanced and emerging market economies indicate that, on average, a person who was 70 in 2022 had the same cognitive ability as a 53-year-old in 2000. Over the course of a decade, this pace of improvement in cognitive abilities is associated with an increase of approximately 20 percentage points in the likelihood that individuals remain engaged in the labor market, either by working or actively seeking employment, along with an increase of about six hours in average weekly hours worked and a 30 percent rise in labor earnings, conditional on being employed.
- *Although healthy aging will partly offset the negative impact of demographic headwinds, the growth of global output will slow significantly through the 21st century, and many countries will need sizable efforts to stabilize public-debt-to-GDP ratios.* Ongoing increases in the labor supply and improvements in the human capital of older individuals because of healthy aging are expected to contribute about 0.4 percentage point annually to global GDP growth over 2025–50. Despite this tailwind, average global annual output growth under current policies is projected to decline by 1.1 percentage points during the same period, compared with the 2016–18 average. Demographic trends alone are expected to account for almost three-fourths of this decline. Lower growth, combined with an increasing share

of older individuals with higher accumulated savings in large economies, is projected to exert downward pressure on interest rates. Still, most countries are likely to face a worse interest-growth differential than in the recent past, and many will need higher primary balances than they registered in 2016–18 to keep debt ratios stable from 2030 onward. Uneven demographic trends are also likely to exert widening pressure on external global positions through the end of the century.

- *A multifaceted policy approach can increase labor supply, boost growth, and ease fiscal pressures amid global population aging.* Lifelong policies to support the human capital of workers in late adulthood (that is, people who are between age 50 and retirement age), including health promotion and prevention measures, can significantly counter the effect of population aging on growth. In addition, raising labor force participation among the 65-and-older age group—by gradually increasing the effective retirement age in line with improvements in life expectancy—and closing gender gaps where they remain large would provide significant growth tailwinds in many countries. A combination of labor supply policies could boost global annual output growth by about 0.6 percentage point over the next 25 years, offsetting almost three-fourths of the drag from demographics during that period. The fiscal dividends from progrowth policies would enable many countries to rebuild buffers and create space for critical spending needs. Expanding access to international financial markets through credit and capital market reforms, alongside stronger governance and institutions, would allow younger, low-income countries to reap demographic dividends before the window for doing so closes and offset potential losses from migration outflows to older, labor-scarce economies.

The chapter examines the implications of population aging for growth, interest rates, external balances, and public finances but does not cover all relevant aspects. Notably, it abstracts from shifts in consumer demand and sectoral reallocations driven by aging, as well as the implications for the financial sector, house prices, and urbanization. The analysis also abstracts from endogenous technological responses to aging—such as automation and artificial intelligence (AI)—which could mitigate some of the negative growth effects.

Uneven Pace of Global Population Aging

Advancements in health care, public health measures, and improvements in living standards in past decades have contributed to significant declines in mortality rates across the world. Lower mortality rates in middle and old age have resulted in significant increases in life expectancy and longevity. These trends, together with falling birth rates, are leading to significant changes in the age structure of economies.

Under current demographic projections, economies around the world are progressively crossing their "demographic turning point"—the year when the share of the working-age population in their total population begins to decline—typically marking a transition from a demographic dividend to a demographic drag (Bloom, Canning, and Sevilla 2003). By 2035, all advanced economies and the largest emerging markets will have crossed this threshold (Figure 2.2, panel 1). By 2070, most low-income countries will have experienced similar shifts.

At the same time, increased longevity is contributing to the rise of the silver economy, because the share of the older population is projected to increase rapidly (Figure 2.2, panel 2). Although the rise in the share of older individuals is steepest in the "early agers"—including the largest advanced economies and emerging markets in Europe and Asia—the relatively younger Latin American economies, as well as the world's youngest regions (Africa and the Middle East), will also experience a sharp rise in the share of the older population.

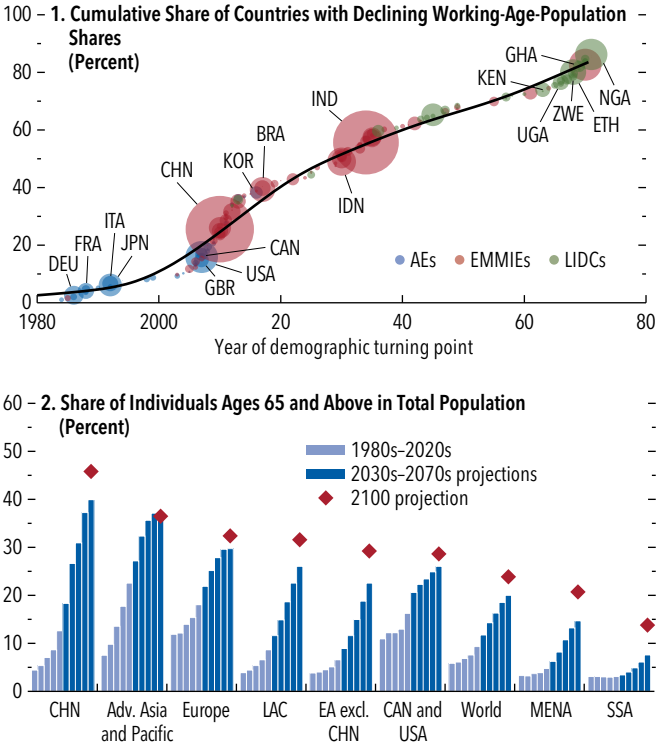
Aging is no longer a concern limited to advanced economies; it is a universal trend whose implications all countries will navigate throughout this century. And the window for low-income countries to reap demographic dividends is gradually closing.

Healthy Aging and Implications for Labor Markets

Because longevity is a key driver of changes in the age structure of economies, an important question is whether individuals are aging in better health. Is there evidence that the functional ability of older individuals has been increasing over time? How broad-based are these gains across different economies? And what are the implications for labor markets?

To tackle these questions, this section uses microdata from surveys of individuals ages 50 and above,

Figure 2.2. Global Demographic Trends

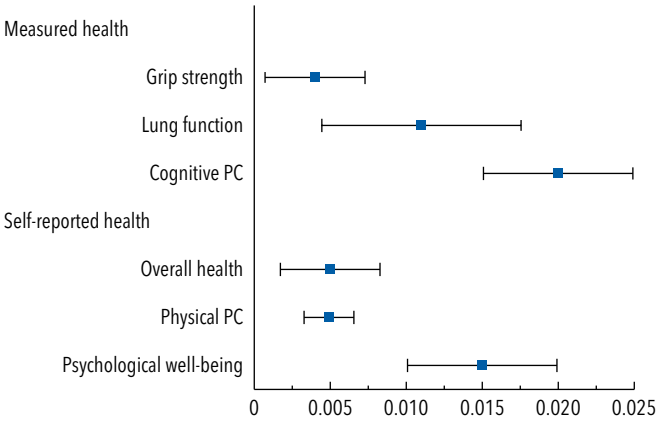


Sources: United Nations World Population Prospects; and IMF staff calculations.

Note: In panel 1, a demographic turning point marks the year when the share of the working-age population (ages 15–64) peaks and starts to decline. Bubble size indicates the country's population relative to the global population in the year of its demographic turning point. In panel 2, the bars denote the share of the older population (ages 65 and above) in the total population by the end of the respective decade. Data labels in the figure use International Organization for Standardization (ISO) country codes. AEs = advanced economies; Adv. Asia and Pacific = advanced Asia and Pacific; EA = emerging Asia; EMMIEs = emerging market and middle-income economies; excl. = excluding; LAC = Latin America and the Caribbean; LIDCs = low-income and developing countries; MENA = Middle East and North Africa; SSA = sub-Saharan Africa.

Figure 2.3. Healthy-Aging Trends, 2000–22

(Regression estimates, trend coefficient)



Sources: Gateway to Global Aging Data; national microdata sources; and IMF staff calculations.

Note: The figure shows the coefficient from ordinary least squares regressions of health indicators of individuals ages 50 and older on the survey year, with individuals' age, gender, education, household wealth, and country fixed effects controlled for. Squares represent point estimates, whereas bars represent 90 percent confidence intervals. PC = principal component.

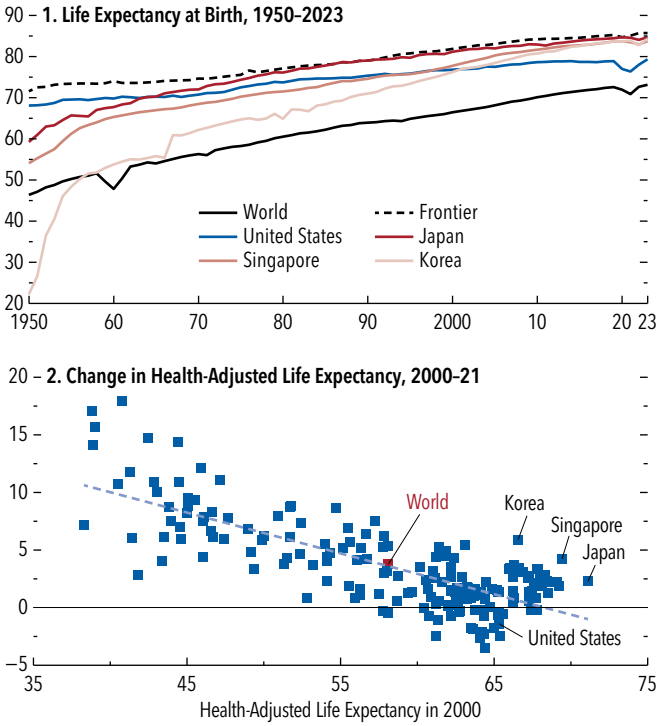
conducted over 2000–22 in 41 advanced and emerging market economies (see Online Annex 2.1 for details).[1] The surveys ask for information on various dimensions of physical, cognitive, and mental health, as well as the incidence of 18 chronic diseases (for example, arthritis, heart conditions, diabetes, cancer, psychological disorders) and individuals' health behaviors (for example, smoking, alcohol consumption, physical activity, obesity). Among *measured health indicators* are physical capacity metrics (grip strength and lung function) and various measures of cognitive ability (memory, orientation, verbal fluency, and basic mathematics). *Self-reported health indicators* include overall health status, various aspects of physical functionality (ease of performing activities of daily living, such as dressing and eating, and instrumental activities of daily living, such as managing money and shopping for groceries; frequency of pain; and hearing ability), and a composite measure of psychological well-being. Not surprisingly, all these indicators capturing the functional capacity of individuals tend to decline with age (Online Annex Figure 2.2.2). However, a key question is whether, for a given age, they have been improving across cohorts.

Healthy Aging amid Persistent Heterogeneity

Are successive generations experiencing better health at older ages, consistent with the concept of healthy aging? The findings indicate a broad-based healthy-aging phenomenon, as evidenced by a range of physical, cognitive, and mental health indicators showing improvement over time when other covariates are controlled for (Figure 2.3). Healthy-aging gains appear to be most prominent in regard to cognitive functions. The estimated trend for the first principal component of cognitive indicators suggests that, on average and after individuals' socioeconomic characteristics (such as age, gender, education, and wealth) and country fixed effects are controlled for, the cognitive abilities of a

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

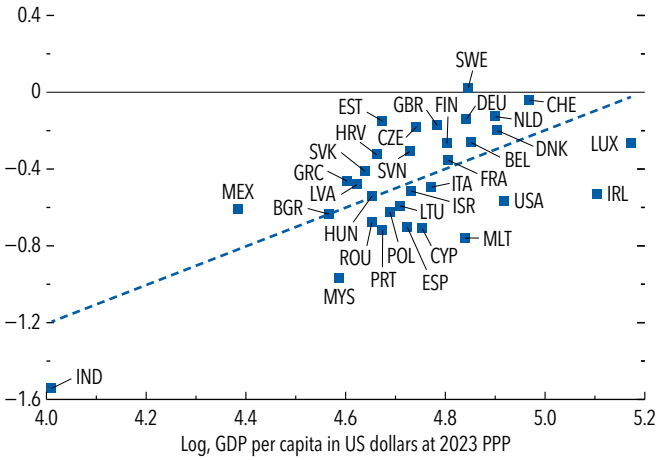
Figure 2.4. Life Expectancy and Cross-Country Convergence
(Years)



Sources: United Nations World Population Prospects; World Health Organization; and IMF staff calculations.

Note: World average is population-weighted, based on 183 countries. "Frontier" = maximum life expectancy across countries.

Figure 2.5. Cognitive Capacity
(Regression estimates, cognitive health score, country fixed effects)



Sources: Gateway to Global Aging Data; national microdata sources; and IMF staff calculations.

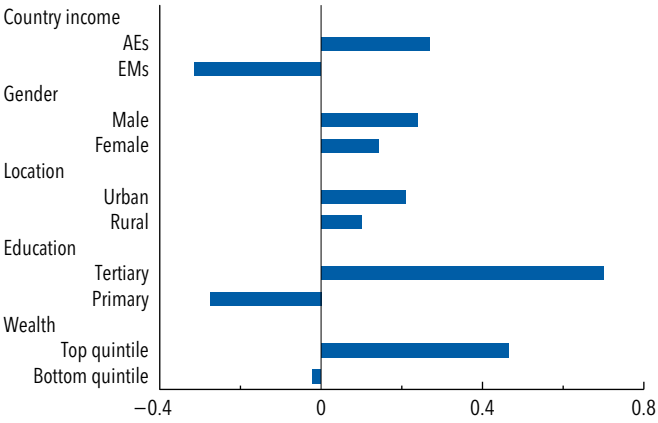
Note: The vertical axis shows country fixed effects from ordinary least squares regressions of the cognitive health score of individuals ages 50 and older on the survey year, with individuals' age, gender, education, and household wealth controlled for. Cognitive health score is the first principal component of cognitive indicators, standardized to mean zero, standard deviation one. The regression sample period is 2000–22. Data labels in the figure use International Organization for Standardization (ISO) country codes. PPP = purchasing power parity.

person aged 70 in 2022 are comparable to those of a person who was 53 in 2000. The trend is also positive and statistically significant, albeit somewhat weaker, in regard to other health measures and for a composite "frailty" health index (like the one used in Abeliansky and Strulik 2019; Abeliansky, Erel, and Strulik 2020; Old and Scott 2023). On average, the frailty of a 70-year-old person in 2022 corresponded to that of a person who was 56 in 2000 (Online Annex 2.2). The fact that improvements in the area of cognitive skills have been significant and large is particularly relevant as there is evidence that people tend to work in less physically demanding roles at the workplace as they age (Online Annex Figure 2.2.7).

Although these trends are encouraging, another important question is how broad-based these healthy-aging gains have been across countries and socioeconomic groups. A simple inspection of life expectancy across countries does point to some global convergence in longevity. First, average life expectancy across countries has been gradually catching up to the life expectancy frontier (Figure 2.4, panel 1; note that setbacks in the 1960s and 2020s shown in the figure were due to global pandemics). For instance, Japan, Korea, and Singapore—among the countries with the highest longevities today—had very different life expectancies in the 1950s. Second, countries with lower health-adjusted life expectancies—defined as the average number of years that a person can expect to live in good health—at the start of the 21st century have experienced, on average, faster improvements than other countries over the past two decades (Figure 2.4, panel 2).

However, survey-based data reveal important cross-country differences in the functional capacity of older individuals. If cognitive indicators are the focus, the analysis shows that although individuals' cognitive health is positively associated with their countries' GDP per capita, there is notable variation across countries (Figure 2.5). Among Nordic countries, for instance, Sweden has a higher cognitive health score than Denmark and Finland. Meanwhile, despite a comparable GDP per capita and higher health care spending, the United States systematically lags behind Nordic countries on measured health indicators. Also, cognitive health scores of older

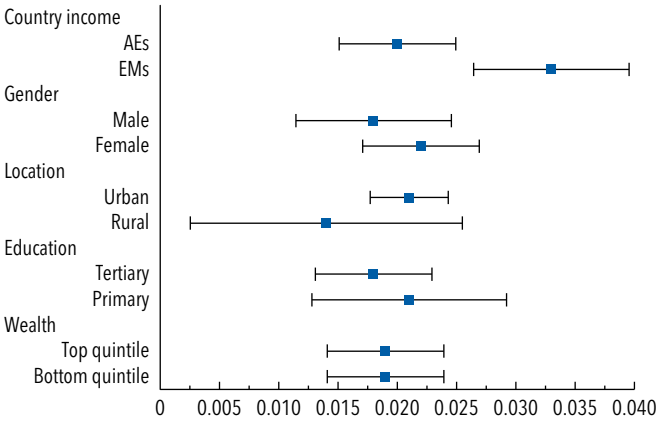
Figure 2.6. Cognitive Health Inequalities
(Cognitive health score, average)



Sources: Gateway to Global Aging Data; national microdata sources; and IMF staff calculations.

Note: The figure shows average health cognitive scores of individuals ages 50 and older by socioeconomic group. Cognitive health score is the first principal component of cognitive indicators, standardized to mean zero, standard deviation one. T-tests indicate that the differences in means are statistically significant for all socioeconomic categories. AEs = advanced economies; EMs = emerging markets.

Figure 2.7. Heterogeneity in Cognitive Health Trends
(Regression estimates, trend coefficient)



Sources: Gateway to Global Aging Data; national microdata sources; and IMF staff calculations.

Note: The figure shows estimates from ordinary least squares regressions of cognitive health score of individuals ages 50 and older on the survey year, by socioeconomic group, with individuals' age, gender, education, wealth, and country fixed effects controlled for. Squares represent point estimates, whereas surrounding bars represent 90 percent confidence intervals. Cognitive health score is the first principal component of cognitive indicators, standardized to mean zero, standard deviation one. AEs = advanced economies; EMs = emerging markets.

individuals from emerging market economies are lower than those from advanced economies after individuals' socioeconomic characteristics are controlled for (Figure 2.6).

Within countries, health disparities are related to socioeconomic characteristics. Average health scores are significantly lower for individuals in rural locations, individuals with at most primary education, and lower-wealth households (Figure 2.6). In turn, although faster improvements in healthy aging in emerging markets (compared with advanced economies) suggest some cross-country "catching up," the pace of health improvements across other dimensions has been similar despite widely varying initial conditions (Figure 2.7). This indicates that existing socioeconomic health disparities—related to gender, location, education, and wealth—have persisted.[2] Further analysis reveals that lifestyle factors, such as levels of physical activity, body mass index, and smoking, are significant determinants of the functional capacity of older individuals after age and socioeconomic characteristics are controlled for (Online Annex 2.2).

In summary, although there is some evidence of cross-country convergence, notable disparities in the physical and cognitive capabilities of older individuals persist, both within and across countries. Strengthening health care quality and expanding access, particularly for preventive care and for disadvantaged groups, and providing incentives for healthy lifestyles can help narrow these healthy-aging gaps. Singapore's remarkable increase in life expectancy, from 90th in the world in 1950 to first in 2018, underscores the variety of policies that can be effective, including subsidizing healthier food options, regulating sugar content in beverages, building widespread public fitness centers, introducing automobile congestion charges, and subsidizing housing in proximity to family to promote intergenerational social connections (Buettner 2012).

Labor Market Implications of Healthy Aging

Have healthy-aging gains been associated with improvements in labor market outcomes of older

[2]Similarly, Old and Scott (2023) find that frailty has decreased over time in the United Kingdom, though at varying rates across socioeconomic groups, with the wealthiest experiencing the largest decreases. Abeliansky and Strulik (2019) show that health deficits have declined over time in a sample of European countries, but health inequalities have persisted. Abeliansky, Erel, and Strulik (2020) find that the time trend of health improvements in the United States is similar across regions and for men and women, but significantly lower for African Americans compared with Caucasians.

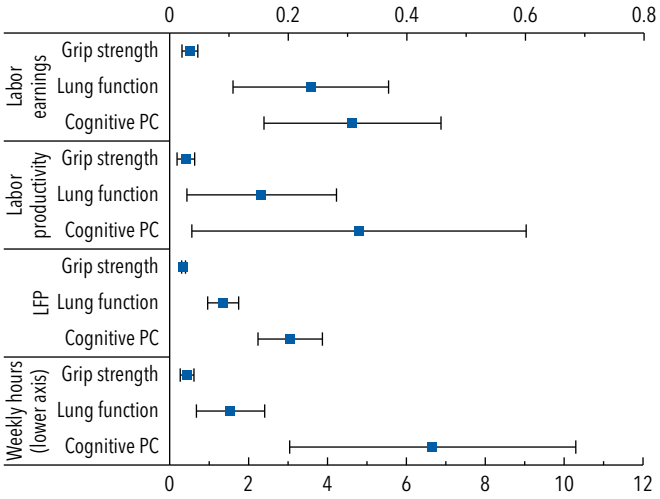
individuals? To shed light on this, the analysis investigates the effect of health indicators capturing the functional capacity of older individuals on measures of labor supply and labor earnings.

A simple regression analysis reveals that higher scores on the health indicators are associated with increased total labor earnings and labor productivity (proxied by hourly earnings), as well as with positive employment outcomes along both the extensive margin (labor force participation) and intensive margin (hours worked); see Online Annex Table 2.2.3. However, these associations may not necessarily reflect causal relationships. Some studies have argued that increasing the retirement age negatively affects health outcomes, especially for those in low-status occupations (Barschkett and others 2022; Abeliansky and Strulik 2023), in which case the estimated correlations between the two would need to be interpreted as lower bounds. Others find that working longer is beneficial for most people but negative for some, especially those in low-quality jobs (Calvo 2006). In addition, there could be unobserved drivers of both health and labor market outcomes that would bias the relationship between the two.

To address these concerns, the analysis here employs an instrumental-variables approach that exploits exogenous health shocks, proxied by the development of chronic diseases.[3] Given that smoking, poor nutrition, physical inactivity, and excessive alcohol use are key risk factors for most chronic diseases (Hacker 2024), the regression employed in the analysis controls for these lifestyle behaviors. The estimates remain statistically significant and are quantitatively larger than the simple correlations (Figure 2.8). In regard to economic magnitude, the results imply that average cognitive health gains observed for older-age individuals over a decade are associated with rises in labor earnings and labor productivity by about 30 percent, an increase in their likelihood of participating in the labor force by about 20 percentage points, and higher numbers of average weekly hours worked by about six hours. In addition, better health is also associated with later retirement, working more weeks per year, and a lower probability of being unemployed, and qualitatively similar relationships hold for other health indicators (Online Annex Table 2.2.4).[4]

Although healthy-aging gains have been comparable across age groups, the labor market impact of a given improvement in health does vary with age. For instance, the impact of better health on labor force participation of individuals in their 50s is significantly larger than that for individuals in their 60s and 70s (Online Annex Figure 2.2.6). This suggests that even if the functional capacity of older individuals improves, other factors—such as skills obsolescence, pension incentives, and age discrimination—can still constrain their attachment to the labor market (Neumark, Burn, and Button 2019; D'Albis 2023). However, evidence

Figure 2.8. Effect of Healthy Aging on Labor Market Outcomes
(Regression coefficients)



Sources: Gateway to Global Aging Data; national microdata sources; and IMF staff calculations.

Note: The 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 diseases), with individuals' age, gender, education, wealth, and country fixed effects controlled for. 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. PC = principal components; LFP = labor force participation.

[3]The identification strategy rests on the assumption that at least some chronic diseases—those unexplained by individuals' socioeconomic characteristics and health behaviors—occur randomly. Using alternative approaches to identify health shocks, previous studies have demonstrated that sudden changes in health can induce older workers to reduce their labor supply or retire (Bound and others 1999; Riphahn 1999; Disney, Emmerson, and Wakefield 2006) and force younger individuals into inactivity (García-Gómez and López-Nicolás 2006; García-Gómez, Jones, and Rice 2010), and that the employment effects may persist over many years (García-Gómez and others 2013).

[4]Qualitatively similar results are obtained when using an augmented inverse-probability-weighting approach, in which chronic disease cases that are less predictable (that is, more random)—based on individuals' socioeconomic characteristics and health behaviors—are given a higher weight, and when using the composite health measure of frailty that averages various measured and self-reported health indicators (Online Annex 2.2).

of a general rise in the "age-friendliness" of today's jobs (Acemoglu, Mühlbach, and Scott 2022) provides something of a silver lining. Also, occupation-level data suggest that older workers with college educations are relatively well positioned to benefit from the productivity-boosting potential of AI because it complements their tasks and skills (Box 2.3).

Overall, these findings suggest that healthy aging can expand the effective labor supply of older individuals through higher labor force participation, employment probability, numbers of hours worked, and productivity. To assess how healthy aging can mitigate the economic effects of population aging, the next section incorporates these elements into a general equilibrium analysis.

Economic Implications of Global Population Aging

The economic impact of demographic shifts is multifaceted. First, variations in fertility, mortality, and migration have an impact on both population growth rates and age structures. Given individuals' typical life cycle—birth, schooling, working, and retirement—chronological age thresholds defining economic activity and retirement relative to life expectancy play a critical role. A rising share of the working-age population (those ages 15–64) boosts labor supply and economic growth, whereas an increasing old-age dependency ratio (number of individuals ages 65 and older relative to the number in the working-age population) weighs on growth and strains public finances on account of higher spending on pensions, health care, and long-term care. These pressures intensify as the lifespan beyond retirement age lengthens.[5]

Second, the expected length of working lives relative to retirement influences individuals' saving behavior. If life expectancy increases while the effective retirement age remains unchanged, individuals tend to save more to smooth consumption over their lives, driving up aggregate savings. Moreover, if the within-economy age profiles of wealth and labor income are held fixed, an increasing share of older individuals raises total wealth. At the same time, a shrinking workforce increases capital per worker, reducing investment needs. These forces combine and, on balance, tend to place downward pressure on interest rates (Gagnon, Johannsen, and López-Salido 2021; April 2023 *World Economic Outlook* [WEO], Chapter 2).[6] The uneven pace of these trends across economies due to aging will largely shape their net foreign asset positions (Auclert and others 2024). The general equilibrium effects of aging on both growth and interest rates will have important implications for public finances.

Third, beyond chronological age, physiological aging also influences individuals' labor supply and retirement decisions. In line with findings in the previous section, research suggests that physiological functioning is a key predictor of individuals' labor force participation and productivity, independent of their chronological age (Kotschy, Bloom, and Scott 2024). Improvements in how individuals age can thus affect education, work, and saving decisions, with broad implications for aggregate labor supply, interest rates, and economic growth.

Finally, asynchronous aging across countries creates opportunities for efficiency gains from cross-border reallocation of production factors. Capital may flow from old, high-savings economies to younger, capital-scarce economies, shaping external balances (Gourinchas and Rey 2014; Auclert and others 2024). Similarly, labor may gradually migrate from younger, labor-abundant economies to older economies facing labor scarcity.

The Model

This chapter employs an extension of the global overlapping-generations model in Auclert and others (2024) to assess the general equilibrium implications of demographic forces for individual economies and globally (see Online Annex 2.3 for details).

- *Country coverage:* The model includes 21 advanced economies, 4 emerging market economies (including China and India, which together account for almost 50 percent of emerging market economies' GDP), and a bloc economy comprising 44 low-income

[5]The subsequent analysis focuses on effective (rather than statutory) retirement age, which has significant macroeconomic implications. Among advanced economies, the median effective retirement age is about 2.5 years lower than the statutory retirement age. However, it varies widely across countries and over time, likely reflecting adjustments to the statutory retirement age, the generosity of pensions, and differences in health status among older workers.

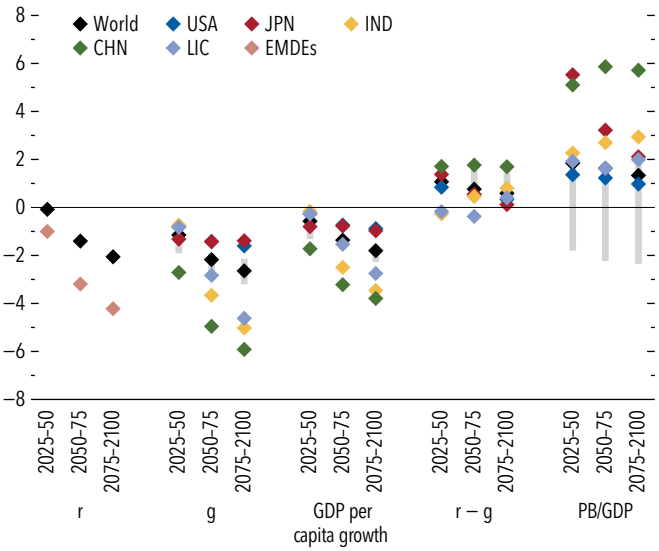
[6]The focus of the chapter is on aging-induced pressures on interest rates due to changes in the age structure of economies and their impact on savings supply and investment demand. However, the future direction of interest rates is also shaped by other factors influencing investment demand, such as future productivity trends as well as public spending to tackle pressing policy issues such as climate change or national security.

countries (LICs) expected to pass their demographic turning points after 2040 (denoted *LIC bloc* hereafter). Altogether, the model accounts for about two-thirds of the world economy and population.

- *Healthy aging:* The country-specific age-productivity profiles of workers vary over time to integrate the impact of healthy aging on effective labor supply (proxied by labor earnings, capturing effects on labor productivity and number of hours worked) documented in the previous section. Even if policies supporting healthy aging remain unchanged, the improvements observed over 2000–22 are likely to persist for some time as current young workers who benefited from those policies transition into old age. Accordingly, the baseline assumes a continued—though moderating—improvement in the functional capacity of workers ages 50 and older over the next three decades.
- *Productivity:* Apart from the effect of healthy aging on age-productivity profiles, aggregate productivity at the country level is driven in the model by three forces, which are calibrated based on empirical evidence: the growth of total factor productivity (TFP) at the global frontier, convergence toward the TFP frontier, and the impact of demographics on TFP growth through innovation and entrepreneurship channels.
- *Global capital market:* The model assumes that the integration of China, India, and the *LIC bloc* into global capital markets is imperfect. This results in a wedge between domestic and global interest rates for these economies that is assumed to decline gradually as they undertake credit and capital market reforms, continue strengthening governance and institutions, and become increasingly integrated in global financial markets.[7]
- *Fiscal policy:* Initial values for effective retirement rates, labor taxes, retirement replacement rates, and other public spending are calibrated to match country-specific targets in the data. In the baseline, effective retirement ages are assumed to increase by one month per year over 60 years in all countries (except for India and the *LIC bloc*, where they are assumed unchanged). Labor taxes, replacement rates, and other public spending adjust period by period so that trajectories of debt-to-GDP ratios are aligned with WEO projections until 2029 and remain stable from then onward.

[7]In the literature, the wedge in the interest rate that emerging market and developing economies face can be attributed to factors such as a higher growth rate of the labor force (Carvalho and others 2023), a lower degree of financial integration (Bielecki, Brzoza-Brzezina, and Kolasa 2020), and market segmentation (Pellegrino, Spolaore, and Wacziarg 2024).

Figure 2.9. Baseline Projections: Growth, Interest Rates, and Primary Balances
(Deviation from 2016–18 average, percentage points)



Source: IMF staff calculations.

Note: Diamonds mark the annual average over the reported periods. Grey bars denote interquartile ranges. A positive value for PB/GDP indicates a country would need a higher primary balance in the reported period than it had, on average, in 2016–18 to keep its debt ratio stable beyond 2029. The values for "World" denote averages for the economies included in the model while the values for "EMDEs" denote averages for China, India, and the LIC bloc. Data labels in the figure use International Organization for Standardization (ISO) country codes. EMDEs = emerging market and developing economies; g = GDP growth rate; LIC = bloc of low-income countries; PB = primary balance; r = interest rate.

Implications of Aging under Current Policies

Under current policies, global growth is expected to decline as population aging accelerates, but the severity of the expected growth decline varies widely across countries (Figure 2.9). Global average annual growth over 2025–50 is projected to be about 1.1 percentage points lower than the average over 2016–18, and 2 percentage points lower when the average over 2025–2100 is considered. Advanced economies with relatively older populations (such as Japan) will see their economies shrink. Other advanced economies that are projected to avoid a decline in

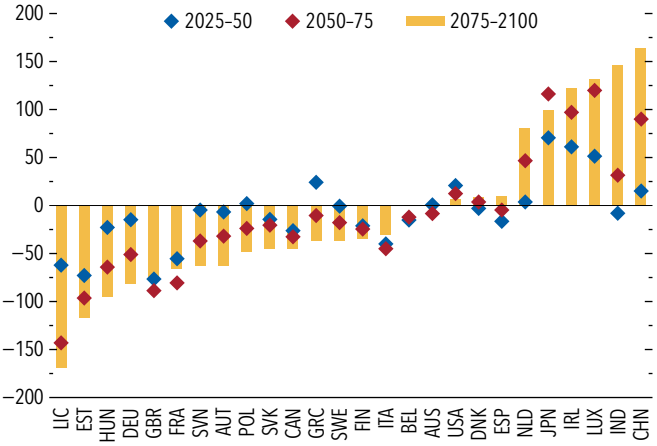
their working-age populations under baseline fertility and migration assumptions (such as Canada and the United States) will continue to grow, albeit more slowly over time.

In the group of emerging market and developing economies, China will witness a particularly sharp decline in its GDP growth over 2025–50—a deceleration of 2.7 percentage points relative to the 2016–18 average—reflecting acutely adverse demographics, as well as the approaching end of the era of rapid catch-up to frontier productivity. India, with its relatively favorable near-term demographics, is projected to experience a smaller growth decline in 2025–50 (of about 0.7 percentage point), but the decline will intensify over 2050–2100 as the country passes its demographic turning point. Low-income countries are also expected to see a sharper deceleration in growth in the second half of the century, once demographic dividends turn into headwinds.

The projected slowdown is generally smaller in regard to output per capita, but most economies will see a deceleration going forward. For the world average, and relative to 2016–18, output per capita growth will be about 0.6 percentage point lower in 2025–50 and 1.8 percentage points lower toward the end of the century.

Lower expected growth, combined with an increasing share of older populations, would reduce the need for additional investments and push up desired aggregate savings, resulting in downward pressure on interest rates.[8] However, the interest-growth differential ($r - g$) projected for the next 25 years is higher than the 2016–18 average for all economies except India and the *LIC bloc*—meaning that, all else equal, a higher primary balance would be needed to keep debt ratios stable. Average $r - g$ for the world is projected to be 1 percentage point higher in 2025–50 than in 2016–18, moderating to about 0.5 percentage point toward the end of the century as population aging increases global savings relative to investment demand everywhere. Early- (late-)aging countries will see $r - g$ pressures easing (increasing) toward the end of the century as aggregate savings and wealth evolve along with the transition.

Figure 2.10. Baseline Projections: Net Foreign Assets
(Deviation from 2016–18 average, percent of GDP)



Source: IMF staff calculations.

Note: The bars and diamonds denote annual averages over the reported periods. Data labels in the figure use International Organization for Standardization (ISO) country codes. LIC = bloc of low-income countries.

To keep debt-to-GDP ratios stable from 2030 onward, about half of the model economies are projected to need higher primary-balance-to-GDP ratios than they had on average over 2016–18. Importantly, this group includes the largest economies, such as China, Japan, and the United States. The larger required fiscal effort reflects the combination of adverse demographics and the large increase in public debt many countries have experienced since the onset of the pandemic.[9]

The uneven demographic trends would influence the direction of future capital flows and contribute to divergent net foreign asset positions across the world over the long run. Large emerging market economies (China and India) would accumulate foreign assets, especially over 2050–2100, whereas many advanced economies would gradually draw down foreign assets throughout the projection horizon (Figure 2.10). The net foreign asset position for the *LIC bloc* would

[8]It is conceivable that investment rates may not fall by much if aging-induced labor scarcity fosters investment in labor-saving technologies (Goodhart and Pradhan 2020). If automation or AI adoption responds endogenously to an aging population, interest rates could face upward pressure, either from sufficiently large productivity gains (Stähler 2021) or an increase in the capital share in output (Moll, Rachel, and Restrepo 2022). These channels are not accounted for in the model.

[9]The model accounts for the implications of aging for pension spending but does not include other age-related health care and long-term care spending. The European Commission Directorate-General for Economic and Financial Affairs (2024) estimates these nonpension expenditures could increase by 1.2 percentage points of GDP on average across member states, whereas education spending would decline by 0.5 percentage point of GDP as a result of aging; the spending impact would, however, be highly heterogeneous across countries.

worsen through most of the projection period, as low-income economies with younger populations in this bloc benefit from continued capital inflows. However, this trend would slow and eventually reverse around 2070 as these countries' aggregate wealth starts to increase with population aging.

Growth Dividends from Healthy Aging

To what extent does healthy aging help to avert an even steeper slowdown in GDP growth under current policies? Results from counterfactual simulations indicate that the contribution to growth from recent healthy-aging improvements will be sizable over 2025–50. For the world, healthy aging is projected to add about 0.4 percentage point to GDP growth, on average, over 2025–50 (Figure 2.11, panel 1). That is, if expected gains from healthy-aging trends were abstracted from, global output growth would be projected to slow by 1.5 percentage points—as opposed to 1.1 percentage points—in 2025–50 when compared with average growth in 2016–18.

The projected contributions of healthy-aging gains to average annual output growth are positive and sizable for all individual economies in the model, ranging from about 0.3 percentage point to 0.6 percentage point. The contribution is particularly large for India, for instance, as its share of workers ages 50 and older is projected to grow fast in that period, whereas it is relatively lower in Japan, as its share of older workers, though high, will grow at a slower pace over 2025–50.

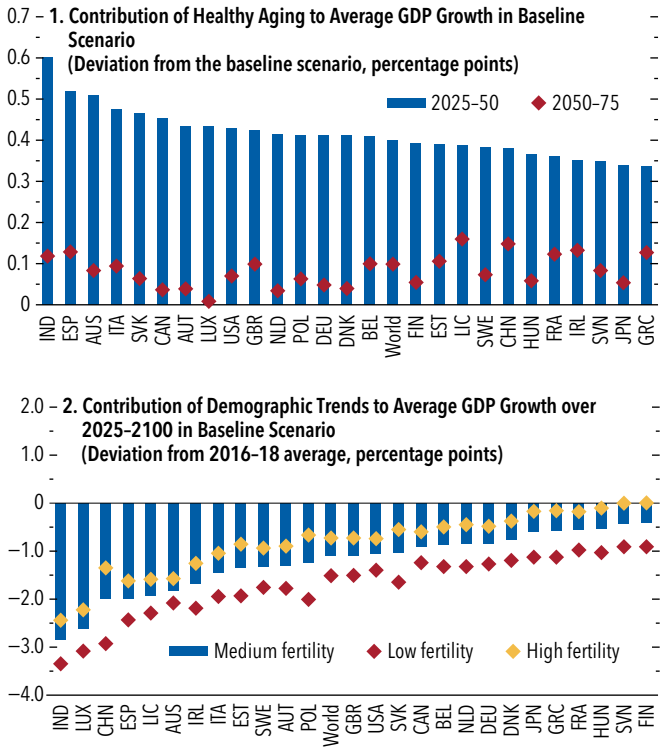
Under current policies, the contribution to growth from healthy aging would gradually fade as current cohorts of workers transition through their late adult stage and into retirement. The average contribution to world growth would be about 0.1 percentage point over 2050–75 and would decline further thereafter.

Impact of Demographic Assumptions

The model simulations take as given United Nations World Population Prospects (UNWPP) assumptions regarding the future path of fertility and mortality rates in individual countries. These demographic assumptions are an important driver of the projected growth slowdown under the baseline: They account for about half of the slowdown in projected GDP growth over 2025–2100 relative to the average in 2016–18. More precisely, demographic forces alone—that is, abstracting from the other forces considered in the baseline, such as cross-country convergence in productivity and the impact of healthy aging—explain 1.1 percentage points out of a reduction of 2 percentage points in global GDP growth (Figure 2.11, panel 2). Among countries in the model, the average contribution of demographic forces to GDP growth in 2025–2100 ranges from close to –2.8 percentage points in India to –0.4 percentage point in Finland and Slovenia.

Demographic projections are of course subject to uncertainty. For instance, whereas the UNWPP "medium" fertility projections used for the baseline assume birth rates will eventually rebound in many countries, fertility projections have been systematically revised downward in recent years (see Online Annex Table 2.3.1). On the other hand, authorities in more than 50 countries, especially in Asia and Europe, where the pace of aging has raised alarms, have adopted policies to foster higher birth rates (United Nations Department of Economic and Social Affairs 2021).

Figure 2.11. The Role of Healthy Aging and Demographic Trends



Source: IMF staff calculations.

Note: The bars and diamonds denote annual averages over the reported periods. The values for "World" denote averages for the economies included in the model. Data labels in the figure use International Organization for Standardization (ISO) country codes. LIC = bloc of low-income countries.

To assess the sensitivity of projections to fertility assumptions, the model is simulated using alternative UNWPP projections based on fertility rates higher and lower than those in the medium-fertility scenario.[10] Indeed, the expected contribution from demographics to GDP growth in 2025–2100 varies widely with the fertility assumptions, with the country-specific growth estimates under alternative fertility assumptions varying, for instance, by 0.5 percentage point in Australia and 1.6 percentage points in China. However, the contribution of demographics to GDP growth is mostly negative under different fertility assumptions.

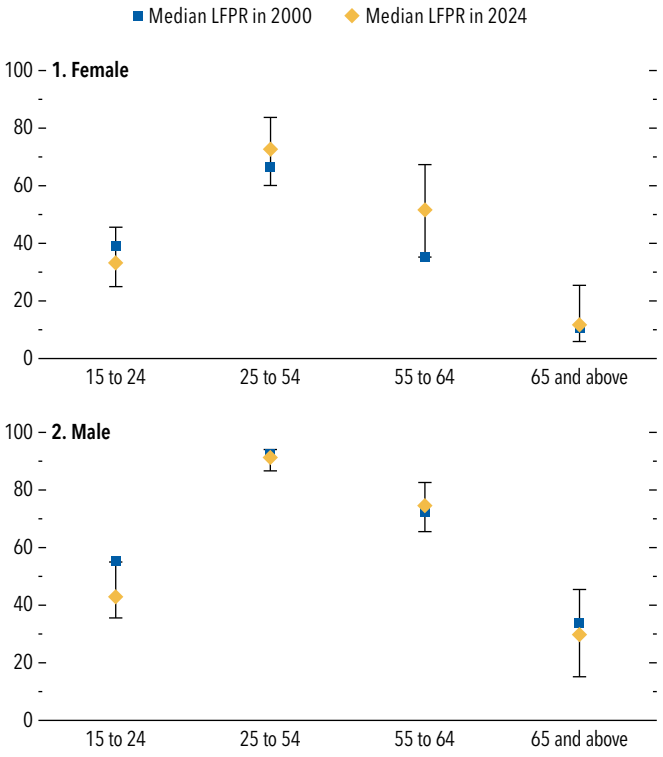
Growth Tailwinds from Labor Supply Policies

How can policies mitigate the adverse economic impacts of population aging? There are three key policy levers that could provide growth tailwinds amid population aging: tackling the decline in participation rates of older individuals, extending working lives as life expectancy rises, and narrowing gender participation gaps (Figure 2.12). A set of alternative scenarios is used to assess the general equilibrium impact of addressing these issues (see details in Online Annex 2.3):

Healthy-aging policies: Targeted health policies and other initiatives can enable older workers to increase their labor force participation rates. Indeed, the significant increase in the global median participation rate between 2000 and 2024 in the 55–64 age group is encouraging, but there is significant room for further narrowing the participation gap with respect to prime-age workers. A first model scenario assumes the rollout of policies in areas such as health promotion and prevention that lead to a gradual narrowing of cross-country differences in the functional capacity of workers ages 50 and older. Under such a scenario, the additional long-term improvement in the functional capacity of older individuals would reduce current cross-country gaps by one-fourth and, on average, would be equivalent to about 49 percent of the estimated gains over 2000–22. The results indicate notable growth dividends because of higher labor force participation rates for older individuals who have not yet reached retirement age, as well as higher productivity relative to the baseline (Figure 2.13). For the world, average annual GDP growth over 2025–2100 would be about 0.2 percentage point higher than in the baseline—and 0.3 percentage point higher over 2025–50.[11]

Higher effective retirement age: There is also scope for increasing labor force participation among both men and women in the 65-and-older age group, by postponing the effective retirement age given healthy-aging improvements. This is not necessarily or exclusively related to raising statutory retirement ages. Healthy aging may encourage older workers to voluntarily delay their retirement even if statutory retirement ages are unchanged, depending on the incentives of pension plans.[12] A second scenario assumes that policy changes

Figure 2.12. Labor Force Participation by Age Group
(Percent)



Sources: International Labour Organization; United Nations World Population Prospects; and IMF staff calculations.

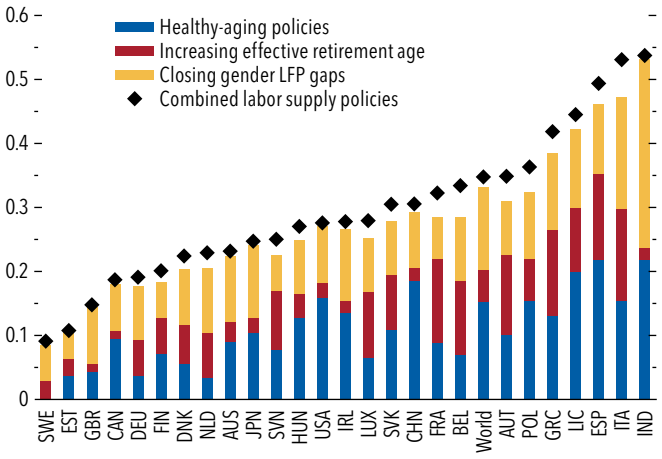
Note: The whiskers indicate 2024 interquartile ranges across countries. LFPR = labor force participation rate.

[10]Under the UNWPP's high- (low-)fertility scenario, fertility is projected to remain 0.5 children above (below) the fertility rate in the medium-fertility scenario over most of the projection period.

[11]The scenario assumes all countries in the model implement policy changes, but their magnitude and pace depend on initial conditions. Countries at or close to the health frontier, which do not see any additional improvement in the functional capacity of older workers relative to the baseline, would not register growth dividends.

[12]At the same time, raising the statutory retirement age may not yield the desired impact on effective retirement age if older workers are not physically or cognitively able to remain active or if their productivity declines rapidly with age (Kotschy, Bloom, and Scott 2024).

Figure 2.13. Average Impact of Labor Supply Policies on GDP Growth over 2025–2100
(Deviation from the baseline scenario, percentage points)



Source: IMF staff calculations.

Note: The bars (markers) represent the deviations from the baseline scenario when each labor policy is implemented in isolation (all labor policies are implemented together). The sum of the values for the individual policies does not necessarily coincide with the value for the combined policy scenario because of interactions between the policies. The value for "World" denotes the average for the economies included in the model. Data labels in the figure use International Organization for Standardization (ISO) country codes. LFP = labor force participation; LIC = bloc of low-income countries.

lead effective retirement ages to increase at a faster pace than under the baseline in countries where life expectancy at retirement is 20 years or more—in line with prospective old-age thresholds (Sanderson and Scherbov 2010; Kotschy and Bloom 2023)—while otherwise evolving as in the baseline. In such a scenario, average annual GDP growth over 2025–2100 for the world would be about 0.1 percentage point higher than in the baseline. The growth dividends would be higher in European economies, in which the gap between effective retirement ages and life expectancy is large and would increase further under unchanged policies.

Closing labor force participation gaps: Finally, average labor force participation rates remain higher for men across most countries, providing scope for closing gender gaps in labor force participation. A third scenario assumes that policies lead to narrowing country-specific gender gaps in labor force participation by three-fourths by 2040. Under this scenario, average annual GDP growth for the world economy would be 0.1 percentage point per year higher than in the baseline over 2025–2100—and the difference would be even larger, at 0.3 percentage point, over 2025–50—with a particularly large boost in India given its current large gender gaps.

Combined policy package: Combining the three labor supply policy layers would yield sizable growth gains and partly mitigate the projected growth decline in the baseline. For the global economy, average annual growth would be 0.3 percentage point higher over 2025–2100 than in the baseline scenario, reversing about one-third of the drop in growth attributable to demographic trends through the end of the century. The boost to global growth would be even larger, at about 0.6 percentage point, over 2025–50 (Online Annex Figure 2.3.4), offsetting close to three-fourths of the drag from demographics during that period. Some countries—notably India, low-income countries, and some European economies—could reap even higher growth dividends. Equally meaningfully, keeping older workers engaged in economic activities may offer non-monetizable societal benefits from improved well-being for a large portion of future societies (Scott 2023).

Fiscal Implications

How much could labor supply policies ease fiscal pressures? These policies would first have direct implications for the primary balance of the public sector—including but not limited to their impacts through pension system balances. For instance, increasing female labor force participation and employment could boost labor tax revenues. Similarly, policies that raise the effective retirement age would increase labor taxes and reduce transfer payments.

Second, labor supply policies would also have an impact on public finances through their effect on $r - g$. Higher GDP growth would contribute to reducing $r - g$ and easing fiscal pressures—meaning that, all else equal, a lower primary balance would keep the debt ratio stable. However, labor supply policies could also put upward pressure on interest rates because of lower desired aggregate savings—due, for instance, to longer expected working lives—and increased investment demand to accommodate a larger labor force.[13] The overall effect on $r - g$ would depend on how much these reforms boost growth in individual countries and

[13]It is also important to acknowledge that government borrowing costs may deviate from equilibrium interest rates considered in the model as a result of factors related to the depth of markets for sovereign debt, the international currency status of the country issuing the debt, and increased debt issuance, as well as shifts in safe asset demand or market sentiment regarding fiscal risks. Limited market capacity to absorb large debt issuances may also put upward pressure on government borrowing costs and cause gradual erosion in the "convenience yield" on government debt; see, for example, the discussion in Mian, Straub, and Sufi (2022) and the April 2023 WEO, Chapter 2.

on the sensitivity of global interest rates to improved growth prospects. Model simulations indicate that five model economies (Greece, India, Italy, Spain, and the *LIC bloc*) would see some fiscal respite from lower $r - g$ over 2025–50, reinforcing the direct benefits of labor policies on primary balances.[14]

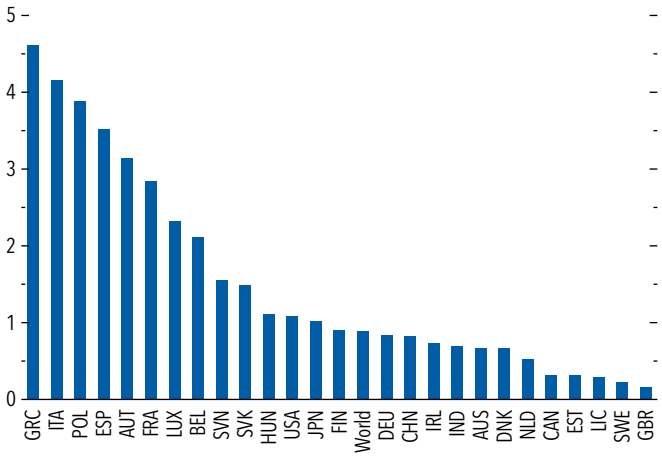
Altogether, when the effect of labor supply policies on primary balances and on $r - g$ is considered, all model economies would gain fiscal space under the combined policy scenario. That is, they could afford to increase spending on critical areas, such as climate-related initiatives reduce labor income taxes, or expand transfers, while maintaining public debt targets. The extent of additional fiscal space would nonetheless be quite heterogeneous across countries. Assuming the fiscal dividends from progrowth policies are employed in equal proportions to reduce taxes, increase transfers, and increase other spending, the gains would be equivalent, on average, to more than 4 percentage points of GDP in Greece and Italy, but less than 1 percent of GDP in China and the United Kingdom (Figure 2.14). An additional exercise shows that the fiscal dividends from progrowth policies would allow many countries—though not all—to gain fiscal space while at the same time rebuilding buffers by reducing public debt to its average level in 2016–18 (Online Annex Figure 2.3.5). The differences in potential fiscal dividends across countries reflect variations in the direct effect of labor supply policies on primary balances as well as the interaction of higher interest rates with different initial levels of debt.

One caveat to these findings is that implementing some of the policies considered here could entail direct budgetary costs, which could lead to somewhat smaller net fiscal dividends than implied by the model simulations. Implementing active labor market policies, for instance, can entail costs (for example, Banerji and others 2017). However, these policies also tend to benefit older workers the most (April 2024 WEO, Online Annex 3.2). Additionally, policies to foster healthier aging are not necessarily fiscally costly. For instance, taxes on alcohol and tobacco can generate fiscal revenue, and preventive health policies can lead to future saving on health care spending (McDaid, Sassi, and Merkur 2015). Because quantifying the overall net fiscal cost from implementing the labor supply policies considered in the chapter is subject to large uncertainty, the model abstracts from these costs.

[14]The sensitivity of global interest rates to labor supply policies is partly related to households' saving response to changes in growth prospects, which is difficult to pin down with precision. Assuming a different calibration for households' willingness to substitute future consumption for present consumption, the effect of progrowth reforms on interest rates would be smaller, and $r - g$ would decline for almost all economies over 2025–50 (Online Annex 2.3).

Figure 2.14. Additional Fiscal Space in Combined Policy Scenario

(Deviation from the baseline scenario, percentage points of GDP)



Source: IMF staff calculations.

Note: The figure shows the fiscal gains under the combined policy scenario due to higher effective labor supply and improved old-age dependency ratio relative to the baseline; see Online Annex 2.3.3 for further details. Because the magnitude of the gains varies over the transition, the figure reports the average gain over 2025–2100. The value for "World" denotes the average for the economies included in the model. Data labels in the figure use International Organization for Standardization (ISO) country codes. LIC = bloc of low-income countries.

Conclusions and Policy Implications

Declining birth rates and increasing life expectancy are leading to a sustained decline in population growth and significant changes in the age structure of economies. As the share of the working-age population starts to decline in more and more countries, and the workforce becomes tilted toward older ages characterized by lower labor force participation and employment rates, demographic forces seem to be casting long shadows over prospects for living standards and public finances.

However, there is a silver lining to the rise of the silver economy. The analysis in this chapter highlights that individuals across a diverse set of economies are aging in better health than previously. Increased longevity has been accompanied by improvements in the physical and cognitive capacities of older individuals across subsequent cohorts—although there are still

sizable disparities across socioeconomic groups and countries. Importantly, this healthier-aging trend has also been associated with higher labor force participation rates, a higher likelihood of being employed, and higher labor earnings for individuals ages 50 and older.

Nevertheless, population aging, together with other forces such as waning catch-up growth in large emerging market economies, is expected to depress global economic growth. Even as ongoing gains from healthy aging are estimated to boost annual global growth by about 0.4 percentage point over 2025–50, the analysis in this chapter indicates that under current policies global output growth would decline on average by about 2 percentage points through the end of the century. With lower growth prospects and historically high levels of public debt, many countries will need significant fiscal efforts to keep debt-to-GDP ratios stable beyond 2030.

A multifaceted policy approach is essential to deal with these challenges. Broad-based improvement in the functional capacity of individuals ages 50 and older over the past few decades shows that aging can be a malleable process (Scott 2023). Policies aimed at improving the human capital of older workers can enhance productivity and narrow the participation gap with prime-age workers. Emphasizing health promotion and prevention policies is warranted, and these policies need to be carefully deployed to address health inequalities. Measures that tackle behavioral risk factors throughout the course of life—such as tobacco smoking, harmful alcohol use, physical inactivity, and unhealthy diets—and other risk factors related to the environment and mental health can decrease the incidence of chronic diseases and health inequalities (Liu and others 2016; Rashbrook 2019; Lee, Park, and Lee 2020; Hacker 2024). Examples include immunization, regular health checks, screenings for chronic diseases, campaigns to prevent substance abuse, taxation (for example, on tobacco and unhealthy food), regulations (for example, those to promote smoke-free environments), and providing access to mental health resources. These measures often span beyond the health care sector and are not necessarily costly. Evidence suggests many are cost-effective and can produce savings by reducing expenditure on health intervention down the road (McDaid, Sassi, and Merkur 2015; OECD 2015). Yet spending on health promotion and prevention accounts for only 1–6 percent of total health expenditure in member countries of the Organisation for Economic Co-operation and Development and tends to be cut disproportionately during downturns (Gmeinder, Morgan, and Mueller 2017; Hacker 2024).

A comprehensive approach, combining pension reforms, training, and workplace adaptations, should complement health-oriented interventions to increase effective retirement ages in line with improvements in life expectancy. Besides changes to statutory retirement ages, reducing early retirement benefits, introducing incentives to postpone retirement, and allowing for phased retirement can induce a rise in effective retirement age. Pension system reforms need to balance sustainability with adequate protection to mitigate old-age poverty and inequality (Amaglobeli and others 2019). More broadly, the malleability of aging and the diversity in health status and experience among older workers suggest that age-based provisions in policies are likely to be inefficient and should be reconsidered (see discussion in Scott 2023). Also, lifelong upskilling and reskilling programs are crucial to ensure individuals remain employable as they age. This becomes even more important at the cusp of a potential AI revolution, in which skilled older workers will be well positioned to reap the benefits given the complementarity of their skills with AI, whereas unskilled workers may struggle to keep their jobs or manage successful job transitions (Box 2.3). Enhancing adaptability through flexible work arrangements and workplace adjustments that improve the age-friendliness of jobs can also support longer working lives. Combating biases and discrimination against older individuals is also important, as the former can limit access to reskilling opportunities and lead to premature exits from the labor force (Gaillard and Desmette 2010; Lamont, Swift, and Abrams 2015; Officer and others 2020; Alcover and others 2021).

Policies aimed at reducing labor force participation gaps, particularly by fostering higher female labor force participation, can also provide substantial growth dividends to counter demographic headwinds. To avert an adverse impact on fertility, policies should aim for improving the work-life balance for women, including improved parental leave systems, expanding on affordable childcare options, and promoting flexible work arrangements (Gu and others 2024).

Furthermore, enhanced global integration can play a crucial role in supporting growth amid aging trends occurring at different paces and timings across countries. In particular, policies that enhance access to international financial markets—including credit

and capital market reforms, as well as those strengthening governance and institutions (Budina and others 2023)—are key for enabling low-income countries to reap the benefits of still-positive demographic dividends (Box 2.1). Gains from deeper financial integration can also offset the labor losses from migration outflows toward advanced economies, in which the additional workers can boost labor supply and output amidst an aging and dwindling workforce (see Chapter 3).

The simulations in this chapter suggest that a combination of policies for boosting labor supply could attenuate the slowdown in global growth over 2025–50 resulting from demographic headwinds by almost three-fourths. Although these progrowth policies could also contribute to higher global interest rates, they would nonetheless provide substantial fiscal dividends. Many countries would be able to rebuild fiscal buffers and create additional fiscal space to finance critical spending. Some economies, however, would still require additional fiscal efforts given the current precarious state of their public finances. In those cases, an early, gradual, and sustained effort is crucial to ensuring intergenerational fairness (Box 2.2) and maintaining economic stability amid ongoing demographic transitions.

Although policies to boost labor supply and facilitate cross-country factor mobility are key, they are not a substitute for efforts to reignite technological innovation and productivity growth—the ultimate driver of improvements in living standards. Structural reforms to promote market competition, financial accessibility, and labor market flexibility can boost productivity growth by fostering innovation, facilitating a more efficient allocation of capital and labor across firms (see Budina and others 2023; April 2024 WEO, Chapter 3). They can also help countries benefit from technological advances such as AI-related technologies, which are complementary to labor in occupations more typical of older workers (Box 2.3) and can provide the latter with skills and methods for coping with functional decline due to aging (Abril-Jimenez and others 2022).

Technological progress and innovation can be important not only for countering the adverse effects of population aging on output growth, but also for enhancing the malleability of aging itself. Promoting research and development in the scientific understanding of biological aging has the potential to further extend healthy longevity in the decades ahead (Cox 2022). Furthermore, AI-based solutions in health care hold potential for transformation through scaling up of preventive health practices (Chan and others 2024), for instance by automating routine tasks such as screening and diagnostics. They can also bring clinical expertise to underserved and remote areas, helping to reduce the heterogeneity in physical and cognitive capabilities of older individuals documented in this chapter. For example, the Aravind Eye Care System in India has deployed AI-based tools to screen millions of retinal images for diabetic retinopathy, effectively addressing the country's shortage of ophthalmologists and preventing vision loss among patients (Yu, Beam, and Kohane 2018).

Ultimately, the rise of the silver economy brings both challenges and opportunities, making a comprehensive and proactive policy approach essential for navigating the challenges of population aging while harnessing the benefits of longer, healthier lives.

Box 2.1. Enhancing Global Financial Integration to Support Growth in Low-Income Countries

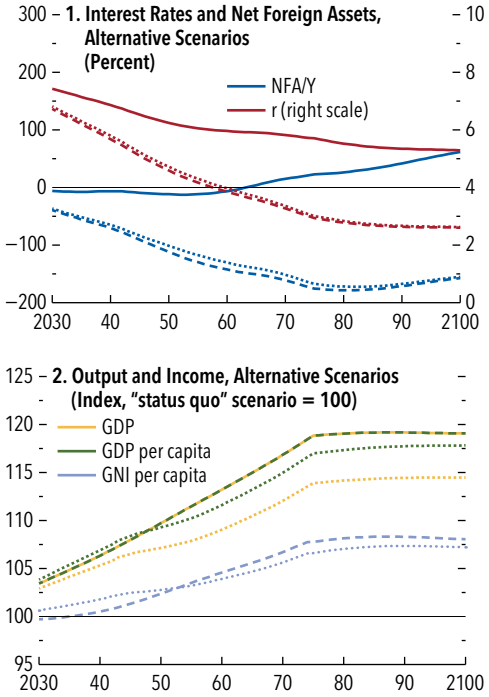
Could capital flows from advanced to capital-scarce, low-income countries help the latter grow faster and capitalize on their demographic tailwinds? Would gains from enhanced financial integration offset losses from potentially larger migration outflows toward older, rich countries? To answer these questions, this box uses the model presented in the chapter and focuses on alternative scenarios for cross-border capital and labor flows in the low-income country group (*LIC bloc*).

Firms in emerging market and developing economies face generally higher costs of capital than firms in advanced economies when accessing global financial markets. This wedge or premium may reflect credit market imperfections, expropriation risks, bureaucratic inefficiencies, corruption, or any combination of these factors (Gourinchas and Jeanne 2013). To assess potential gains from financial integration, a first, *status quo* scenario assumes that after the *LIC bloc* starts from a zero net foreign asset position, capital can flow from and toward it, but the initial wedge between domestic and global interest rates, which is set to 300 basis points in line with estimates in Gerding, Henriksen, and Simonovska (2025), remains unchanged throughout the simulation period. A second, *enhanced financial integration* scenario assumes instead that *LIC bloc* countries undertake credit and capital reforms, improve their governance frameworks, and strengthen their institutions such that the interest rate wedge gradually declines until disappearing by 2070—assumptions similar to those for the baseline projections in the chapter.

In the *status quo* scenario, the *LIC bloc* does import capital from the rest of the world, but flows are limited. Net foreign liabilities peak at about 13 percent of GDP (Figure 2.1.1, panel 1). From about 2050 onward, capital flows reverse as demographic shifts in the *LIC bloc* push desired savings upward. In the *enhanced financial integration* scenario, demand for investment increases as the interest rate that domestic agents face falls at a faster pace, leading to larger capital inflows and net foreign liabilities reaching about 180 percent of GDP by 2070–80. After that, as aging accelerates in low-income countries, their net foreign asset positions stabilize and then start to gradually reverse toward the end of the century. The capital stock and output are significantly higher than in the *status quo* scenario, with the gap widening until the 2070s. Because the population dynamics are the same across the two scenarios, both GDP and GDP per capita are about 19 percentage points higher than in the *status quo* scenario in the long term (Figure 2.1.1, panel 2). As a result of the fact that the dividends from part of the additional investment financed with capital inflows accrue to nonresidents, the long-run increase in gross national income per capita is smaller than that for GDP, but it is still sizable at about 7 percentage points.

Given the asynchronous pace of aging across countries, labor would tend to gradually migrate from

Figure 2.1.1. Low-Income Countries: Impact from Enhanced Financial Integration and Migration Outflows



Source: IMF staff calculations.

Note: In panel 1, solid lines denote "status quo" scenario. In both panels, dashed lines denote "enhanced financial integration" scenario and dotted lines denote "enhanced financial integration plus migration" scenario. GNI = gross national income; NFA/Y = net-foreign-assets-to-GDP ratio; r = interest rate.

The authors of this box are Bertrand Gruss, Eric Huang, and Galip Kemal Ozhan.

Box 2.1 *(continued)*

young, labor-abundant economies to older economies facing labor scarcity, attracted by higher wages and better employment prospects. A key question is whether the benefits from financial integration can offset headwinds low-income countries may face from potentially larger migration outflows. A third, e*nhanced financial integration plus migration* scenario adds to the previous one by assuming also that the annual flow of young migrants from the *LIC bloc* into advanced economies gradually increases up to 2040 such that, from then onward, the annual outflows of young migrants are twice as large as recent historical flows and remain at that higher level thereafter.[1] As the labor force in the *LIC bloc* shrinks over time relative to what occurs in the previous scenario, capital accumulation slows down because of lower investment demand, and, consequently, capital inflows are somewhat smaller. In the long term, with a smaller workforce and less capital, aggregate GDP in the *LIC bloc* would be about 5 percentage points lower relative to that in the *enhanced financial integration* scenario, but still 14.5 percentage points higher than in the *status quo* scenario.

Since the additional migration flows are assumed to be among young individuals, who have lower labor force participation rates and productivity than prime-age workers, GDP per capita in the *LIC bloc* in the *enhanced financial integration plus migration* scenario initially increases by more than it does without additional migration flows. Over time, however, GDP per capita becomes lower than in the *enhanced financial integration* scenario because the workforce is smaller. In the long term, GDP per capita in the *LIC bloc* is about 1.2 percentage points lower than in the *enhanced financial integration* scenario but almost 18 percent higher than in the *status quo* scenario.

Overall, the results illustrate the importance of financial sector reforms and efforts to strengthen governance and institutions in enabling low-income countries to reap their demographic dividends before the window for doing so closes and to offset potential output losses from migration outflows to older economies.

[1]The model scenario assumes that the additional migrants, beyond what is assumed in United Nations World Population Prospects projections, are concentrated among individuals ages 20–24. This is a simplifying assumption that allows to abstract from the net wealth of the additional migrants as the 20-year-old cohort in the model is assumed to have zero net wealth.

Box 2.2. Intergenerational Considerations in Pension Reforms

Because the share of individuals ages 65 and older is projected to increase steadily worldwide, relatively fewer workers will be supporting more retirees, stressing pay-as-you-go pension plans and public finances. Policymakers can employ different levers to adjust pension plans so that they remain solvent, such as increasing statutory retirement ages, increasing contributions from workers or firms, and reducing benefits to pensioners. Policymakers often opt to postpone unavoidable reforms, because the financial pressures from aging accrue slowly. The choice of instruments and their timing, however, can entail uneven reform costs across cohorts and larger costs overall.

This box uses the Overlapping Generations and Retirement model (Baksa and Munkacsi 2016) to simulate the impact of pension reforms in a typical advanced economy. This is a dynamic general equilibrium model with demographics, overlapping generations, unemployment, and a rich fiscal sector.[1] Population changes over time, with the changes driven by shocks to fertility and mortality. The model tracks the macroeconomic and fiscal implications of aging and fiscal policy separately for two generations: the young, who work (or are unemployed) and pay consumption and labor income taxes (or receive unemployment benefits), and the old, who are retired and receive pension benefits. Population aging causes the labor force to shrink (in relative or absolute terms), which, in turn, drags down the growth rates of consumption, investment, and output.[2] Aggregate consumption and savings are also affected by the fact that workers and retirees have different consumption and saving patterns. The prospect of living longer can also trigger precautionary saving. Shrinking labor supply can contribute to higher capital-to-labor ratios, reducing the need for further investment, which puts downward pressure on interest rates. Meanwhile, aging carries several fiscal challenges: Pension (and health) spending can climb when the number of retirees rises, whereas a shrinking labor force might imply lower consumption and labor income tax revenues. As a result, aging can push the public-debt-to-GDP ratio upward.

The analysis considers three instruments for reforming pension plans. In regard to direct effects, higher social security contributions affect the disposable income of young workers, a reduction in the wage replacement rate of pensions means lower benefits for pensioners, and raising the statutory retirement age implies a reduction in the number of retirees relative to the number of workers. Policy changes employing these instruments could also trigger indirect effects through behavioral responses. The analysis considers the impact of each reform separately and when implemented jointly as a package, as well as with immediate implementation versus that with a 10-year delay. Each reform scenario is calibrated such that the aging-induced increase in the public-debt-to-GDP ratio is reversed in 75 years (Table 2.2.1).

Simulations based on the model indicate that aging would depress per capita consumption for both the young and the old (with a larger decline in the case of the older populations) in the absence of reforms (red bars in Figure 2.2.1), because an increasing level of public debt would need to be serviced. However, the simulations also indicate that consumption losses can be attenuated and shared more equitably across generations if a reform that uses a mix of instruments is implemented, and if reforms start earlier rather than later:

- If reforms rely on a single instrument, sizable measures are needed. For instance, if only the retirement age is adjusted, an increase of six years would

The authors of this box are Daniel Baksa and Zsuzsa Munkacsi.

[1]Stylized data on demographics, labor markets, GDP and its components, and the fiscal sector are considered to capture the long-term characteristics of the artificial economy.

[2]The precise impact is determined by which factor or factors dominate (lower fertility, higher life expectancy, migration, other factors, or a combination of these), as outlined in Baksa, Munkacsi, and Nerlich (2020).

Table 2.2.1. Size of Reforms Needed to Stabilize Age-Induced Increase in Public Debt

	Retirement Age (Years)		Replacement Rate (%)		Contribution Rate (%)	
	Immediate	Delayed	Immediate	Delayed	Immediate	Delayed
Single-Instrument Reform	+6	+8	–25	–35	+18	+34
Mix	+2	+2.7	–8.3	–11.7	+6	+11.3

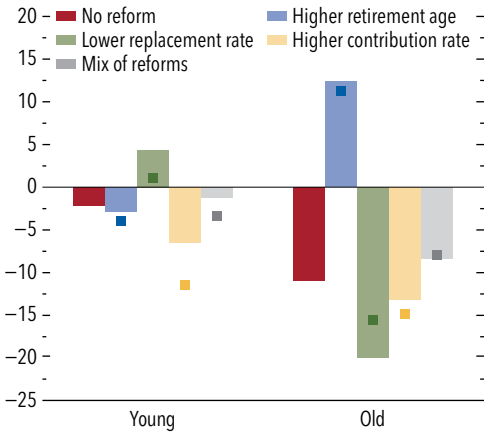
Source: IMF staff calculations.

Note: The reform scenarios are calibrated to reverse the aging-induced increase in the public-debt-to-GDP ratio over 75 years. The reforms are assumed either to be implemented immediately or to be delayed by 10 years.

Box 2.2 *(continued)*

Figure 2.2.1. Average Change in Consumption, 2025–65

(Deviation from 2025, percentage points)



Source: IMF staff calculations.

Note: Solid bars denote average consumption losses or gains over a period of 40 years from a reform implemented immediately. Markers denote consumption losses or gains if instead the reform is delayed by 10 years. The red bars show the impact of aging only, and the rest of the bars show the impact of aging and the respective reforms.

be needed if the reform is implemented immediately (Table 2.2.1). However, under a combined reform scenario, the increase in retirement age could be less, at two years.

- The consumption losses from reforms that rely on a single instrument are significantly larger than those when a mix of instruments is used, at least for one of the generations (Figure 2.2.1). Combining the three measures helps ensure the burden is shared across the young and old, potentially contributing to the acceptability and feasibility of reforms (see also the October 2024 *World Economic Outlook*, Chapter 3, and the April 2025 *Fiscal Monitor*, Chapter 2).
- The size of required fiscal measures is more profound and aggregate consumption losses are larger when the reforms are postponed for 10 years compared with those in a scenario in which they are implemented immediately. For instance, containing the rise in public debt induced by aging requires a 6-year increase in the retirement age if the reform is carried out immediately, but an 8-year increase is needed if the reform is postponed by 10 years. Moreover, the consumption losses from postponing reforms usually fall disproportionately on the young compared with the old.

In summary, policymakers should act sooner rather than later, using a combination of tools to ensure a fairer distribution of the burden across generations and by doing so enhance the feasibility and acceptability of pension reforms. Although the exercise here is calibrated for a typical advanced economy, with a population that has already aged significantly, the lessons are even more pertinent for emerging market economies and low-income developing countries. As of today, their old-age dependency ratios are lower than those of advanced economies. However, they will experience a faster pace of population aging than did the latter, which means they will have less time to react.

Box 2.3. The Impact of AI for Older Workers

Artificial intelligence (AI) is rapidly reshaping labor markets, transforming the way individuals work, communicate, and solve complex problems. Although recent advances in AI technology hold great potential to boost productivity by assisting workers and enabling them to focus more on complex and high-value tasks, they also pose risks by rendering certain skills obsolete, thereby increasing the risk of unemployment. Older workers (ages 55 and older) are particularly vulnerable, as historical evidence suggests that they are less likely to adapt to new technologies and transition to new occupations (Autor and Dorn 2009). Without adequate policy interventions, disruptions resulting from the realization of these risks may lead to reduced labor market participation, lower numbers of working hours, transitions to less suitable roles, premature workforce withdrawal, or any combination of these outcomes—further exacerbating labor market pressures in aging economies. However, if older workers are concentrated in occupations expected to expand and experience productivity gains as a result of AI, they may be well positioned to benefit from AI advancements, as long as they are able to use new technologies.

To measure the initial impact of AI on labor markets in a context of aging populations, this box examines both AI exposure and its potential to complement older workers. Occupations can be grouped into three categories: those at high risk of labor substitution (high exposure and low complementarity, or HELC), those likely to experience productivity and wage boosts (high exposure and high complementarity, or HEHC), and those less affected by AI adoption (low exposure).[1] Regardless of demographic shifts, ongoing labor market trends indicate that occupations vulnerable to automation are already losing ground to those involving AI-enhanced roles. For instance, in the United States, vacancies in HELC occupations have expanded at a slower pace in locations with greater AI adoption, whereas HEHC job vacancies have remained stable or even increased slightly in these areas (Pizzinelli and others 2023).

The likely impact of AI on older workers, in a manner similar to that in which it operates on younger cohorts, will depend largely on their levels of education (Figure 2.3.1). Workers with at most a high school diploma are predominantly employed in occupations with low exposure to AI, making them less susceptible to disruption from AI adoption. In contrast, workers with tertiary education are more exposed to AI, with more than 80 percent employed in AI-intensive occupations. However, most of those are concentrated in HEHC occupations, poised for productivity and wage gains.[2] This suggests that, for a given educational level, older workers may benefit more from AI adoption than younger cohorts, as the former are relatively more concentrated in HEHC occupations.

Interestingly, several features of jobs with high AI exposure are aligned with older workers' preferences. Over the past three decades, there has been a general rise in age-friendly jobs—characterized by less-demanding physical activity, lower levels of job hazards, and moderate work paces (Acemoglu, Mühlbach, and Scott 2022). Such features are attractive for older workers and align with the positive gains in their cognitive capacities amid healthy aging documented in this chapter.[3] Indeed, data for the United States suggest that AI-exposed jobs are compatible

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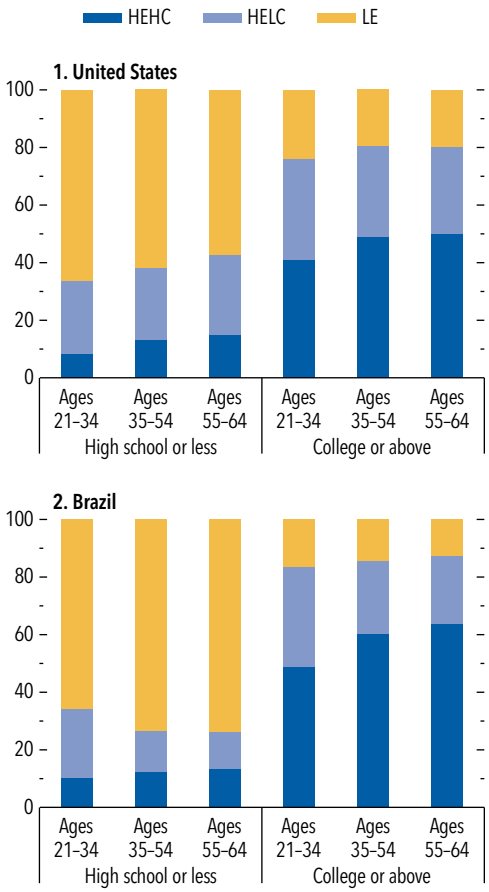
[1]Exposure is measured by the extent to which AI can replicate skills essential for a given occupation (Felten, Raj, and Seamans 2021), whereas the degree of complementarity measures how likely AI is to augment workers in certain occupations (Pizzinelli and others 2023). The complementary measure incorporates broader occupational factors that influence the likelihood of benefiting from AI adoption; see Pizzinelli and others (2023) for details.

[2]This is based on data for Brazil (National Household Sample Survey) and the United States (Current Population Survey). About 65 percent of workers in Brazil and 45 percent in the United States work in HEHC occupations.

[3]Acemoglu, Mühlbach, and Scott (2022) find that this rise in age-friendly jobs has tended to benefit females, college graduates, and older workers (especially females, those with college education, or both), whereas male graduates have benefited the least.

Box 2.3 *(continued)*

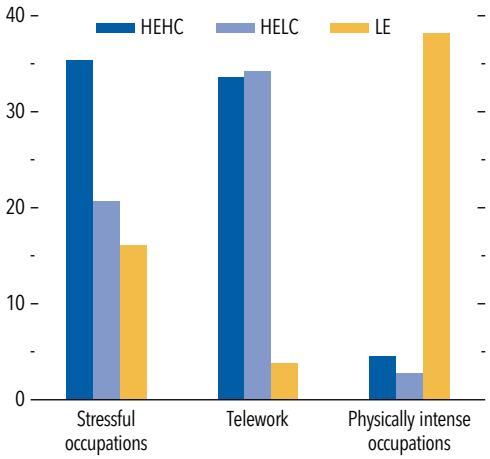
Figure 2.3.1. Employment Shares: AI Exposure and Complementarity
(Percent)



Sources: Brazil National Household Sample Survey (Pesquisa Nacional por Amostra de Domicilios) microdata; United States Current Population Survey; and IMF staff calculations.

Note: HEHC = high exposure, high complementarity; HELC = high exposure, low complementarity; LE = low exposure.

Figure 2.3.2. AI Exposure and Age-Friendliness, United States, Ages 55 and Older
(Share of occupations, percent)



Sources: United States Current Population Survey microdata; and IMF staff calculations.

Note: The figure shows the share of workers who report their jobs having these characteristics, by occupation group. Data on working from home rely on survey data in 2023 and 2024; other variables consider the period 2010–19. HEHC = high exposure, high complementarity; HELC = high exposure, low complementarity; LE = low exposure.

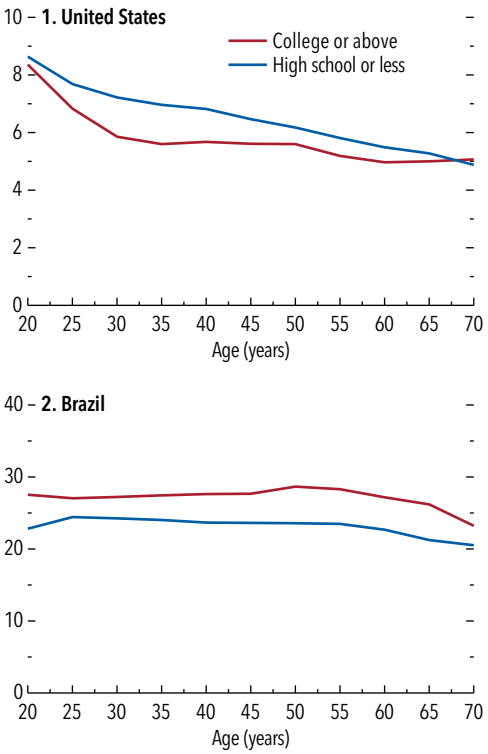
with working from home, and involve less physical effort, relative to low-exposure jobs (Figure 2.3.2), which enhances their appeal to older workers, especially given that these AI-exposed jobs also generally offer higher earnings. However, these same occupations also involve higher levels of responsibility, such as critical decision making, which can increase

Box 2.3 *(continued)*

stress and reduce the occupations' desirability among older workers. Despite these challenges, older workers are already more represented in occupations poised to benefit from AI than in those at risk from it. These findings suggest that improving job conditions—particularly through stress management, remote work options, and flexibility—could help retain older workers in AI-enhanced roles.

Targeted policies remain necessary for older workers in HELC occupations. Across different education levels, 20–30 percent of older workers are employed in HELC jobs vulnerable to AI-driven disruptions. This group is particularly at risk, as historical data suggest older workers are less likely to switch jobs or occupations (Figure 2.3.3). As labor demand for HELC occupations declines, the ability of these workers to relocate to growing sectors of the economy may be limited, especially during the late stages of their careers. This highlights the need for targeted policies that facilitate job transitions. Active labor market programs can help older workers adapt to new technologies, and job transition support can mitigate the risk of early retirement from job displacement.

Figure 2.3.3. Workers' Probability of Transition across Occupations, by Age
(Percent)



Sources: Brazil National Household Sample Survey (Pesquisa Nacional por Amostra de Domicilios) microdata; United States Current Population Survey; and IMF staff calculations.

Note: The figure shows transitions across occupations measured using the four-digit US Census Bureau 2010 classification at a monthly frequency for the United States and the four-digit International Standard Classification of Occupations (ISCO) 2008 classification at a quarterly frequency for Brazil.

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