

Look Forward

Funding the Future

Volume 4 | January 2024



S&P Global

W

elcome to *Look Forward*. In this issue, our teams take you inside some of the biggest trends shaping the business world and global economy from now until the end of the decade.



For my entire career, I've been working with data — for energy markets, to manage risk and to make strategic investments. The data and analysis in this journal point to a future in which leaders face a more challenging and costly operating environment. At a time when the need to finance economic growth, climate resilience, the energy transition and aging populations is as great as ever, decision-makers must also confront higher debt levels, higher interest rates and higher degrees of fragmentation within and among nations.

Despite the uneven state of global affairs, I remain optimistic about the years ahead. I still believe in the value of public-private partnerships and in the power of technology and innovation to execute and finance the transition to a sustainable future. Finding solutions won't be straightforward, but leaders have the data and insights to inform their thinking and to propel organizations to success.

In closing, I want to thank *Look Forward*'s researchers, analysts, writers and editors for the fabulous work they do, and I want to thank you, our readers, for your interest in the insights our teams have uncovered about the themes transforming our world.

A handwritten signature in black ink that reads "Doug Peterson".

Douglas L. Peterson
President and CEO, S&P Global

Funding the Future

As we look ahead to 2030, the world faces unprecedented, accelerated and multifaceted transitions. With global debt potentially reaching \$336 trillion, i.e., over 238% of the world's baseline GDP, how can we afford to confront the global challenges of climate, the energy transition and an aging population, and who has the capacity to pay?

Significant investments are necessary to curb global emissions and limit temperature increases to well below 2 degrees C above the preindustrial age. A radical transformation is needed to reduce the economy's carbon footprint through decarbonization of industrial processes, transition to renewable energy, electrification of transportation and changes to consumption habits. The cost of inaction could also be substantial. A slow transition could put a significant part of the global population and up to 12% of GDP in certain parts of the world at risk by 2050. Markets do not fully reflect the cost of this transition in asset prices.

The economy and workforce will be shaped by an aging population across developed and developing economies, increasing fiscal pressure on governments to support rising pension and healthcare costs. The digital revolution, further accelerated by the arrival of generative AI, could offer a silver lining by increasing productivity, and new technologies could enable more efficient use of the world's precious resources.

The investments necessary to support these transitions could add another 10% to global debt at a time when structurally higher interest rates will make the bill bigger, and unaffordable in certain parts of the world. Governments will bear the biggest share of the debt burden, and policymakers will have to make trade-offs in balancing the needs of current and future generations. Corporates and investors must start accounting for the costs of these necessary transformations.

Given the global nature of climate challenges and their disproportionate impact on developing and frontier countries, more global collaboration is vital. Innovative solutions to combine public and private capital will be necessary to fund the required infrastructure investments in less creditworthy economies. The increased geopolitical fragmentation and the rising divide between the Global North and the Global South will require a reinvention of the global order following the end of the Washington Consensus.

The COVID-19 pandemic has shown how extraordinary circumstances can accelerate progress in technology development, international collaboration and changes in working habits. Despite all its challenges, this transition could create new opportunities to drive technological innovation across all sectors of the economy, supporting the construction of new, clean infrastructure and a more efficient and sustainable use of the world's natural capital, defining the future of work, fostering innovative financing models to support private and public investments, and shaping new forms of international collaboration.

This edition of S&P Global's *Look Forward Journal* delves into solutions to accelerate global progress while discussing the issues of debt, energy transition and global fragmentation. The next edition, to be published in early 2024, will be dedicated to supply chains. We strive to look beyond the immediate and separate the signals from the noise that is pervasive in today's global discourse.

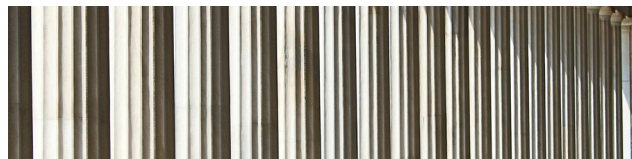
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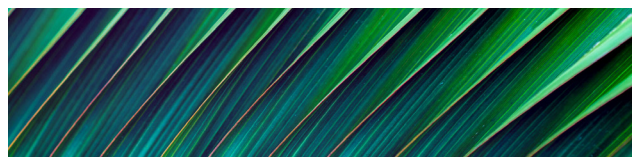
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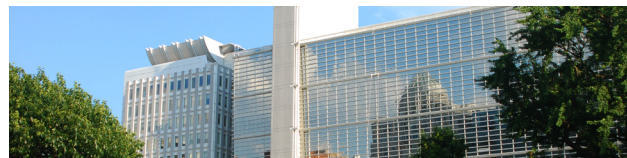
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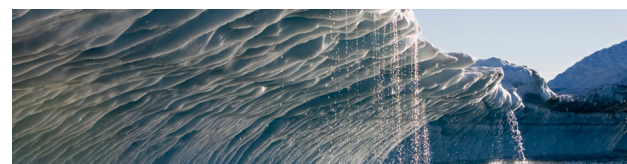
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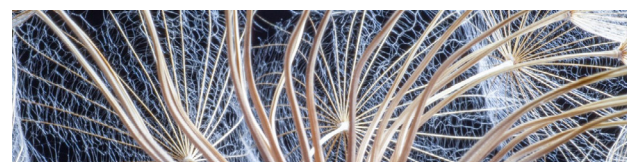
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Global debt 2030: Can the world afford a multifaceted transition?

With global leverage reaching new peaks and a higher cost of debt, can governments, corporates and households finance climate, digital and demographic transition?

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Highlights

Global leverage trending up and structurally higher interest rates will increase the financing bill for governments, corporates and households.

Additional investments will be necessary to address climate-related risks, the energy transition, digital transformation and an aging population, with developing economies disproportionately affected.

International collaboration and a combination of public and private capital will be required to make the transition affordable globally, although increasing geopolitical fragmentation will make this more difficult.

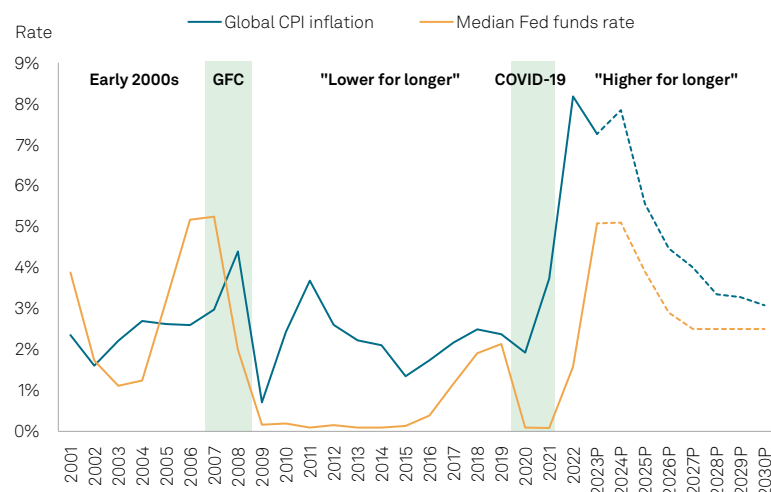
High interest rates are increasing the burden of servicing global debt. We estimate that global debt-to-GDP leverage will rise by a moderate 3% to 238% by 2030, reaching a high of \$336 trillion under a baseline scenario. However, factoring in a possible \$37 trillion in additional transition investments due to climate mitigation and adaptation, digital transformation, and aging, we project leverage to rise 9% if financed exclusively through debt. The combination of higher interest rates and transition costs will be particularly onerous for developing economies given their more limited financial capacity.

Higher real equilibrium rates

With the end of the Washington Consensus leading to more constrained trade and higher costs of doing business, and with the structural rise in investment needed to combat climate change, price pressures are likely to become structurally higher (see “[End of the Washington Consensus](#)” to learn more). Most major central banks are committed to achieving their inflation targets (e.g., 2% for the US Federal Reserve) over the medium term. We assume they will do what is needed to achieve those objectives, which means central banks are likely to keep policy rates structurally higher to achieve their inflation targets. Put another way, the world’s real equilibrium interest rate (r^* (r-star)) has risen and is likely to stay higher through 2030 than in the post-global financial crisis decade. The chart below shows global consumer price index inflation and US Federal Reserve funds rates for 2001–2022 and projected 2023–2030.

Interest rates to be kept high to control inflation

Global CPI inflation and US Fed funds rates, 2001–2030 (%)



Data compiled Dec. 1, 2023.

CPI = consumer price index; GFC = global financial crisis; P = projected.

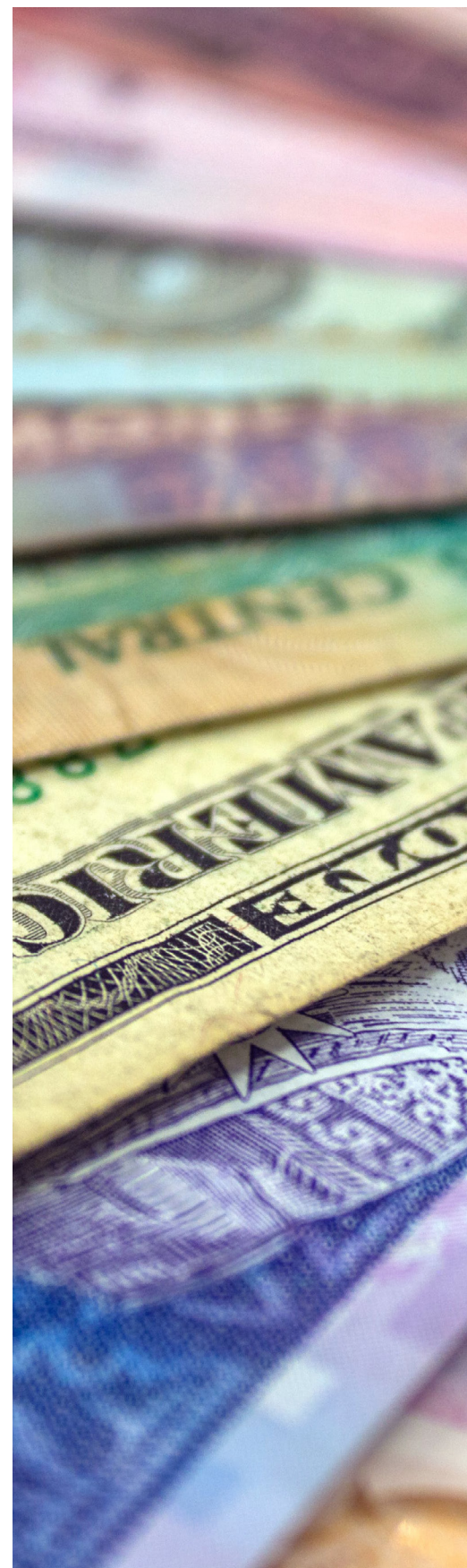
Source of CPI data: S&P Global Market Intelligence. Source of historical Fed funds rate: Federal Reserve Bank of St. Louis (FRED), retrieved Oct. 24, 2023. Source of projected Fed funds rate: Federal Reserve Board, Summary of Economic Projections, Sept. 20, 2023.

Source: S&P Global Ratings.

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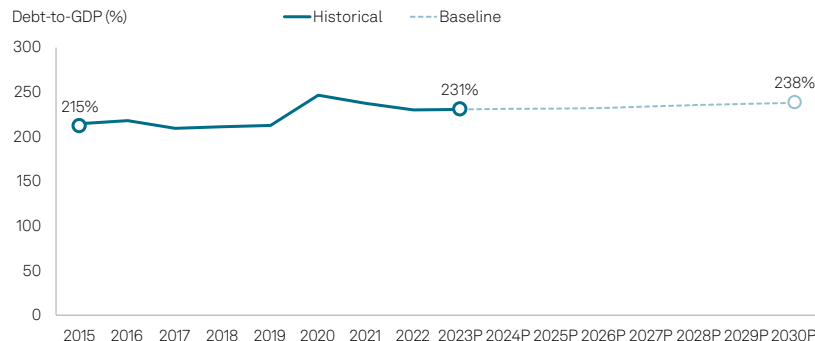
Nominal debt may surge to \$336 trillion

We project debt-to-GDP leverage to grow 3% to 238% from 231% over 2023–2030. This translates to a compound annual growth rate of 0.4% (see next subsection for details). Inflation will drive up both absolute debt and nominal GDP. We anticipate that absolute debt will rise by half to \$336 trillion by 2030, from \$225 trillion in 2023. Removing the effects of inflation, absolute debt would have grown only 10% to \$247 trillion (in 2023 dollars; see chart). (Note: In this paper, global debt comprises the debt of nonfinancial corporate, government and household sectors, excluding the financial sector, to avoid possible double counting.)



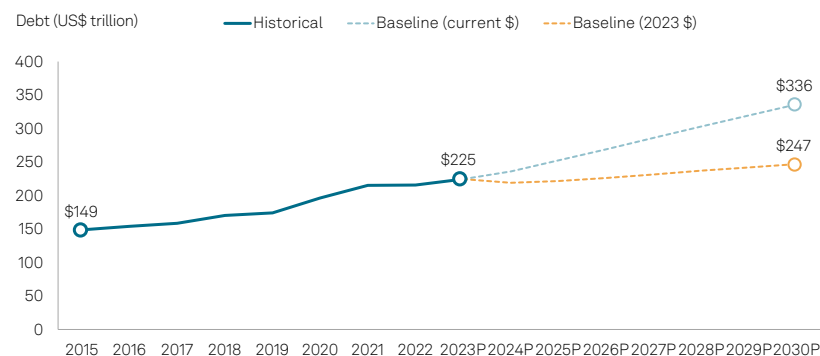
Global debt-to-GDP leverage to rise 3% by 2030 ...

Global debt-to-GDP baseline scenario to 2030 (%)



... although inflation drives absolute debt up by half

Global debt baseline to 2030 (current and 2023 \$)



Data compiled Dec. 1, 2023.

P = projected.

Source: S&P Global Ratings.

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Leverage to increase faster in emerging markets than in mature markets

We expect emerging markets' leverage to grow twice as fast as that of mature markets. This is not surprising given that as emerging economies develop, their degree of financialization tends to increase. Our baseline projection is for the leverage of emerging markets to grow 6% to 211%, with emerging markets (excluding mainland China) up 7% to 133% and mature markets up 3% to 257%. The US and China — the two largest economies, accounting for almost half of global GDP — could see their debt-to-GDP increase to 269% and 295% in 2030, from 254% and 283% in 2023, respectively. Together, these countries could hold 53% of the world's debt in 2030.

We project corporate and government leverage to increase four times faster than household leverage. Our baseline projection is for the debt-

The US and China — the two largest economies, accounting for almost half of global GDP — could see their debt-to-GDP increase to 269% and 295% in 2030, from 254% and 283% in 2023, respectively.

to-GDP leverage of the global corporate sector to grow 4% to 88%, the global government sector to climb 4% to 87% and the global household sector to stay relatively flat at 62% (see charts). We see the household sector as more interest rate sensitive, as the average household has less headroom to increase income over a short period.

We do not expect much incremental corporate borrowing over 2024–2025 because of the impact of high interest rates, subdued M&A activity and more financial risk aversion from corporate managers. From 2026 to 2030, we expect corporate debt-to-GDP to increase from a combination of more moderate borrowing costs and a return to risk-seeking behavior by investors.

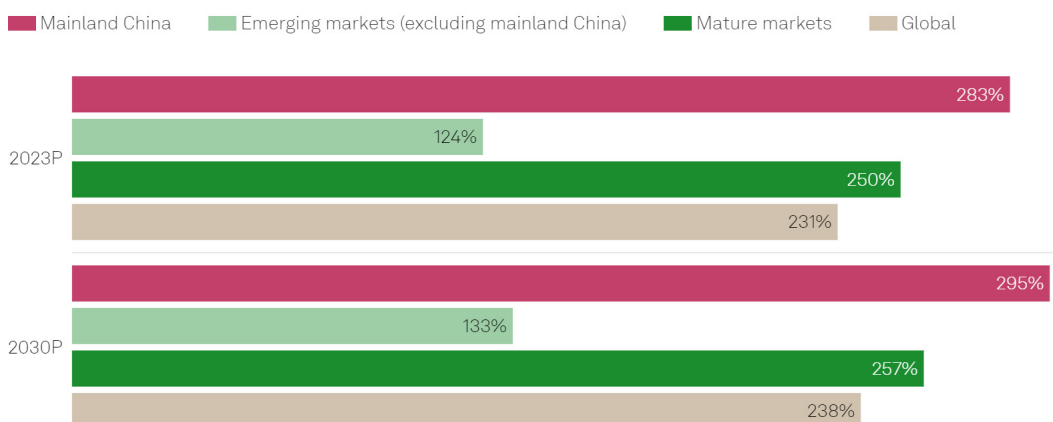
We forecast government debt, mainly driven by fiscal dynamics in mature markets, to remain fairly high, at 87% of GDP by 2030, instead of retreating to lower levels, as would have been expected from the

The need for governments to pick up momentum on fiscal consolidation will become imperative to maintain current levels of creditworthiness.

post-pandemic recovery. This is also assuming the cost of funding will be higher than before the pandemic. If we add to this other factors likely to increase pressure on government balance sheets, such as an aging population, climate mitigation and adaptation, and technological challenges, the need for governments to pick up momentum on fiscal consolidation will become imperative to maintain current levels of creditworthiness. Nonetheless, governments are likely to prioritize their spending as they are already doing so with the energy transition and aging-related issues.

Emerging markets excluding mainland China's leverage to be up 7%, twice the 3% of mature markets

Debt-to-GDP, 2023 and baseline 2030 (%)



Data compiled Dec. 1, 2023.

P = projected.

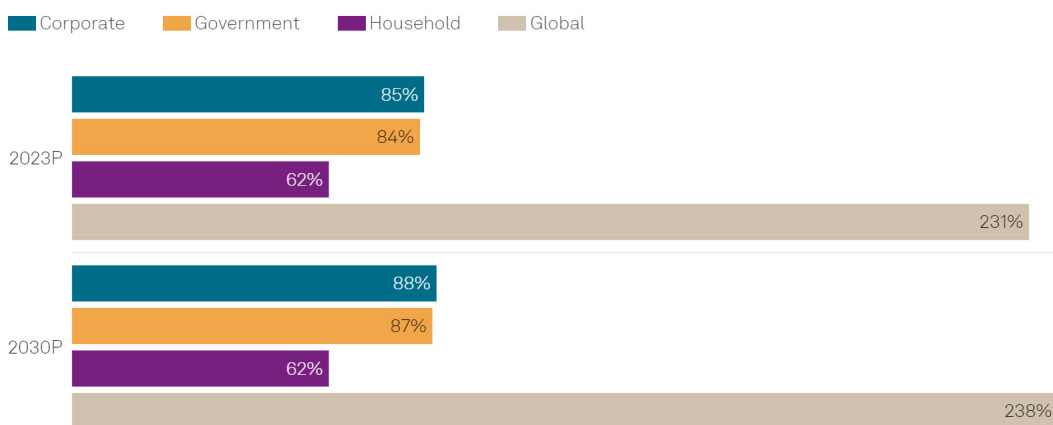
Emerging markets includes Argentina, Brazil, Chile, mainland China, Colombia, Czech Republic, Egypt, Ghana, Hungary, India, Indonesia, Kenya, Malaysia, Mexico, Nigeria, Pakistan, Peru, Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, United Arab Emirates and Vietnam. Mature markets includes Australia, Austria, Belgium, Canada, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, UK and US.

Source: S&P Global Ratings.

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Corporate and government sectors' leverage to rise 4%, while household to increase 1%

Debt-to-GDP, 2023 and baseline 2030 (%)



Data compiled Dec. 1, 2023.

P = projected.

Source: S&P Global Ratings.

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While we expect global household debt leverage to remain relatively flat, there is a diverging trend between emerging and mature markets. We project emerging markets' household leverage to reach 51% in 2030, from 46% in 2023, driven by a rise in per capita income and population wealth, financial development and easier access to credit, and above-average GDP growth increasingly supported by greater consumption. On the other hand, we expect mature markets' household sector leverage to reduce by a few percentage points to 70% over the same period.

High climate, digital and aging transition costs

\$37 trillion needed to finance transition over 2024–2030

The cost of climate inaction is substantial. Lower- and lower-middle-income countries face up to 12% of GDP being at risk of physical hazard losses by 2050 under a slow transition scenario and absent adaptation (see [“Investment in climate adaptation needs have high returns on growth”](#) to learn more). Meanwhile, the challenge of energy security, affordability and sustainability looks very different in developing economies than in Europe and the US, where per capita incomes are as much as 40 times higher (see [“The multidimensional path to net-zero”](#)). Concurrently, IT advances are continuing apace, e.g., generative AI (see [“Can generative AI create a productivity boom?”](#)), requiring governments and corporates to make further investment. On the societal front, many countries are facing an increasingly aging population, which could stymie further economic growth. There is a cost in caring for such aging populations (see [“The challenges of aging: Fast and slow”](#)).

Besides the baseline scenario described above, we have developed a supplemental “cost of transition” scenario that assumes additional debt (over the baseline) is raised to fund climate mitigation and adaptation, digital transformation and an aging population. We have not compared results with other development pathways that countries might take, which could be more costly than this transition scenario (e.g., failure to act on climate change).

Climate financing takes up the largest share of debt for transition. We estimate that a cumulative \$37 trillion of debt — \$25 trillion for climate, \$7 trillion for digital transformation and \$5 trillion for aging — may have to be raised between 2024 and 2030 (see chart). In arriving at these transition sums, we have used a variety of proprietary and external sources. For climate, we refer to the Intergovernmental Panel on Climate Change’s “Sixth Assessment Report” and the UN Environment Programme’s “Adaptation Gap Report 2023.” For digital, we refer to the Organisation for Economic Co-operation and Development’s “A Roadmap Toward A Common Framework For Measuring The Digital Economy.” For aging, we drew on S&P Global Ratings’ [“Global Aging 2023”](#) report. Our measure of climate mitigation costs includes those for the energy transition, and digital transformation costs are gross fixed capital investment in digital technology to transform nondigital processes and services into digital ones.



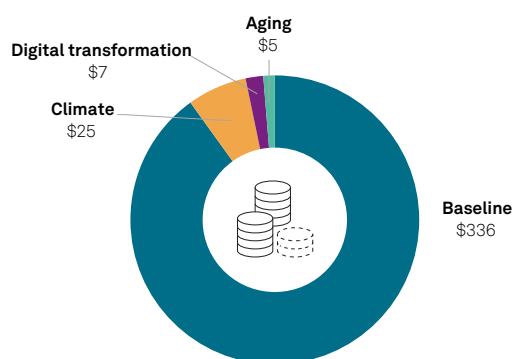
We acknowledge that there is always a high degree of uncertainty in such estimates and variability in ranges of estimates for this financing gap. For example, we note that more recent estimates around climate scenarios suggest higher financing needs or wider gaps. Also, other sources such as taxes, including a carbon tax, and equity financing could contribute to financing gaps. Nonetheless, the proposed transition scenario represents in our view a reasonable midrange estimate to support our discussion.

Cost of transition could push leverage up another 7%. In our scenario, absolute debt could grow to \$373 trillion between 2023 and 2030, 11% more than the baseline \$336 trillion. This translates to

the global debt-to-GDP ratio rising to 254%, 7% more than the baseline 238% (see chart). Because the weight of physical risk falls disproportionately on low- and low-middle-income countries (see [“Investment in climate adaptation needs have high returns on growth”](#) for more on climate adaptation costs), we see the absolute debt and, consequently, the debt-to-GDP leverage rising faster for emerging markets than for mature markets (see charts below). The lower-income cohort of our emerging markets sample (classified as lower-middle-income economies by the World Bank) could fare even worse; they may see absolute debt increase 19% and debt-to-GDP jump 14% in the transition scenario compared with the baseline.

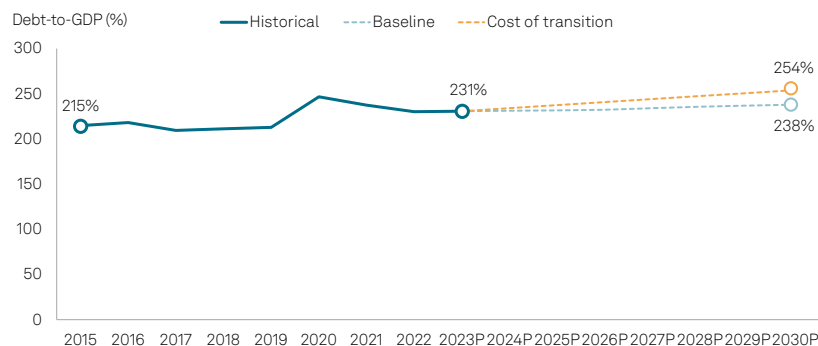
Additional debt needed for transition pushes absolute debt up 10% from baseline 2030 ...

Global debt, transition scenario, 2030 (US\$ trillion)



... which translates to leverage rising a further 7% to 254%

Global debt-to-GDP scenarios to 2030



Data compiled Dec. 1, 2023.

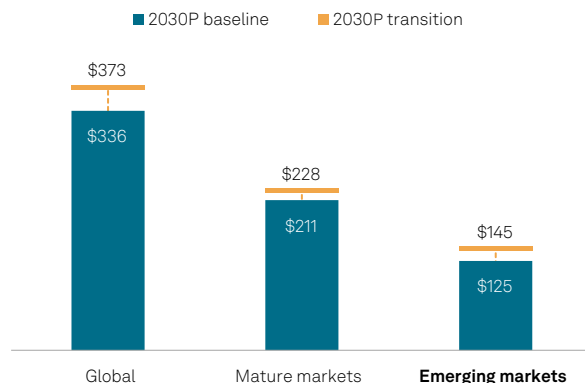
P = projected.

Sources: S&P Global Ratings; Institute of International Finance.

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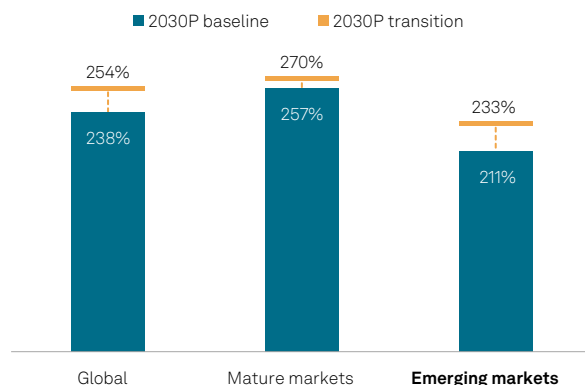
Transition scenario: Emerging markets' debt growth of 16% will be double that of mature markets ...

Global debt, transition scenario, 2030 (US\$ trillion)



... which translates to leverage for emerging markets rising 10%, twice as fast as mature markets

Global debt-to-GDP scenarios to 2030



Data compiled Dec. 1, 2023.

P = projected.

Emerging markets includes Argentina, Brazil, Chile, mainland China, Colombia, Czech Republic, Egypt, Ghana, Hungary, India, Indonesia, Kenya, Malaysia, Mexico, Nigeria, Pakistan, Peru, Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, United Arab Emirates and Vietnam. Mature markets includes Australia, Austria, Belgium, Canada, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, UK and US.

Sources: S&P Global Ratings; Institute of International Finance.

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Higher debt servicing costs

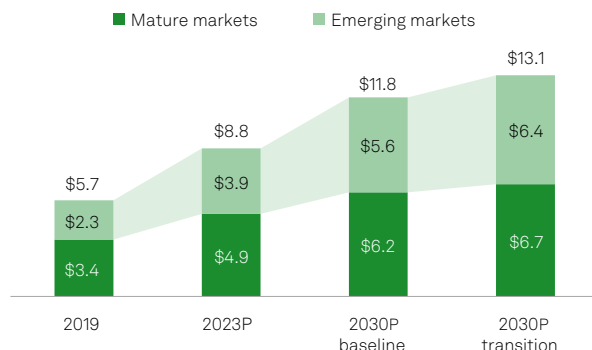
Interest expense will be higher than pre-COVID-19

We estimate that global borrowers are paying annual interest expenses of \$9 trillion, 50% higher than 2019's \$6 trillion (see chart). In our baseline, this rises to \$12 trillion by 2030 given higher nominal debt. Our cost of transition scenario shows the amount climbing 8% against the baseline to \$13 trillion. We estimated interest to revenues for corporates from the financial statement data of 50,000 entities, sourced from S&P Global Market Intelligence's Capital IQ database; for governments from S&P Global Ratings' [Sovereign Risk Indicators](#), published Oct. 9, 2023; and for households based on mortgage rates from national sources and disposable income data from S&P Global Market Intelligence's EconoSim database.



Interest expense is 50% higher than pre-COVID-19

Interest expense, 2019, 2023 and 2030 (US\$ trillion)



Data compiled Dec. 1, 2023.

P = projected.

Emerging markets includes Argentina, Brazil, Chile, mainland China, Colombia, Czech Republic, Egypt, Ghana, Hungary, India, Indonesia, Kenya, Malaysia, Mexico, Nigeria, Pakistan, Peru, Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, United Arab Emirates and Vietnam. Mature markets includes Australia, Austria, Belgium, Canada, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, UK and US.

Source: S&P Global Ratings.

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Governments to continue facing higher, albeit uneven, interest expense

Governments are likely to take the biggest hit.

Despite an expected easing in interest rates, the global interest expense-to-revenue ratio is forecast to be 17% higher in 2030 than in pre-COVID 2019. The household sector is projected to experience the least change in its interest expense-to-revenue ratio, partly due to an assumed 1% increase in leverage ratios over the 2023–2030 period. The corporate sector is in the middle. We expect governments to bear most costs due to the climate transition, digital transformation and aging, which leads to worse ratios in our cost of transition scenario.

example, we expect potential GDP losses from physical risks by 2050 (under a slow transition scenario and absent adaptation) to be more than four times greater for less developed countries than for their wealthier peers. Likewise, the increase in the old-age dependency ratio and age-related expenditure is far steeper for developing economies than for advanced economies, implying a greater scale of policy adjustment is required to offset rising aging pressures, although from a lower starting point. Emerging markets (excluding mainland China) governments could see their interest expense-to-revenue ratio rise by nearly half to 20.4% in the transition scenario in 2030, compared with 14.4% in 2019.

We estimate transition needs (particularly for climate adaptation and aging) will be more pressing for emerging markets.

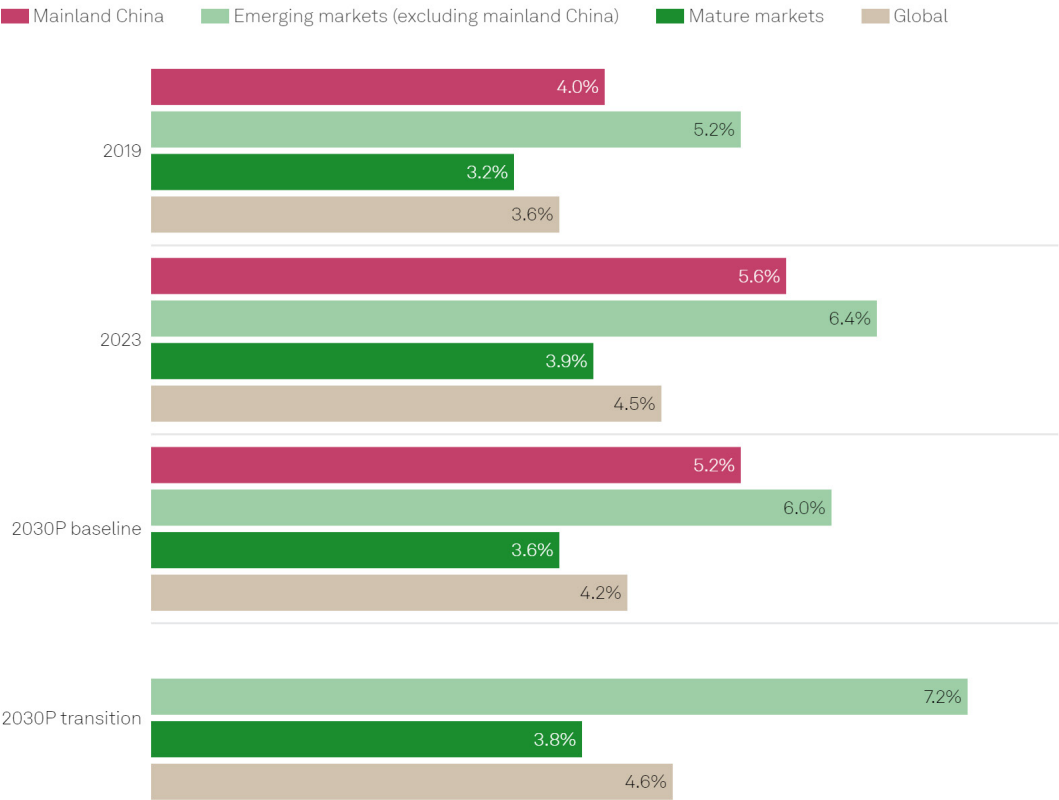
Emerging markets will bear a disproportionate cost of transition. We estimate transition needs (particularly for climate adaptation and aging) will be more pressing for emerging markets. For

What if interest rates do not ease as much as expected?

We conducted a sensitivity analysis by adding a 50-basis-point increment to the anticipated 2030 interest rate for each geographic sector. Because of the continuing debt leverage buildup, albeit at a somewhat low compound annual growth rate, the government sector is most affected. In other words, government borrowers would suffer most if interest rates do not decline sufficiently over the next few years.

Global total interest expense-to-revenue is projected to be 17% higher than pre-COVID-19 ...

Total interest expense-to-revenue, 2019, 2023 and 2030 (%)



Data compiled Dec. 1, 2023.
P = projected.
Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.
Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain, Switzerland, UK and US.
Source: S&P Global Ratings.
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... although the change for global households is more muted ...

Household interest expense-to-revenue, 2019, 2023 and 2030 (%)

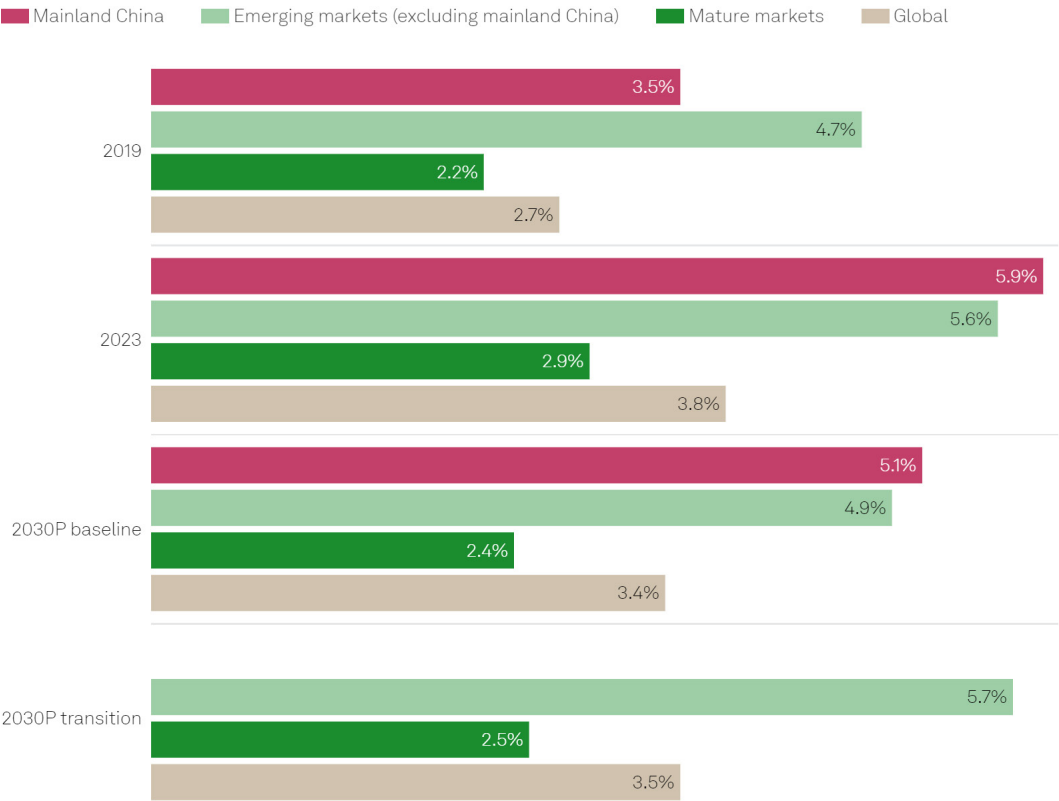


Data compiled Dec. 1, 2023.
P = projected.
Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.
Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain, Switzerland, UK and US.
Source: S&P Global Ratings.
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... with corporates in the middle ...

Corporate interest expense-to-revenue, 2019, 2023 and 2030 (%)

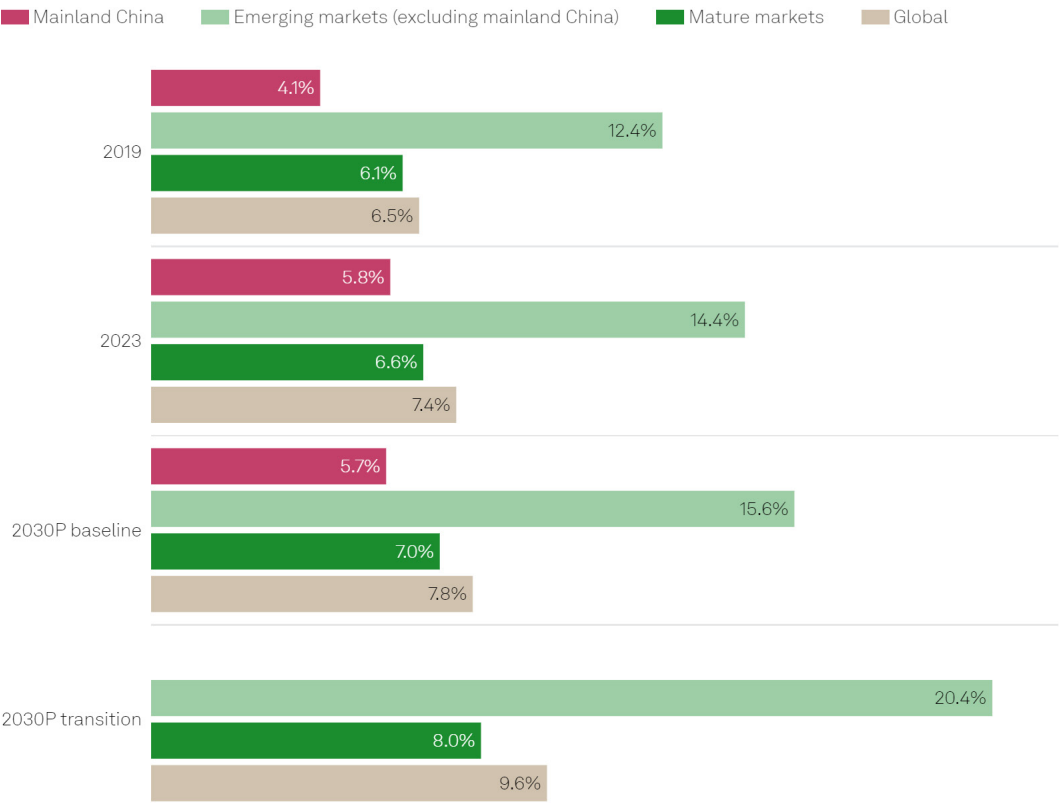


Data compiled Dec. 1, 2023.
P = projected.
Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.
Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain, Switzerland, UK and US.
Source: S&P Global Ratings.
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... but governments will still struggle with high interest expense-to-revenue ratios

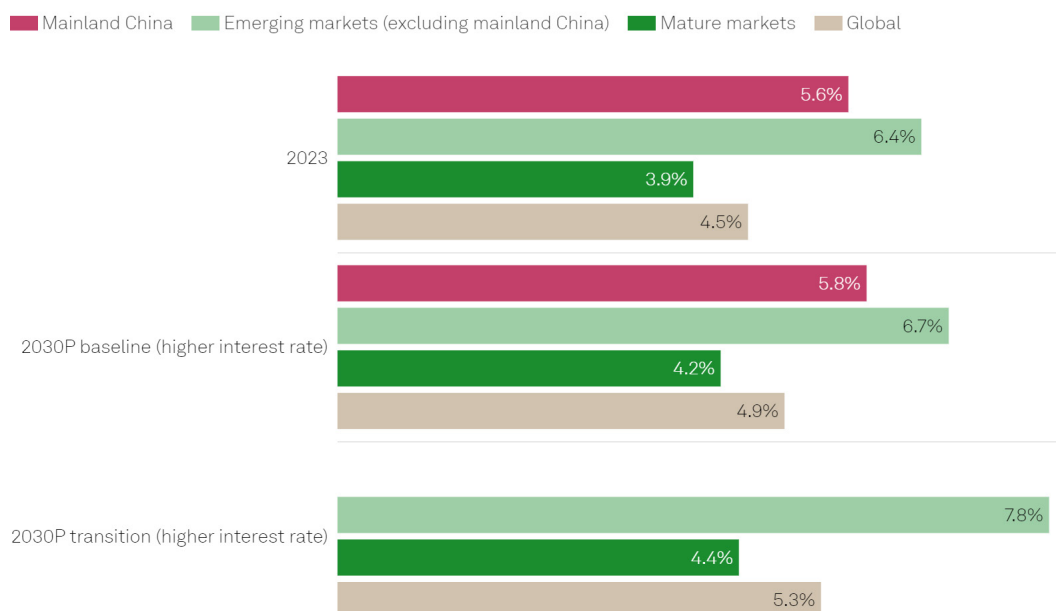
Government interest expense-to-revenue, 2019, 2023 and 2030 (%)



Data compiled Dec. 1, 2023.
P = projected.
Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.
Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain, Switzerland, UK and US.
Source: S&P Global Ratings.
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Higher debt base means +50bps interest rate worsens total interest expense-to-revenue ...

Total interest expense-to-revenue, 2023 and 2030 (%)



Data compiled Dec. 1, 2023.

P = projected.

Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.

Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain,

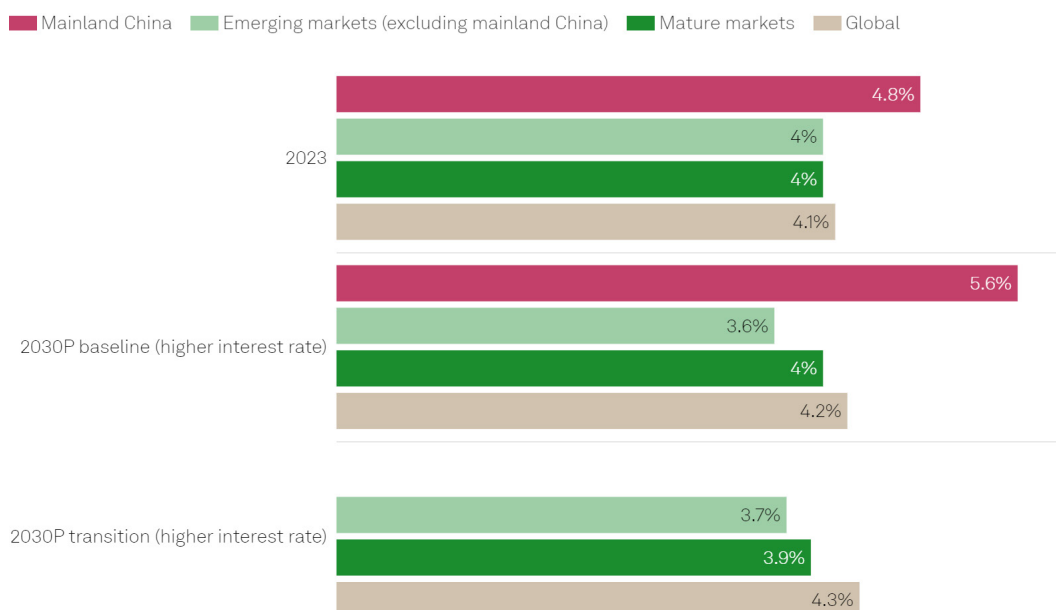
Switzerland, UK and US.

Source: S&P Global Ratings.

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... although households suffer least ...

Household interest expense-to-revenue, 2023 and 2030 (%)



Data compiled Dec. 1, 2023.

P = projected.

Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.

Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain,

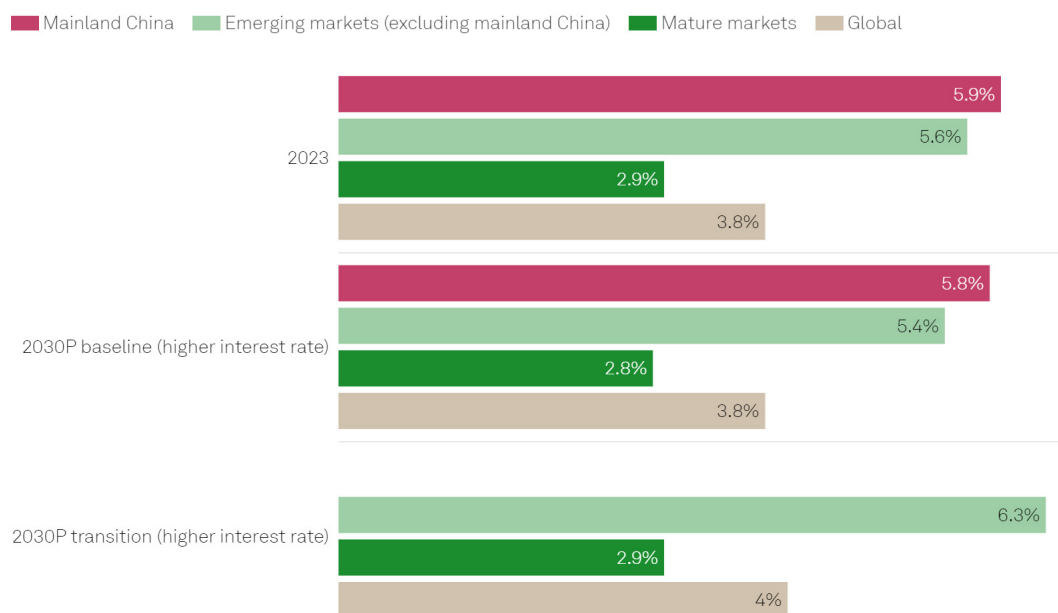
Switzerland, UK and US.

Source: S&P Global Ratings.

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... with corporates still in the middle ...

Corporate interest expense-to-revenue, 2023 and 2030 (%)



Data compiled Dec. 1, 2023.

P = projected.

Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.

Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain,

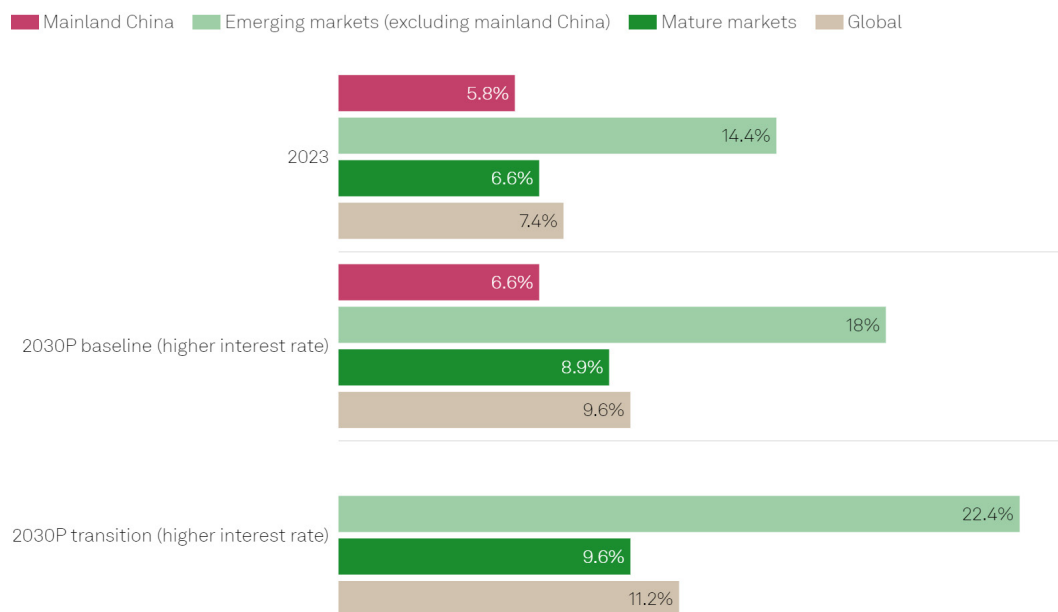
Switzerland, UK and US.

Source: S&P Global Ratings.

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... and governments suffering worst

Government interest expense-to-revenue, 2023 and 2030 (%)



Data compiled Dec. 1, 2023.

P = projected.

Emerging markets includes Argentina, Brazil, mainland China, India, Indonesia, Mexico, Poland, Saudi Arabia, Thailand and Turkey.

Mature markets includes Australia, Belgium, Canada, France, Germany, Israel, Italy, Japan, Netherlands, South Korea, Spain,

Switzerland, UK and US.

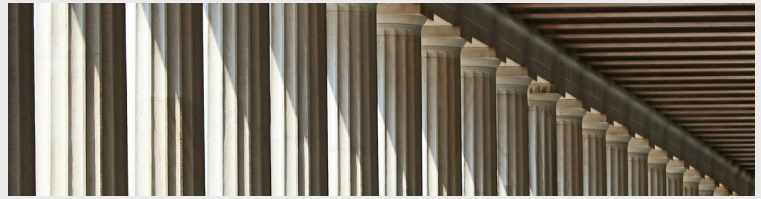
Source: S&P Global Ratings.

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It is likely that debt may have to be raised beyond what is already planned to cover climate, digitalization and aging transition costs.

A world of higher debt and rates

After a step-up during the COVID-19 years, it is likely that debt may have to be raised beyond what is already planned to cover climate, digitalization and aging transition costs. Coupled with this is the high likelihood that interest rates will settle at equilibrium levels higher than those pre-COVID-19. Policymakers will have to address the necessary trade-off between short- and longer-term costs to their economies and population, as the cost of inaction could become greater over time. Given the global nature of climate change and the disproportionate exposure of emerging markets, including lower-income countries, to physical and transition risks, a higher degree of international collaboration to support capital flows, as well as a combination of public and private capital, is needed to make the transition affordable for all. This collaboration could be constrained by an increasingly fragmented geopolitical environment (see our [Q&A with Senior Vice President for Geopolitics and International Affairs Carlos Pascual](#) to learn more). ■



Learn more

[Global Debt Leverage: A 1% Financing Contraction Could Push Cash-flow Negative Corporates To 13%](#)

[Global Aging 2023](#)

[Global Debt Leverage: Is a Great Reset Coming?](#)

[Green Spending Or Carbon Taxes \(Or Both\): How To Reach Climate Targets, And Grow Too, By 2030?](#)

For more detailed information on our analysis, read the full report “[Global Debt 2030: Can The World Afford A Multifaceted Transition?](#).”

This article was authored by a cross-section of representatives from S&P Global and in certain circumstances external guest authors. The views expressed are those of the authors and do not necessarily reflect the views or positions of any entities they represent and are not necessarily reflected in the products and services those entities offer. This research is a publication of S&P Global and does not comment on current or future credit ratings or credit rating methodologies.

End of the Washington Consensus

The world is fragmenting at a time when cooperation is needed to tackle the global issues of climate change, the energy transition, debt and healthcare.

Paul Gruenwald

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The period corresponding to the Washington Consensus, which began with the fall of the Soviet Union, was the high-water mark of global economic efficiency and cooperation. Nearly all countries operated under the assumed benefits of open markets, frictionless trade and limited geopolitics. Incomes and wealth boomed, at least in aggregate, and billions of people were lifted from poverty. Bretton Woods Institutions enjoyed large legitimacy and were used to address global problems. The breakdown of the Washington Consensus leaves us in a more confrontational, less optimal world. Trade is constrained, the cost of doing business is higher, and the cooperation needed to solve global challenges such as climate change, debt and healthcare is elusive.

The life and death of the Washington Consensus

The Washington Consensus is gone. This system of beliefs emerged triumphant after the collapse of the Soviet Union in the early 1990s. Its central tenets were the primacy of markets, with a limited role for the state, multilateralism and globalization, and the free movement of workers and capital. The Bretton Woods Institutions — the International Monetary Fund, the World Bank and the World Trade Organization (WTO) — were the global public bodies charged with promoting its policies and supporting prosperity.

Highlights

The Washington Consensus, the system of beliefs that led to a market-driven expansion of trade not seen in a century, has unraveled. Rising inequality, the global financial crisis and the attraction of China's state-driven model all contributed to its downfall.

The world is now more fragmented. A new global consensus has not emerged, nor is one likely to emerge soon.

This lack of global consensus will impede progress on issues including climate change, the energy transition, debt relief, trade policy and healthcare.

The Washington Consensus encouraged a second wave of globalization, delivering positive results in the 1990s and 2000s. Most notable was a burst of global trade not seen since the UK led the first wave of globalization a century earlier. Companies sought to minimize costs and boost returns, driven by new entrants — particularly China — into global production chains and the WTO. As production spread to new countries and incomes boomed, billions of people were lifted out of poverty in the emerging world. The structural increase in supply kept inflation in check and global interest rates low. As a result, profitability rose, and asset prices soared. However, inequality also increased, particularly in the advanced economies.

What went wrong?

The Washington Consensus was undone by three main factors:

- A lack of attention to distributional issues, particularly in the advanced economies. Globalization was not a win-win. While the economic pie was certainly made bigger, the benefits were unequally distributed. Higher-income groups fared well, but working-class manufacturers in the West saw their jobs

disappear and their living standards stagnate. Some of this was due to technological advances, but trade was also responsible.

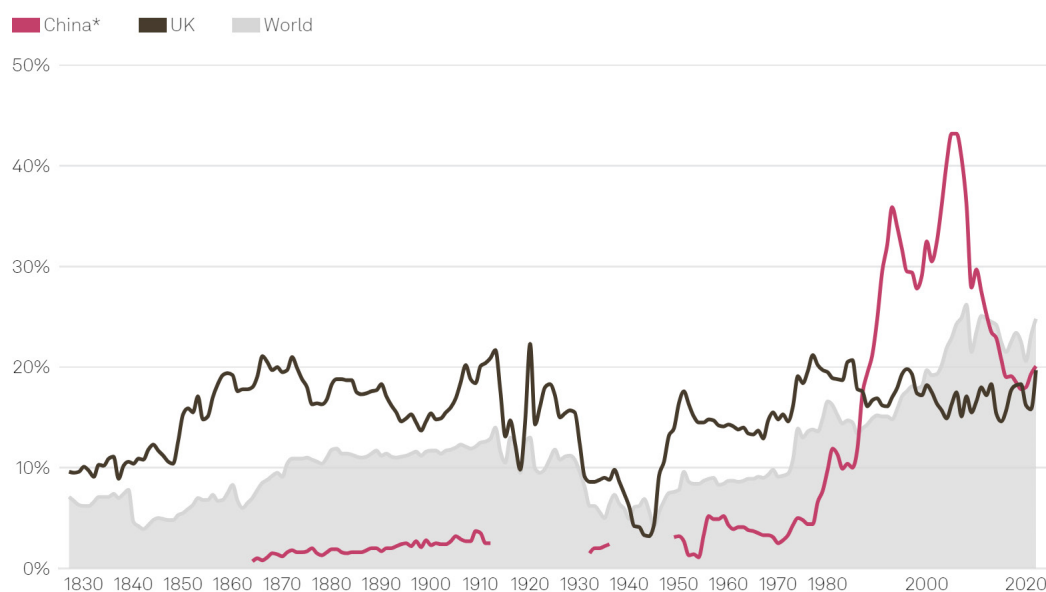
- The global financial crisis of 2008. A financial meltdown originating mainly in the US banking sector, which was supposed to be better at managing risk than the public sector, put a huge dent in support for the Washington Consensus. The US policy response, with limited support for households hit hard by declining property prices, exacerbated these views.
- The rise of China and the relative attractiveness to some countries of its state-led model. This was based on China's meteoric rise, including a mass reduction in poverty. Its relative stability and avoidance of the financial crises plaguing other emerging markets were enticing as well.

Where are we now?

Nationalism is challenging multilateralism. As a result, we are moving to less cooperative and suboptimal outcomes. This unraveling of the Washington Consensus can be seen across the board.

UK, China led 2 waves of globalization

Exports as a share of GDP (%)



Data compiled Nov. 17, 2023.

* Some data for China is unavailable.

Sources: Our World in Data; World Bank; S&P Global Ratings Economics.

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Trade has been increasingly scrutinized, if not weaponized. No longer are we in a laissez faire world where goods are produced according to competitive advantage. Tariffs are seen, incorrectly, as a way to create more balanced trade flows. Countries are applying sanctions for reasons of (very broadly interpreted) national security, some legitimate and some largely imaginary. Production is being moved in anticipation of real or perceived threats from rivals as well as in response to COVID-19-related supply chain disruptions. These measures raise the cost of producing, storing and shipping goods worldwide, although they may be “cheaper” on a risk-adjusted basis.

The role of the state is rising and is no longer seen as secondary to the markets. China, with its consistently adopted state-led economic model, has always had national champions. Now, the US and others are moving toward a more state-heavy model as well. The Inflation Reduction Act is putting enormous amounts of public money toward the energy transition — arguably a public good, where the state should play a catalytic role — but it also aims to “boost domestic manufacturing [and] create good-paying union jobs,” which can be interpreted as industrial policy. Indeed, some US allies are pushing back against the Inflation Reduction Act and its state-induced, “unfair” competitive advantage to American companies.

The post-Washington Consensus world is increasingly fragmenting along ideological and income lines.

On the global stage, the Bretton Woods Institutions are no longer the only game in town. China is flexing its geopolitical muscles by creating a new set of institutions. These include the Asian Infrastructure Investment Bank, which supports the Belt and Road Initiative, and the New Development Bank, which centers on Brazil, Russia, India, China and South Africa — the BRICS — a group that has recently expanded. China is now a larger creditor to many emerging markets than all the traditional development banks combined. More generally, the Global South has emerged as a group of countries wanting a larger say in global governance, including the energy transition.

Perhaps most importantly, trust among the global powers is low, with the frequency and level of communication between the US and China having declined considerably in recent years. While both sides recognize that they remain interlinked economically, this is not translating into a commensurate level of cooperation. The low level of cooperation between the two largest economies and global powers does not bode well for addressing the ever-growing list of global challenges.

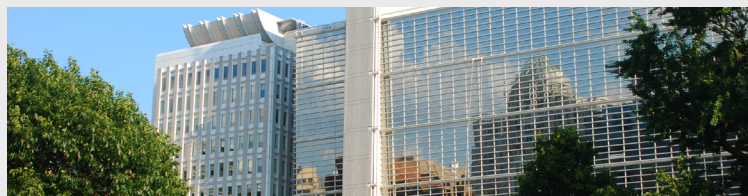
Progress in a less orderly world

A new global consensus has not emerged, nor is one likely to emerge soon. The post-Washington Consensus world is increasingly fragmenting along ideological and income lines. This is happening both across and within countries, particularly in the advanced economies. The lack of a global consensus will make progress difficult in a number of key areas.



- **Climate change** affects us all, and any approach toward addressing it needs global cooperation to be effective and efficient. Progress on adaptation requires joint action across borders.
- The **energy transition** will not take place without rapid scaling of clean energy technologies. This includes decarbonizing the fossil fuel system, building out the renewables system, deploying electric vehicles and expanding new hydrogen infrastructure. Lack of collaboration risks making the transition both slower and more expensive.
- **Debt relief** for lower income countries is necessary to give them space to resume growth and development and to participate in the green transition. Recent progress toward debt relief has been slow, and all creditors need to work together to find the most efficient solutions.
- **Trade policy** is stuck in a rut started by the 2016 “trade wars.” Neither the US nor China has rolled back their retaliatory tariffs, and the weaponization of trade continues. Trade diversion, also known as “de-risking” or “friend-shortening,” remains rampant, and the WTO appears sidelined.
- **Healthcare** is a global public good and, as demonstrated during the COVID-19 pandemic, cooperation is needed to manage the spread of diseases as well as to discover and distribute vaccines and remedies.

If the current geopolitical tensions and lack of global cooperation continue, we can expect progress on these key issues to be constrained. Any gains are likely to be modest and partial as well as more costly than in a world with an updated global consensus. ■



Learn more

[The “Washington Consensus”: Another Near-Death Experience? \(Peterson Institute\)](#)

[The new Washington consensus \(Financial Times\)](#)

[The Washington consensus is dead \(The New Statesman\)](#)

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Q&A



Carlos Pascual

*Senior Vice President, Geopolitics
and International Affairs,
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Do you ever find yourself wishing that your job as an expert in geopolitics was a little less interesting?

Every day I wish that I wasn't challenged on yet another issue. The changes are historic from a geopolitical perspective. We've seen the erosion of the global order over the past decades. We're not seeing what's coming to replace it. It's like a shattering of an equilibrium, and we're all trying to understand how we make progress going forward. This is a phenomenally difficult transitional moment for governments and for companies around the world.

Looking ahead to 2024, what are the geopolitical issues that you believe will most affect the world and the markets?

The list of issues in 2024 is enormous. We must begin with the US and China: the world's two largest nations, two largest consumers of energy, two largest emitters of greenhouse gases and two largest militaries. How these nations behave and their relationship with one another is going to set the tone globally.

The wars in Ukraine and between Israel and Hamas will resonate profoundly in global politics. A North-South divide continues to deepen over economics and climate change. Never in history have we sought to make such a fundamental change in a critical part of our economic system in such a short time. This is going to affect every aspect of our lives. It will have a geopolitical impact, a commercial impact, a technological impact, and all these dynamics will come together within countries. That combination will make it challenging to manage the road ahead.

The war in Ukraine seems to have settled into a state of violent stasis in 2023. Based on your experience in Kyiv, do you have reason to believe that 2023 brought us any closer to an eventual peace?

2023 did not bring us closer to peace. Russia's invasion of Ukraine was critical to the changing nature of the global order. A country's national sovereignty and territorial integrity were violated. We have no effective mechanism to cut that off. Now we see a stalemate on the ground, and we are moving into a winter in which we're likely to see increased bombings by Russia of civilian infrastructure in Ukraine. The question is how to move forward and with what resources. How do we move to

the point where Ukraine's rights are met and Russia is able to accept that? A diplomatic solution eludes us.

The war in Gaza has had remarkably little impact on energy prices so far. Are you surprised by the lack of price movement?

No, I'm not. Oil prices are volatile, but they have declined since Oct. 7. This reflects oil supply and demand throughout the world. The production coming out of the US, Canada, the North Sea, Brazil, Guyana and a few other areas is so strong that it's exceeding the growth in global demand. The reason you would normally see a price spike resulting from conflict in the Middle East would be Iran threatening to shut down the Strait of Hormuz. That hasn't happened because Iran is fundamentally dependent on China as a customer and as an investor. China's other principal partner in the Middle East is Saudi Arabia. These relationships with China have dampened the political risk of disrupting the supply and movement of oil.

Increasingly, we're hearing about the trade-off between the energy transition and energy security. Is the concern over energy security a product of the increasing geopolitical tensions in the world?

We must think about how we elevate energy security and energy transition to achieve both. It's not an either/or. We cannot ignore the necessity and the reality of energy security. Nor are we in a world where we can forget about the energy transition because the realities of climate change are forcing us to deal with environmental consequences and transitional realities. We need to have two energy transitions at the same time. We need to reduce demand for hydrocarbons and decarbonize supply in the energy economy of today. And we need to build the energy economy of the future. Financing and implementing both of these transitions in parallel is one of the hardest strategic choices that the world faces.

The passage of the Inflation Reduction Act seems to have kicked off a global race for dominance to lead the energy transition, with the US, Europe and China each competing for market leadership. Should we be pursuing international cooperation versus competition?

International cooperation is fundamental to achieve our goals for a sustainable planet. That doesn't mean that individual countries should not seek to create the incentives to develop technology. But what is going to become critical in the geopolitics of energy is that these different strategies are united in some form of cooperation. What is still evolving is an understanding of how we share. How do we bring other countries in? How do we make it possible for the lessons learned in one place to be shared and advanced as quickly as possible in other countries? How do we ensure developing countries have access to financing? In the end, one country learning is not enough. All nations are interdependent to solve the climate challenge and ensure our energy security. ■

Investment in climate adaptation needs have high returns on growth

Lower- and lower-middle-income economies risk losing 12% of GDP to hazards such as storms, but investing up to 0.6% of GDP in adaptation will have high returns.

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Climate mitigation is the best form of adaptation in the longer term. A quicker transition to net-zero will help avoid the worst-case scenarios of global warming, reducing the need to adapt. The prospects of net-zero by 2050 are fading, however, and there is increasing evidence that more warming will be associated with rising potential economic losses globally.

Where is climate adaptation finance missing?

Physical climate hazards increasingly affect economic activity and destroy capital. Chronic and acute physical risks reduce productivity, result in higher mortality rates and cause capital destruction. Lower- and lower-middle-income countries, often located in warmer climates, are more vulnerable to these shocks and are unprepared due to their economic structure, access to fewer resources and institutional weakness. Spillover effects of physical climate risks from one country to another, in

Highlights

The prospect of reaching net-zero by 2050 is fading, while the potential losses associated with climate change rise. Lower- and lower-middle-income economies risk losing 12% of their GDP to physical hazards, such as storms, floods and heat waves, by 2050 under a slow transition scenario if they do not adapt.

Investing the necessary 0.6% to 1% of GDP annually in adaptation is likely to have high returns in the face of rising climate-related losses, absent adaptation measures. But institutional and macropolitical volatility are barriers to investment in lower- and lower-middle-income countries.

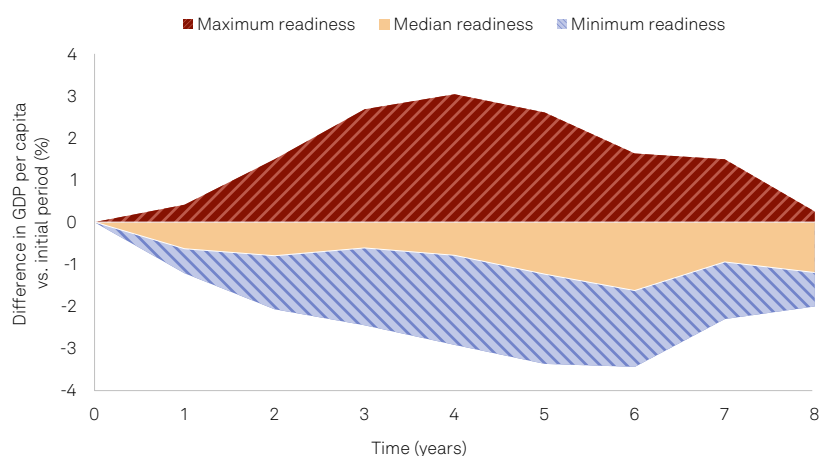
Global collaboration and public-private partnership can help attract investors and close the climate adaptation financing gap through shared risk. Many physical risk adaptation measures are in the public good category and would require public funding, but they also generate additional returns for growth beyond their climate change benefits.

the form of compounding or cascading events (when climate hazards compound with each other or with socioeconomic weakness and changes), are also increasingly likely.

Adaptation is key to avoiding short- and long-lasting negative impacts on GDP. When readiness to adapt is high, temperature increases have no long-lasting impact on GDP per capita, even in warmer climates (see chart). However, scaling adaptation finance in the countries most impacted by droughts, extreme heat, storms, flooding and wildfires is challenging, as those countries often have less access to capital markets.

Countries with lower readiness display a long-lasting impact on GDP per capita

GDP per capita response over time to a 1 degree C annual average temperature rise from 24 degrees C, by readiness



Graphic created Dec. 1, 2023.

Sources: S&P Global Ratings ("Is Climate Change Another Obstacle To Economic Development?" Jan. 16, 2023); Notre Dame - Global Adaptation Index (ND-GAIN) Country Index.

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Disproportionate climate impact in lower- and lower-middle-income countries

Rising losses from physical risks are increasingly likely with time, particularly if mitigation and adaptation efforts are not increased. Without adaptation, between [3.2% and 5.1% of world GDP could be wiped out by climate hazards annually by 2050](#) under a range of climate scenarios, according to a recent study by S&P Global Ratings. Considering global GDP obscures significant variability across income, region and hazard (see chart).

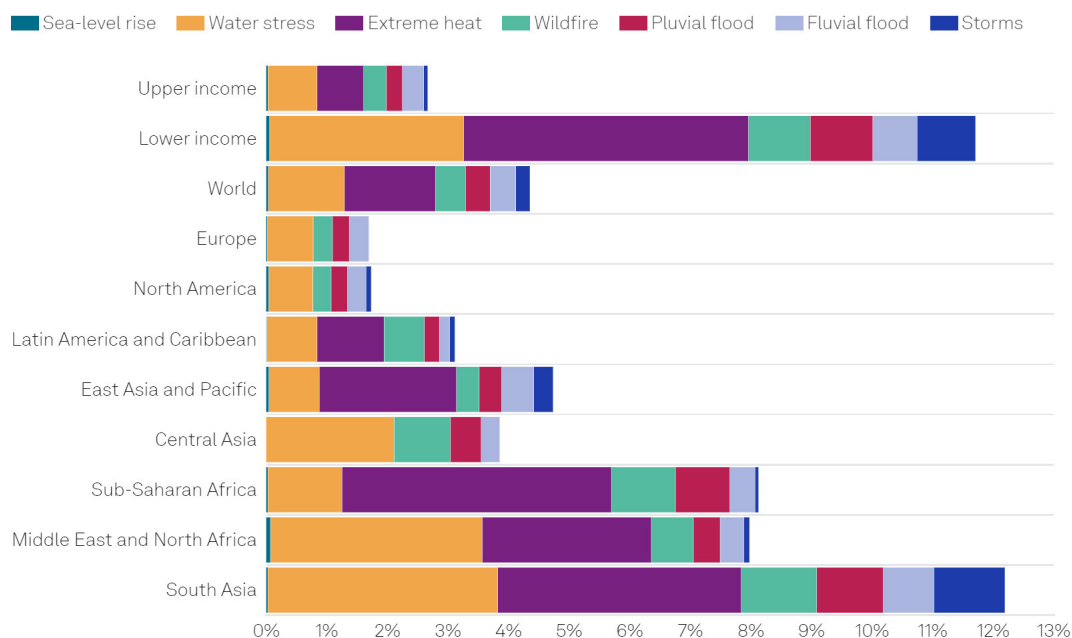
Regional differences in potential losses are stark. Under a slow transition scenario, approximately 12% of South Asia's GDP could be lost annually by 2050 without adaptation. This potential economic loss is three times more than the world average. Sub-Saharan Africa and the Middle East and North Africa follow with roughly 8% of GDP at risk, while Europe and North America tend to be less exposed with about 2% of GDP at risk. These estimates represent the annual share of GDP that could be lost due to high exposure to physical risks, in the absence of adaptation to climate risk. They do not account for changes in economic geography and structure and assume all hazards occur annually.

When readiness to adapt is high, temperature increases have no long-lasting impact on GDP per capita, even in warmer climates.



Less developed countries face 4.4x more losses than their wealthier peers

Annual GDP at risk by 2050 by climate hazard and region, under a slow transition scenario (SSP3-7.0) absent adaptation (%)



Graphic created Dec. 1, 2023.

GDP at risk represents the share of GDP that could be lost annually due to high exposure to physical risks, in the absence of adaptation to climate risk, without accounting for changes in the economic geography and structure and assuming all hazards occur every year.

Sources: S&P Global Ratings; S&P Global Sustainable1 (2023).

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Lower- and lower-middle-income economies are more exposed, suggesting that they need greater relative amounts of investment to build resilience. These countries already face higher average temperatures and more climate extremes than their developed peers, and as temperatures rise, they have a larger share of physical risk-related damages. We estimate that about 12% of GDP of lower- and lower-middle-income countries is at risk of climate hazard-related losses annually by 2050 under a slow transition scenario. This is 4.4 times greater than their wealthier peers.

When expressed as a proportion of countries' GDP, adaptation costs are much greater for lower-income countries (about 3.5% per year) than for lower-middle (0.7%) or upper-middle (0.5%) income countries, according to the UN Environment Programme. Investments are likely to become increasingly important as the impacts of climate change become more extreme, both in terms of intensity and frequency, with some risks becoming hard to adapt to entirely.

Less developed economies already face relatively more losses from climate hazards. More developed countries are better placed to soften the impact

of physical risks and recover, given their greater financial means and stronger institutions. This explains why current economic losses from physical risks can appear relatively low in some, typically more developed, economies, even though exposure to physical risks is high or GDP at risk is significant.

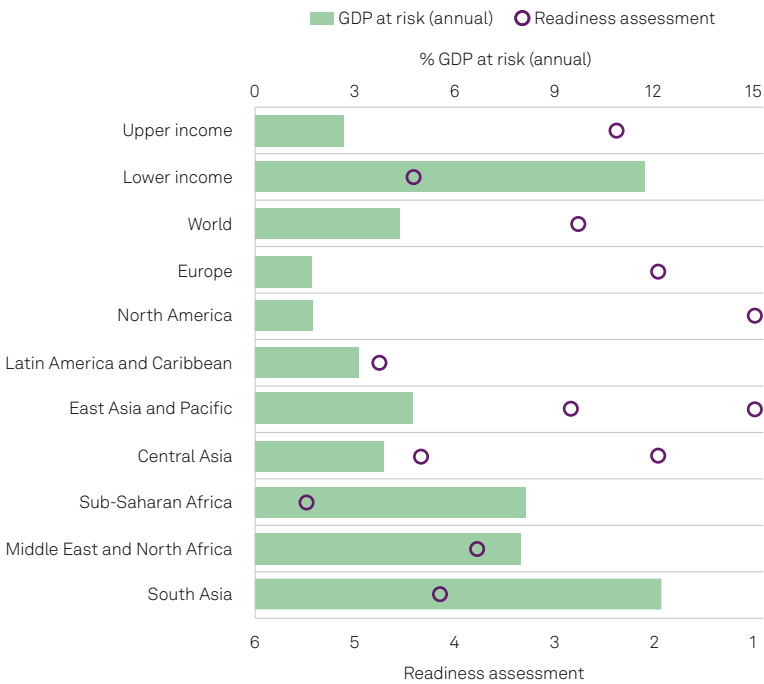
Reduced long-term visibility, less developed infrastructure and weaker social safety nets, along with lower capabilities to carry out some long-term projects, all weigh on countries' ability to adapt to risks in general, while less flexible labor and product markets make it harder to prepare or relocate production after a shock. Our assessment of readiness to cope with climate hazards shows that the regions with greater GDP at risk will have a harder time coping (see chart).

The impact of climate change is already nonlinear — the marginal increase in temperature is more detrimental as it gets hotter (see chart) — but could become increasingly so as climate hazards compound one another's effects within and across countries. Physical risks can also add to ongoing economic weakness or be a source of systemic stress when interdependencies are high. For example, an increased likelihood of simultaneous

crop failure in global breadbaskets could have a larger impact on global food security and prices, also affecting consumers in countries not exposed to those risks.

Lower-income countries are less ready to cope

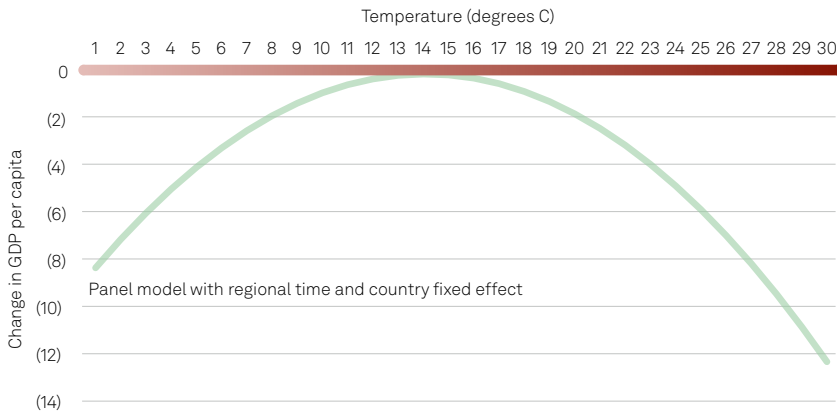
GDP at risk and readiness by region under a slow transition scenario (SSP3-7.0) in 2050, absent adaptation



Graphic created Dec. 1, 2023.
GDP at risk represents the share of GDP that could be lost annually due to high exposure to physical risks, in the absence of adaptation to climate risk, without accounting for changes in the economic geography and structure and assuming all hazards occur every year. Readiness provides a relative picture of countries' ability to avoid and respond to some of these losses based on their economic and institutional strength. Readiness goes from 1 to 6, where a higher number points to lower capacity to adapt.
Sources: S&P Global Ratings; S&P Global Sustainable1 (2023).
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GDP responds to temperature shocks in a nonlinear way

Change in GDP per capita associated with a 1-degree C increase in temperature in the first year, by temperature level



Graphic created Dec. 1, 2023.
The results describe the relationship of GDP per capita with temperature using a panel model estimation with country fixed effects and regional time fixed effects; the range refers to results of other modeling specifications.
Sources: author's calculations; S&P Global Ratings.
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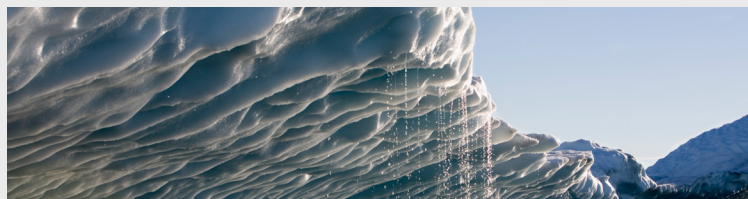
Financing adaptation is harder for countries with less access to capital markets

Lower- and lower-middle-income countries have less access to financial markets and borrow at a higher cost. Financing debt in these countries poses greater credit risk for investors, as higher macroeconomic and policy volatility increase uncertainty. In 2023, less than 9% of green bonds were issued outside developed economies. Although rising, climate finance to developing countries totaled [\\$89 billion in 2021](#), according to the Organisation for Economic Co-operation and Development, or 0.03% of global debt. Most of that finance goes to mitigation, leaving adaptation funding relatively tiny.

The gap between existing climate adaptation finance and the investment need is big and likely to grow in the short term as financing conditions tighten and growth slows. The Intergovernmental Panel on Climate Change estimates that limiting global warming to 2 degrees C by 2050 will require \$3 trillion each year in investment for climate adaptation and energy transition infrastructure. However, higher borrowing costs and other growth priorities are likely to push climate change down the list. According to the United Nations, the adaptation finance gap is already [10-18 times above current](#) international flows. Estimated annual adaptation needs range from \$215 billion to \$387 billion per year, or 0.6%-1.0% of developing countries' GDP, for this decade alone. Meeting adaptation needs likely has high returns in developing countries.

With expected losses from climate change rising, the case for investing in adaptation is increasing. Coupled with development goals, adaptation investments could present large multiplier effects for developing economies. Investing 0.6%-1.0% of GDP annually seems relatively small compared to the risk of losing 12% of GDP without action and points to a good return on investment in a world of high debt and higher interest rates. Higher development is also one of the key factors explaining countries' resilience and adaptation potential to climate change.

Despite this, it is difficult for developing countries to attract investors. Mobilizing sufficient resources to unleash multiplier effects would likely depend



Learn more

[Lost GDP: Potential Impacts Of Physical Climate Risks](#)

[Is Climate Change Another Obstacle To Economic Development?](#)

[Economic Research: Climate Change Will Heighten Output Volatility](#)

[Crunch Time: Can Adaptation Finance Protect Against the Worst Impacts From Physical Climate Risks?](#)

on partnerships between the public and private sectors as well as between private investors and international institutions, such as multilateral banks. Some investments will provide sufficient immediate and direct financial returns to make them profitable for private investors. An increase in insurance coverage could also help households buffer the costs of physical risks when they occur, where social safety nets are not very large.

Investments that fall in the public good category, such as education or infrastructure, may not offer enough financial returns for private investors. Many investments for adaptation or for addressing physical risk, which are socially profitable for the country, would depend upon public funding. Governments may partner with multilateral lending institutions and the private sector to obtain more funding, share the risks and lower the risk premium to attract more private capital inflows into less developed economies. Other international mechanisms could emerge to transfer resources to fund impactful projects in developing countries. The voluntary carbon market has also been flagged as a source of potential revenue for lower- and lower-middle-income countries that could help fill the adaptation funding gap. ■

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The multidimensional path to net-zero

The path to net-zero must span global economies, resources and technologies.

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Developments over the past two years have demonstrated that the energy transition is more complicated than previously thought. While the transition proceeds, expectations of a linear global shift have been shaken as climate goals compete with priorities around energy security, energy access and affordability.

A series of shocks, crises and tensions in the global energy system point to the need for an equitable transition that is inclusive of different situations in different parts of the world and that reflects a diversity of policy approaches.

The energy price spike that began in late summer/early fall 2021 pushed affordability to the fore, leading to policy challenges in many countries. Described by some as “the first energy crisis of the energy transition,” it resulted from a mismatch of strong demand growth and underinvestment in conventional supplies.

The disruption in energy markets arising from Russia’s 2022 invasion of Ukraine — high prices, shortages, a cost-of-living crisis, economic dislocation — reinforced the affordability challenge and put energy security back on the table as a central concern for governments and the public alike. There is now an increased risk that high energy costs will undermine public support for policies and investments backing the transition to a low-carbon economy.

The emergence of a new North-South divide between the wealthy countries of the Global North and the developing countries of the Global South has fostered an increasingly sharp debate over the cost and timing of the energy transition, its relative burdens and its compatibility with other priorities such as economic growth, poverty reduction and improved health.

Highlights

A single, global energy transition path is unrealistic and counterproductive to the goals of reaching net-zero.

Energy security and affordability trump energy transition when lives and livelihoods are at stake.

The math of carbon budgets and climate change is unforgiving; however, so is the math of connecting about 800 million people with no access to electricity.

Fast-paced deployment of clean energy technologies globally offers a promise that emissions will start to decline this decade.



The trilemma of energy security, affordability and sustainability looks very different in Africa, Latin America and the developing countries of Asia than in Europe and the US, where per capita incomes are as much as 40 times higher. This divergence makes addressing the gaps in policy, technology and financing a significant challenge across geographies.

There are also issues related to the supply chains needed for net-zero. Beginning around 2021 and continuing today, a host of governments — the US, the UK, Japan, Canada and the EU — and entities — the World Bank, the International Monetary Fund and the International Energy Agency — have raised concerns over the adequacy of mineral supply and processing capacity to meet the needs of rapidly growing industries such as renewable power and electric vehicles. These supply chain issues are further complicated by rising geopolitical tensions.

For developing economies, which already face high borrowing costs for energy projects, rocketing interest rates make it even more difficult to develop commercially viable projects and attract investors.

Finally, there is an unfolding shock of a different kind — the end of cheap money. Central banks have continued to raise interest rates to tackle stubbornly high inflation. High interest rates raise the cost of capital for all energy investments. For developing economies, which already face high borrowing costs for energy projects, rocketing interest rates make it even more difficult to develop commercially viable projects and attract investors. Higher interest rates also raise holding costs, resulting in potentially lower inventories of oil and risking more volatility.

These issues, along with a growing sense of urgency from the general body of climate science, are part of the evolving framework of the energy transition

— which, despite its complexity, continues to gain political momentum.

The emissions reduction challenge

Policy actions in the US and the EU have cemented net-zero ambitions, with the launch of the Inflation Reduction Act in the US and the REPowerEU plan in Europe. The former has been described as generational in its impact. Meanwhile, China's investment in the energy transition continues to outpace all others, driven by a quest for national security linked to reducing its dependence on imported oil and gas.

However, the realities of the global energy system and the diverse status of global economies represent challenges to meeting these goals.

According to S&P Global Commodity Insights, current nationally determined contributions would reduce global emissions by only 10% in 2030 relative to 2019 levels. This compares with the 43% reduction that the [Intergovernmental Panel on Climate Change](#) set as the benchmark to align with a 1.5 degrees C pathway.

Despite a rise in climate ambitions and supporting policies, in the last 30 years, the share of hydrocarbons in the global primary energy mix has hardly changed, to 80% from 81%. Global greenhouse gas emissions are estimated to have increased 0.9% in 2022, hitting a new record of 52 gigatonnes. Energy demand has continued to grow in most emerging and developing economies as hundreds of millions more people with increased access to reliable and affordable energy have achieved improved living standards.

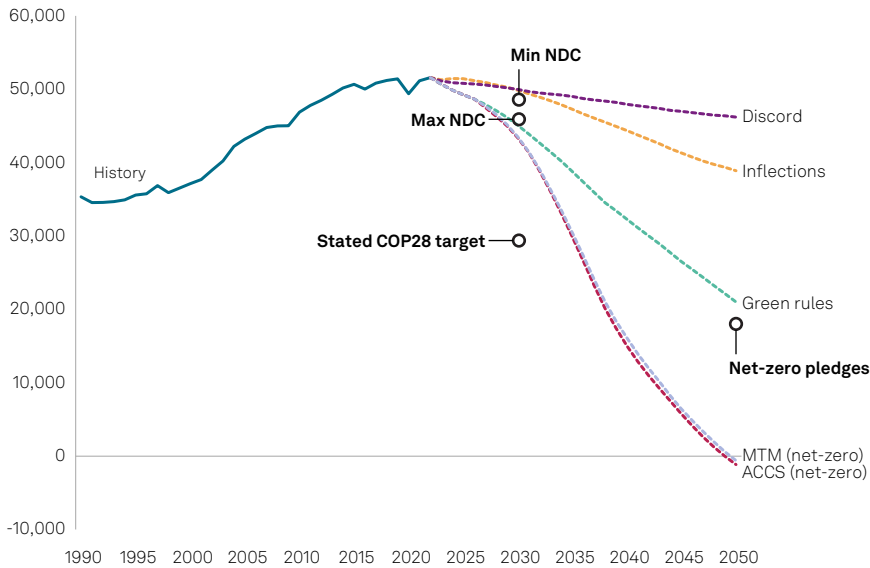
The challenge is how to bend the emissions curve while ensuring economic growth. The climate policies of the Global North will be insufficient to achieve the global goal of net-zero unless there are reductions in emissions from fast-growing developing economies.

The widening gap between current emissions trajectories and the pathway required to achieve net-zero by 2050 is illustrated by emissions scenarios developed independently by the International Energy Agency and S&P Global Commodity Insights.¹

¹ IEA NZE 2022 and S&P MTM and ACCS scenarios are back cast from a 1.5 degree C objective, i.e., what would be required to achieve this goal? Other scenarios are forward projections based on current or anticipated changes to policies and markets.

Emissions mitigation: No easy pathway to net-zero

Total GHG emissions in S&P Global Commodity Insights global scenarios, NDC targets and net-zero pledges (MMtCO₂e)



Data compiled Oct. 2, 2023.

ACCS = accelerated carbon capture and storage; MTM = multitech technology mitigation;

NDC = nationally determined contributions.

Source: S&P Global Commodity Insights.

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The challenge is how to bend the emissions curve while ensuring economic growth.

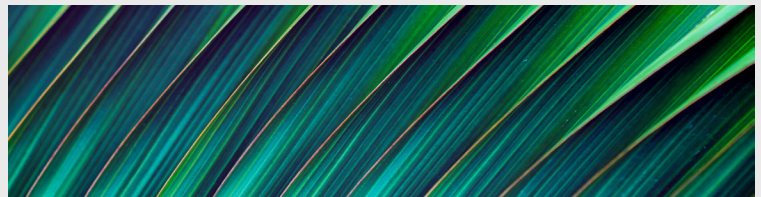
Looking forward

In large measure, closing this gap will depend on scaling low-carbon technologies. According to [S&P Global Commodity Insights](#), investment in renewable power and energy storage amounted to about \$477 billion in 2022 and will average \$700 billion per year through 2030 — with most investments centered on a handful of regions: China, the EU and North America.

S&P Global data shows that 301 GW of new renewable power was installed in 2022.² S&P Global expects that 70% to 75% of the new generating capacity installed between 2023 and 2050 will be renewable power.

Progress is being registered on large-scale battery storage to enable this growing share of variable power to become baseload power. The rollout of EVs is also accelerating. In the first half of 2023, 28% of new cars sold in China were EVs, with 19% in Europe and 9% in the US.³

Hydrogen, which was hardly on the agenda half a decade ago, has become a major target for investment and projects, and biofuels and renewable natural gas are also gaining greater scale. Technology advances, government support, regulation and growing private sector support — all of these will continue to pave the path ahead. ■



Learn more

[Unraveling Uncertainty: 2023 Scenarios and Net-Zero Cases](#)

[India's Energy Transition: More Energy, Fewer Emissions](#)

[IRA at 1: US heralds clean energy manufacturing 'renaissance'](#)

² Renewable power includes solar PV/CSP, onshore/offshore wind, biomass and waste, geothermal, ocean and other renewables.

³ See S&P Global Commodity Insights' "Pulse of Change: Monthly BEV and PHEV sales update," July 6, 2023. Includes BEV and PHEV cars. Sales data compiled for January–May 2023, except for the US, where data is available for January–April 2023.

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The journey to further EV adoption

The uptake of electric vehicles varies across global economies, but the market is dynamic, and trends can change quickly.

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Highlights

Electric vehicles are gaining market share, although affordability and ease of public charging remain challenges to broader consumer acceptance.

The share of EVs in the global light vehicle market will expand significantly over the next decade, driven by tightening government regulation.

Supply of battery raw materials is a key risk to a steep EV adoption curve.

EVs will erode oil's near-monopoly as a road transportation fuel over time.

The global electric vehicle market has grown over the past three years, led by earlier adopters swayed by environmental considerations, the “cool factor” of the vehicles and government incentives. While EVs gain market share, some incumbent automakers have signaled caution about broader consumer acceptance, and stakeholders are increasingly aware of the lingering challenges of affordability and ease of public charging. An S&P Global Mobility consumer survey corroborates such caution: The proportion of consumers in key global auto markets open to purchasing an EV dropped to 67% in 2023, from 71% in 2022 and 86% in 2021.

The EV affordability challenge

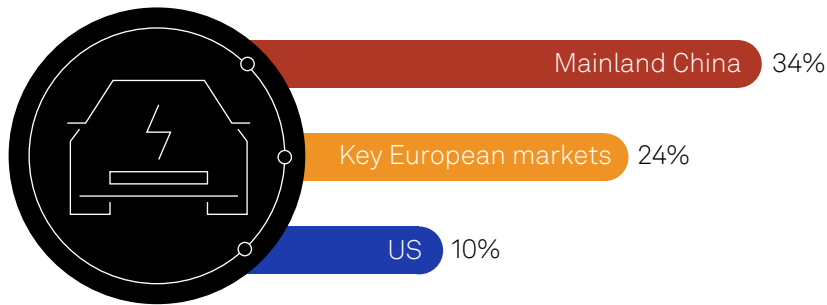
EVs generally remain more expensive than conventional internal combustion engine vehicles. In Europe and the US, this is compounded by cost-of-living concerns and higher interest rates, both

of which are impacting the broader automotive market. This is one example of the link between macroeconomic conditions and the pace of the energy transition.¹

¹ In this article, EVs refers generally to battery-electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel-cell electric vehicles (FCEVs). Conventional internal combustion engine (ICE) vehicles are considered to be all other powertrain types. Like BEVs, PHEVs can be plugged in but have both an ICE and a battery. Many consider PHEVs to be a “bridging” technology between ICE vehicles and BEVs. Light vehicles (LVs), which include passenger cars and light trucks, are the focus of this article. Medium and heavy vehicles (MHVs) are also a priority for policymakers seeking to reduce transportation sector emissions, although the market for zero-emission MHVs is at an earlier stage of development than for LVs.

Mainland China is at the vanguard of EV adoption

BEV and PHEV share of new LV registrations in Q3 2023



Data compiled Nov. 27, 2023.

BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle; LV = light vehicle.

Key European markets include Denmark, France, Germany, Italy, the Netherlands, Norway, Spain and the UK.

The US data point is for July and August 2023 only.

Source: S&P Global Mobility.

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Mainland China, the epicenter of the global battery supply chain, is an exception, where EVs are increasingly attracting mainstream car buyers. In the third quarter of 2023, battery-electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) accounted for 34% of new light-vehicle (LV) registrations, supported by the availability of many competitively priced, software-rich EVs and the rapid expansion of public fast-charging infrastructure.

A policy-led transition

Government policy is an important driver of EV adoption. Increasingly stringent carbon dioxide and zero-emission vehicle (ZEV) sales requirements for automakers, coupled with EV purchase incentives for consumers, are supporting EV adoption from the supply and demand sides, respectively.

Key policies include the EU's CO₂ regulation for LVs, which requires automakers to cut CO₂ emissions by 100% by 2035; California's ZEV mandate, which requires automakers to sell 100% light ZEVs, also by 2035; and the US Inflation Reduction Act, which includes generous tax credits for battery production and for new and used EV purchases, albeit with income, vehicle price and supply chain country of origin restrictions.

Such policies compel automakers to develop and bring to market more, and more affordable, EVs and offer consumers help in bridging the near-term price gap.

Lithium supply and battery security

It is unclear whether there will be enough battery raw materials to produce the number of EVs the industry plans to build over the next decade. This is a risk to steep EV adoption. New supply of battery minerals can be subject to long lead times, and market tightness could apply upward pressure on prices and make BEVs more expensive.

At the same time, battery security is becoming a greater focus for both governments and industry. Parts of the battery supply chain are highly geographically concentrated, notably mineral processing capacity in mainland China, adding another layer of supply risk.



Lithium is the building block of lithium-ion batteries. Spot lithium prices surged more than 500% between June 2021 and December 2022 before falling by about 70% by October 2023 (see chart). S&P Global Commodity Insights forecasts lithium supply to outpace demand over the next few years, owing in part to a supply response to the much higher prices of 2021–2022. In the latter part of the decade, the lithium supply-demand balance could tip into a sustained deficit as a potential sharp rise in EV-driven demand overtakes supply. Supply of other key battery raw materials, such as cobalt and nickel, could also fall short of demand later this decade, putting upward pressure on their prices.

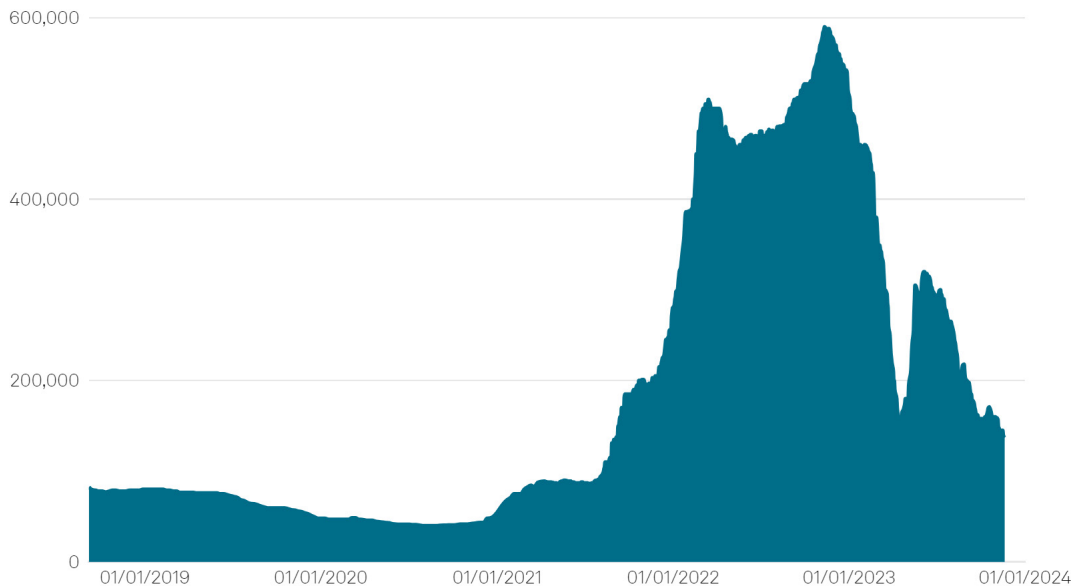
Yet a sustained period of high battery raw material prices is not inevitable. If the history of the markets for these and other commodities is a guide, their prices will be cyclical, with high and low prices prompting responses from both the supply and demand sides.

For example, novel lithium extraction methods, such as direct lithium extraction, could increase lithium output. Greater adoption of lower-cost, though less energy dense, alternatives to nickel-rich battery chemistries could moderate the impact of higher mineral prices on battery costs (see chart). These alternatives include lithium-iron-phosphate and lithium-manganese-iron-phosphate chemistries, neither of which use cobalt and nickel, and sodium-ion, which does not use lithium. Battery-makers' claims of energy density breakthroughs should be treated with caution, but solid-state battery technologies could offer a step-change in energy density, enabling a much-improved combination of driving range and cost compared with incumbent lithium-ion battery technologies.

As with other commodities, the prices of battery minerals will fluctuate, and automakers may adjust their product offerings and pricing to manage periods of higher battery costs as they strive to meet increasingly stringent government regulations.

Spot lithium prices have been on a roller coaster

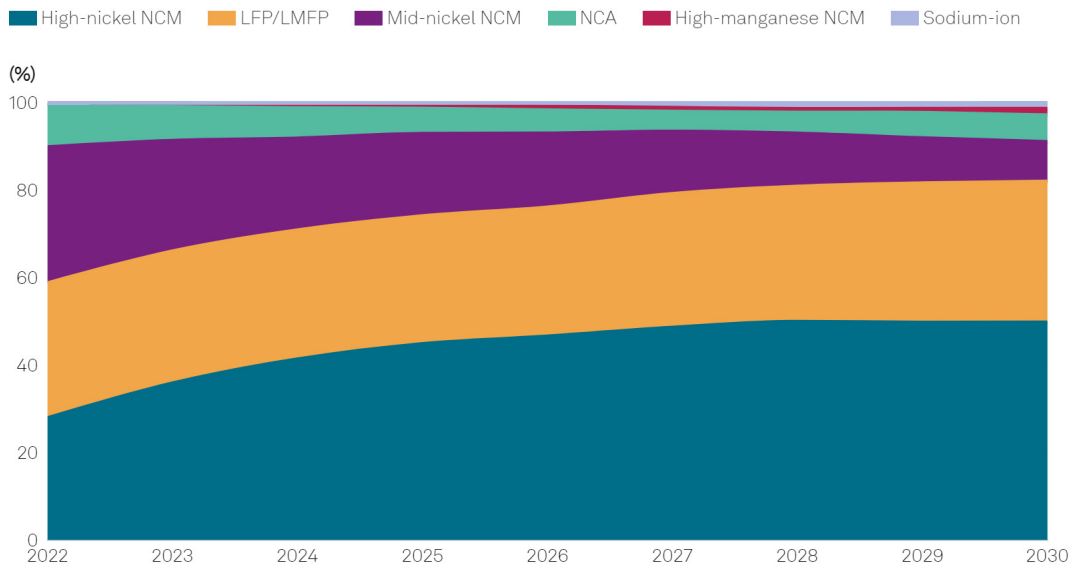
(Lithium carbonate DDP China, yuan/metric ton)



Data compiled Nov. 20, 2023.
DDP = delivery duty paid.
Source: S&P Global Commodity Insights.
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There is a range of battery chemistries for automakers to choose from

Outlook for share of total battery demand for LV applications as measured by GWh



Data compiled October 2023.

LV = light vehicle; GWh = gigawatt-hour; NCM = lithium, nickel, cobalt, manganese; LFP = lithium, iron, phosphate; LMFP = lithium, manganese, iron, phosphate; NCA = lithium, nickel, cobalt, aluminum oxide.

Source: S&P Global Mobility, AutoTechInsight, High Voltage Battery forecast.

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EV market share will expand significantly by 2030

S&P Global Mobility expects the global EV share of LV sales to rise to between 39% and more than 50% in 2030, from an estimated 17% in 2023. The range reflects multiple plausible outcomes based on differences in assumptions including regulatory stringency, consumer acceptance (including driving range) and battery costs. The pace of EV adoption will differ by region, with Europe and mainland China set to be at the forefront among large auto markets, followed by the US. In most emerging market economies, such as India, adoption is expected to be slower, owing to vehicle affordability and power infrastructure challenges, although lower-priced Chinese EVs could accelerate adoption in price-sensitive markets.

Tension between tighter regulations and consumer acceptance of EVs is likely to continue generating turbulence for the businesses of incumbent automakers. Ultimately, a widening gap between auto industry investments in EVs and internal combustion engine (ICE) vehicles means that technology and economies of scale will improve faster for the former, trends that will whittle down the “BEV premium” for prices.

EVs and oil demand

Over time, EVs will erode oil’s near-monopoly as a road transportation fuel.

In a notable inflection point, the global fleet of light conventional ICE vehicles is expected to peak in the next few years and begin to gradually decline. A peak in global LV gasoline and diesel demand is likely to be roughly concurrent with a peak in the conventional ICE vehicle fleet.

The pace of EV adoption will differ by region, with Europe and mainland China set to be at the forefront among large auto markets, followed by the US.

In one gauge of the impact of EV penetration on oil demand, by 2030, EVs could displace more than 3 million barrels per day of oil demand in the Mobility and Energy Future service's base case, on top of the volumes displaced by continued improvements in fuel economy of conventional ICE vehicles.

Just a few years ago, energy circles suggested that destruction of oil demand by EVs was a challenge for the "next decade." Yet policy, industry and market developments have since accelerated the timeline by which the impact of EVs on oil consumption is likely to be felt.

For major oil importers such as mainland China and India, adoption of EVs will have a moderating influence on their oil import dependency ratios and, in turn, the scale of their broader energy import outlays. This dynamic will play out over decades, even in an accelerated EV transition scenario, and oil will prove particularly difficult to dislodge from other sectors of the world economy, including aviation and petrochemicals. ■



Learn more

[Affordability tops charging and range concerns in slowing EV demand](#)

[Mainland Chinese consumers crossing the chasm to mainstream EV adoption](#)

[Average Age of Light Vehicles in the US Hits Record High 12.5 years, according to S&P Global Mobility](#)

[Charging infrastructure incentives gain momentum in key EV markets](#)

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The challenges of aging: Fast and slow

All countries are exposed to demographic transitions, but some will be impacted much sooner than others. Governments must take timely policy action if they are to adequately address the consequential challenges.

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Highlights

Most countries will experience a demographic shift over the coming decades due to falling birth rates and longer life spans.

This change will likely lower real GDP growth and increase budgetary challenges. The extent of the demographic shift, and the capacity of governments to deal with it, is heterogeneous across countries.

While governments will have difficulty in reversing demographic trends, their ability to cap the fiscal risk is more achievable provided policy action is decisive and timely.

Worsening demographics is not a new issue, but its relevance to governments and public finances is growing. Populations are getting older in all 80 rated countries analyzed by S&P Global Ratings, although the intensity of this demographic shift is uneven. We identified 18 countries where by 2035 the elderly population relative to the working-age population (the old-age dependency ratio) will have increased by at least 50%.

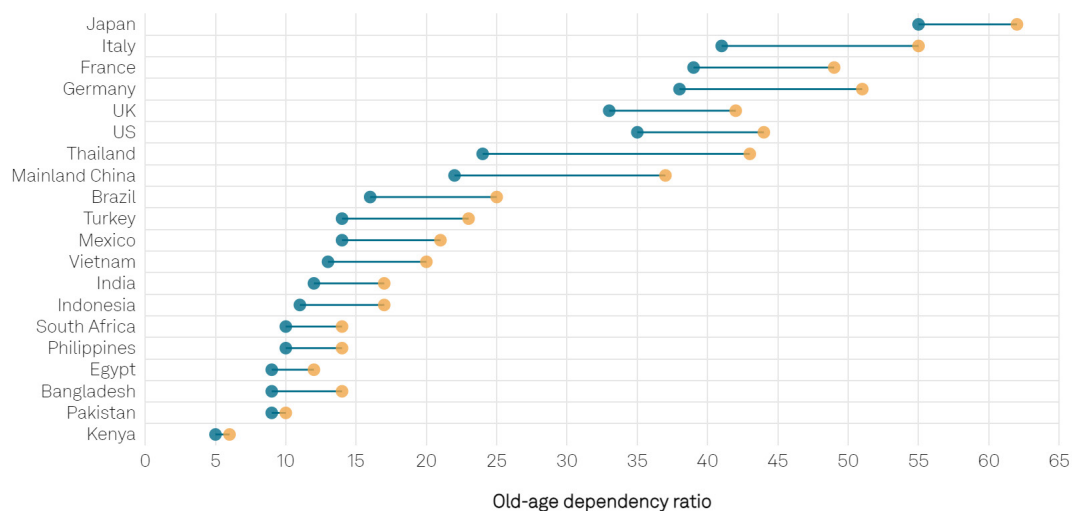
The irreversible demographic shift

By 2035, the demographic shift will be the most significant in five East and Southeast Asian economies — Hong Kong, South Korea, Singapore, Thailand and mainland China. There will be more than two additional elderly people for every 10 working-age residents in these jurisdictions, a near doubling on average of their existing elderly population relative to the working-age population. That these five start with lower shares of elderly in their populations is only partially mitigating, as the aging process will not stop in 2035. The rapid change in these countries' age profiles suggests that care will need to be taken that existing benefits and revenue sources do not face a risk of sudden disruption.

There is stark variation in the pace at which economies will age over the coming decade

Projected change in old-age dependency ratio of 20 most populous economies

● 2022 estimate ● 2035 projection



Data compiled Nov. 27, 2023.
Source: S&P Global Ratings.
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Six countries in our analysis were likely to see their old-age-dependency ratio worsen by less than 1 percentage point, of which five are in sub-Saharan Africa. The birth rate is still high in much of the region, giving them more time to adapt their social security systems.

GDP will be pressured by shrinking labor forces

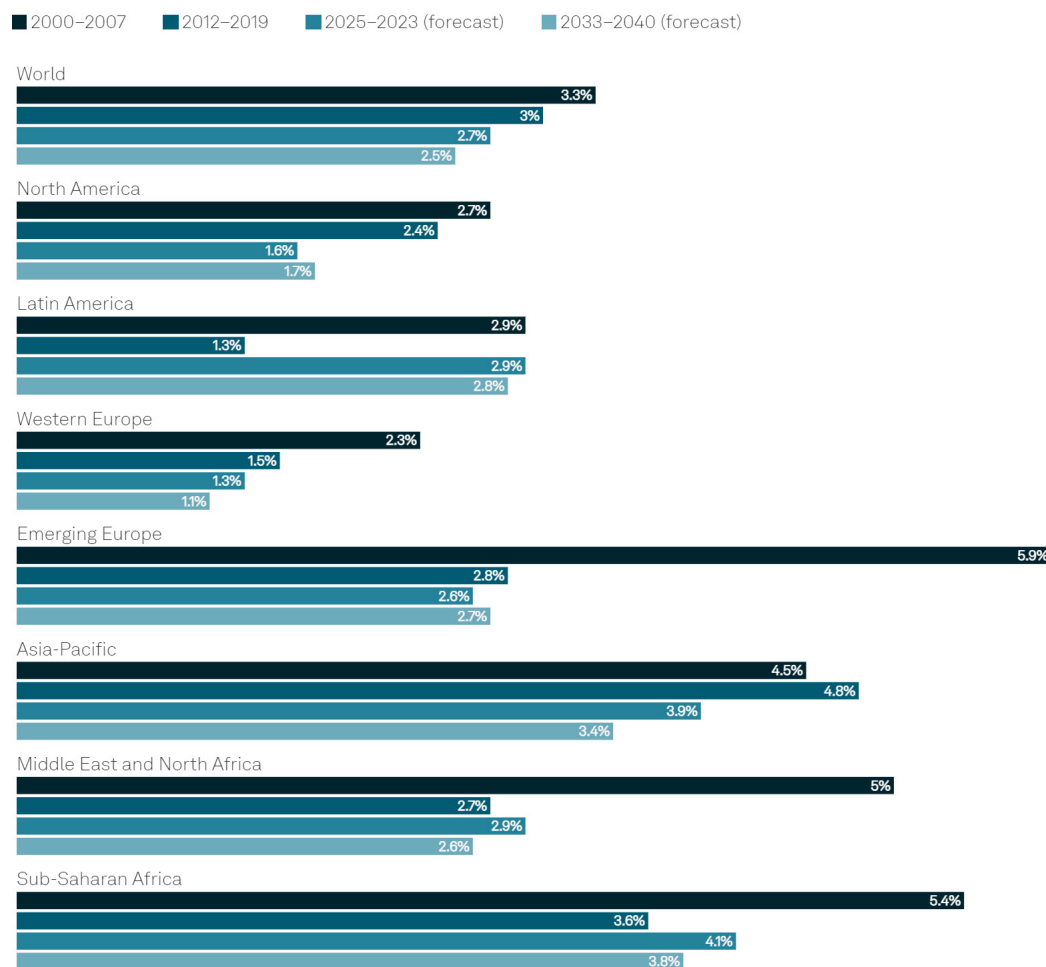
Labor, capital and productivity growth are the three components of long-term growth, so a shrinking supply of labor will pressure real GDP absent other changes. As faster capital accumulation is unlikely to be sustained for a prolonged period, particularly in advanced economies, much will depend on technological development and its impact on productivity. The expected decline in the world's labor force will therefore need to be offset by, for instance, widespread adoption of AI technologies to maintain current growth rates.

Already by 2035, 18 countries will see their elderly populations increase by 50% relative to their working-age populations.

The expected decline in the world's labor force will therefore need to be offset by, for instance, widespread adoption of AI technologies to maintain current growth rates.

Aging population's effect on workforce to put pressure on GDP

Real GDP growth by region (%)



Data compiled Nov. 27, 2023.
Source: S&P Global Market Intelligence.
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Yet, historically, such transformative technological changes have not usually created a persistent change in productivity growth after an initial boost. The implication of the world's changing demographics is clearly of macroeconomic importance as well as being fiscally challenging to governments.

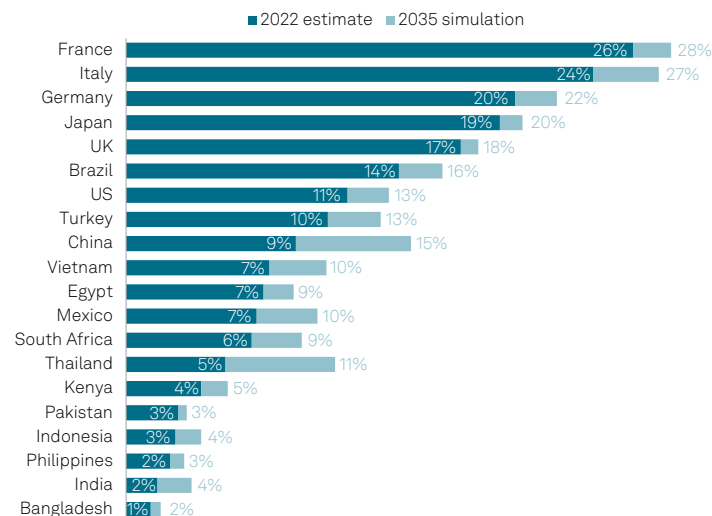
Where are the budgetary pressures most acute?

Aging populations are a formidable challenge for the public purse as social security systems in many

sovereigns are likely to prove unsustainable without policy changes. Pension outlays have been the focus of policy action, but it has become increasingly clear that healthcare spending is at least as important. Understanding their relative composition is paramount to understanding medium- and long-term budgetary pressures. Age-related expenditure includes pensions, healthcare and long-term care. Spending on these items varies massively across regions, with Western and Northern European countries spending an average 19.1% of GDP in 2022, compared with just 2.3% of GDP in sub-Saharan Africa.

Old-age budgetary pressures are not fully correlated with demographic pressures

Simulated change in old-age-related expenditure without new policies of 20 most populous economies (% of GDP)



Data compiled Nov. 27, 2023.
Source: S&P Global Commodity Insights.
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19.1% of GDP: The amount Western and Northern European governments are already spending on age-related items.

In terms of total spending on age-related items, advanced economies are already significantly more burdened than the rest of the world. Countries facing the largest increase in budgetary pressure from this spending are all challenged by a faster demographic shift. Our analysis found that spending growth on these items will increase most intensely in mainland China, South Korea and Thailand. On average, these three governments could be forced to dedicate an additional 5.7% of their GDP to age-related expenditure by 2035, absent any policy change. Family is a key provider of long-term care in these countries, and an important mitigant of related budgetary pressures in the near term. The largest part of related responsibilities falls on women, so as female labor participation increases, pressures for institutionalized support will likely trigger additional demand for government spending.

Getting old before getting rich

Over the next decade, advanced economies will remain well ahead in terms of age-related spending, but emerging market economies will be under increasing budgetary pressure from their aging societies. It is possible that a significant number of people will get old before they get rich. The budgetary implications of these shifts appear more forecastable given the set social security

parameters, while the macroeconomic implications of such a shrinking in the relative labor force is less clear and could undermine emerging markets' aspirations to achieve higher-income status.

- Governments in Colombia and Chile are under significant budgetary pressure owing to their shifting demographics. This is despite a somewhat less intense demographic shift compared with the Asian economies already discussed and reflects the relatively more generous state support for the elderly in terms of pensions and healthcare. Without corrective or offsetting policy actions, by 2035, we expect the Colombian government will need to find 5.3% of GDP to support older populations, and the Chilean government 4.5%.
- Gulf countries are likely to start experiencing aging pressure if generous state benefits continue. Saudi Arabia is one country where pressure appears most intense over the coming decade, and Qatar's age-related spending will more than double, albeit from a much lower base. The coming decade is likely to be just the start of Gulf countries' transition; our simulations out to 2060 imply demographic pressure could seriously cumulate in the region in the years after 2035.

European governments are likely to remain the world's top spenders on age-related items.



Generous state-led social security systems along with universal government-provided healthcare leave the region's governments structurally exposed to their populations' demographic shifts. The pass-through of these demographic shifts to government spending is not one-to-one. Aging Greece, the fourth-oldest country in our sample, is projected to see a decline in age-related expenditure by 2035. This reflects significant structural reform taken by consecutive Greek governments, which has effectively reduced benefits. One example is the elimination of a large part of a pension's automatic indexation. The future challenge for the government may relate to adequate provision of social security benefits rather than to their financial sustainability. Several central and Eastern European governments, such as Romania and Slovenia, have taken insufficient action to fully shield public finances from their worsening demographic profiles, and further reforms are warranted.

Lessons from Japan, the world's oldest country

Active efforts to boost employment rates among older groups have been an important offset to deteriorating demographics. Japan stands out for being head-and-shoulders above all other countries in terms of demographic transition; 29.2% of the population are aged over 65, and a further 1 in 10 are over 80. The skew of the population has been partially offset by increasing employment rates across older age groups over the past decade. This was achieved by pushing out retirement ages, encouraging reemployment among the older population and efforts to improve female labor market participation. In the context of Japan's relatively rigid migration policy, this has slowed the depletion of its workforce.

Decisive and timely policy action can help contain risks to long-term sustainability of public finances

Our framework suggests governments can deal with future imbalances in three main ways:

- Through structural reforms aimed at raising employment levels for older workers and raising potential economic growth
- By front-loading a sustained budgetary consolidation
- Through substantial reforms to social security and publicly funded healthcare systems that go beyond most governments' initiatives so far.

While migration can cushion the budgetary impact of population aging, alone it is unlikely to be sufficient to fully offset it. Firstly, the number of migrants is unlikely to be sufficient to compensate for the decline in the population. While the migrant workforce is at first a contributor to growth and social security revenues, it burdens the budget in the same way as the host population as it reaches retirement age, all other things being equal. Finally, where the fertility rates of the migrant population are relatively high compared to those of the host population, over time they converge as the migrant population adapts to the host country's fertility patterns and the population growth of the migrant population reduces.

Given the growing urgency of tackling the budgetary implications of population aging and the capacity of governments to influence the outcomes of policy, the latter two options in the list above appear most realistic in the near term. Which of these reform approaches, if any, governments decide to invest their political capital in to maximize the beneficial impact on fiscal solvency depends on the specific circumstances in each country.

While significant progress has been made in reforming social security systems, especially among advanced sovereigns, many potential political stumbling blocks remain. Total age-related spending in a typical advanced sovereign today represents more than 55% of a government's total primary spending (total government expenditure without interest payments, including spending on education). This implies that the related spending items will be an important part of any government's budgetary strategy, especially if, as is currently the case, it is aimed at reducing budget deficits following the two consecutive economic shocks since 2020.

Rationalizing public pension and healthcare systems can, if embraced early, help spread the impact of such unpopular policy measures over an extended period, with the consequently lower burden of adjustment shared across generations of taxpayers and voters. Such policy behavior is important for managing the expectations of economic agents, avoiding sudden policy shifts that could alienate electorates or undermine economic growth performance.

Besides the need to ensure adequate social transfers to reduce the risk of poverty, the ongoing demographic shift will affect the age structure of electorates, which could make the political climate for pension and healthcare reform more difficult.

For emerging market sovereigns, the policy issues are also complex. Population aging will likely take place against a backdrop of relatively high rates of economic growth. This growth, coupled with greater economic convergence with today's more prosperous sovereigns, should make the social and fiscal pressures arising from population aging relatively more manageable. These governments may have more time to consider their policy options than today's more economically advanced sovereigns, but they will still need to design fiscally sustainable programs as their populations continue to age, especially given the widening of the pension and healthcare system coverage in several sovereigns. Already, following the substantial policy activity among the advanced sovereigns, our analysis suggests that the need to tackle the outstanding challenges is as pressing for many emerging market sovereigns as it is for the sovereigns in advanced economies. ■



Learn more

[Global Aging 2023](#)

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Can generative AI create a productivity boom?

This technology has profound implications for labor markets, the global economy and equitable development.

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Highlights

Generative AI (GenAI) can accelerate human potential, aid in job creation and augment human labor and intelligence in a way comparable to the impact of mobile devices and the internet over the last 25 years.

GenAI is a leap forward in AI that creates fear and optimism in equal measure about the future of jobs and labor markets. While automation and AI have been around for decades, what sets GenAI apart is its ability to “generate new content” and for humans to “interact with it using natural languages.”

GenAI will be a net positive for labor markets and the global economy. It will enable sizable productivity gains, amplify job creation and stimulate investment in technologies that enable humans to measure what they cannot naturally, yielding more inclusive and sustainable development than ever before.

Generative AI (GenAI) has the potential to augment and accelerate human intelligence, facilitating productivity in unprecedented ways and even generating work that was not possible without the technology. Much attention and focus should be given to using such technologies in ways that benefit society through ethical, inclusive and fair means, allowing these innovations to fuel human progress.

Impact of the internet, mobile and digitalization on jobs, productivity and the global economy

Historically, technology, specifically automation, elicited fear of job losses as machines took over repetitive tasks performed by humans, increasing productivity and eliminating some jobs altogether. Those same technologies also created new jobs. The rate of technology adoption has accelerated since the days when steam engines catalyzed the first industrial revolution, and the more recent fourth industrial revolution was supercharged by the convergence of digitalization, the internet, smartphones, the internet of things and AI. To paraphrase American computer scientist Ray Kurzweil’s “Law of Accelerating Returns,” technological advances tend to build on themselves, increasing the rate of further adoption. The recursive properties of technology apply not only to technological development but to economic development as well.

Yet concerns about large-scale job displacement resulting from technological advancements are neither new nor invalid. Technology is a change agent, and some level of resistance to change is part of the human condition. Advancements such as digitalization, the internet and mobile technology have combined to create a net positive impact. According to [Internet Association data](#), the sector accounted for 10% of US GDP and generated over 18 million direct and indirect jobs. The statistics mask the “how” and the “why.” Though the first e-commerce transaction was in the early 1980s, the launch of the World Wide Web in 1993 enabled the explosive growth of the internet as a viable medium by allowing web browsers to view textual information and pictures and, perhaps most importantly, to hyperlink content together using URLs. Before this, the internet was largely text-based, comprising digital messages and bulletin boards. In the late 1990s, the businesses that introduced e-commerce leveraged this technology to formulate new business models for conducting commercial activities, a “killer app” not dissimilar to ChatGPT and other forms of GenAI today. GenAI technology’s adoption process had many periods of rapid development followed by halts in implementation, similar to e-commerce. While not entirely new, technologies such as ChatGPT galvanized GenAI technology’s utility to end users, spawning widespread use and subsequent technological advancement in many similar technologies.

Similarly, smartphones, first developed in 1992 (IBM Simon), were largely dormant for a decade until the iPhone launched in 2007. This helped make the internet accessible to a much larger global population through apps, a new type of software distribution giving smartphone users a nearly infinite ability to customize their devices. Global internet penetration has reached 65.7%, with about 5.3 billion people having access to the internet and almost 90% using it via mobile devices, according to the “[State of Mobile Internet Connectivity Report 2023](#).” The internet and mobile have helped democratize access to the digital economy, reducing the digital divide.

Technology is a change agent, and some level of resistance to change is part of the human condition.

GenAI, too, has the potential to fundamentally transform the global economy and labor force. Much of the current focus concerns labor productivity, with productivity savings estimates ranging from [15% to 40%](#), raising questions about whether it will generate large-scale disruption of the labor market by displacing humans. History shows that productivity growth, powered by technology, has been a key driver of economic growth, creating new jobs and new industries as people and capital are increasingly at liberty to pursue more important, higher economic value outputs.

GenAI and the future of employment

GenAI is already being used to automate tasks previously performed by humans. As AI-powered chatbots used in customer service roles become more sophisticated, fewer people are needed to answer basic queries, for example. While previous

waves of automation affected those engaged in manual labor tasks, GenAI could encroach on tasks performed by knowledge workers, including data entry and data extraction, and by those deemed more highly skilled. This could lead to job displacement in sectors including retail, manufacturing and transportation. If it does, there could be unprecedented demand placed on governments to support reskilling, which would have a major economic impact.

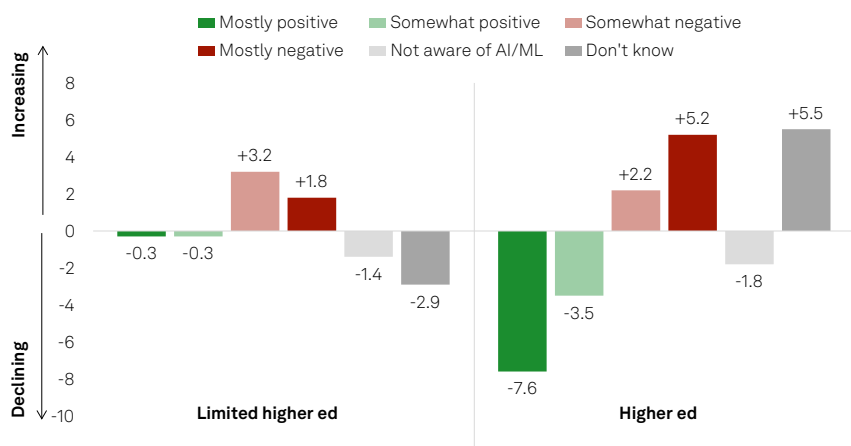
Worries are emerging among people who were not that concerned previously. S&P Global Market Intelligence’s 451 Research VoCUL: Connected Customer, Consumer Representative survey conducted in the second quarter of 2023 found the proportion of higher-education respondents that were “mostly positive” about the impact of AI on their careers decreased to 14% from 22% six months earlier, around the time that ChatGPT launched.¹ Higher-education respondents’ net positive views fell to 12% from 31%, much more pronounced than the 16% to 11% decline seen in non-higher-education respondents.

¹ Sampling is representative of the US online population aged 18 and over across multiple demographics: age, gender, household income, ethnicity and geographic region. Sample size: 5,000. See the full survey [here](#) (subscription required).

History shows that productivity growth, powered by technology, has been a key driver of economic growth, creating new jobs and new industries as people and capital are increasingly at liberty to pursue more important, higher economic value outputs.

Respondents with higher education are increasingly concerned about impact of AI on career

Change in perception from Q4 2022 to Q2 2023, in percentage points



Data compiled Q2 2023.

ML = machine learning.

Q. Over the next two years, do you think AI/ML will have a positive or negative effect on career?

Base: All respondents (n=1,667).

Source: 451 Research's VoCUL: Connected Customer, Consumer Representative, Q2 2023.

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GenAI can also augment human capabilities, making it possible for people to do their jobs more efficiently and effectively. AI-powered tools can help doctors diagnose diseases more accurately, and AI-powered software can help lawyers research and write legal documents more quickly.

The launch of Microsoft Excel in 1987 is a good example of how digitalization can impact the labor market. The number of US workers employed as bookkeepers and accounting clerks declined by about 500,000 to 1.5 million between the late 1980s and 2000, Morgan Stanley research using US Labor Department statistics shows. In the same period, the number of US workers employed as accountants and auditors rose to 1.5 million from 1.3 million, while management analysts and financial managers increased to 1.5 million from 600,000.

Creating new jobs

GenAI will create roles that do not currently exist and, in many cases, that we cannot even imagine — as has happened during past waves of technology adoption. The role of search engine optimization specialist emerged as marketing moved into the digital realm, as did professions in technology such as data scientist and machine learning engineer.



GenAI will create roles that do not currently exist and, in many cases, that we cannot even imagine.

Of those surveyed by the World Economic Forum for its [“Future of Jobs Report 2023,”](#) “49% anticipate AI to be a [catalyst for job creation](#), while 23% also expect it to drive job displacement. This doesn’t necessarily imply job elimination, but rather a shift in roles and the skills required to perform them.”

GenAI has the potential to replace or reduce the need for humans in certain jobs, such as ad creation, customer service and software code writing. These professions have already been affected by AI to some extent. What makes GenAI different from traditional AI is its ability to “create/generate” new content. Coupled with its “natural language capabilities” and “multimodal interaction” (text, image, voice, etc.), it closely mimics human thinking and interactions. GenAI can also help accelerate the “creator economy” (e.g., jobs producing digital content). There are about 50 million people who consider themselves “creators,” but GenAI could significantly expand this in areas such as the arts, music and movies. With its natural language interface, GenAI has the potential to democratize access to AI, giving those who may not know computer programming the opportunity to interact in their native language with AI to create new products and services.

With its natural language interface, GenAI has the potential to democratize access to AI.

S&P Global believes that digital transformation will add roughly \$7 trillion of additional debt to global capital markets by 2030, based on an Organisation for Economic Co-operation and Development report (see [“Global debt 2023”](#) to learn more). However, we also believe that GenAI could have a transformational economic impact on the following areas, and more:

- **Green energy transition:** GenAI could be pivotal, especially with advancements in “under the hood” technologies such as machine learning, neural networks and network science, to develop new and better products that meet sustainable

criteria. GenAI could also help with energy demand forecasting, optimizing power grids and shifting back to a circular consumption economy from a linear one. The International Energy Agency, as part of its [“Net Zero by 2050”](#) road map, estimates that 30 million more people will be working in the clean energy sector by 2030.

- **Education and reskilling:** With its natural language capabilities, GenAI is an ideal tool to deliver training in local languages and help the world’s non-English-speaking population do jobs that require English language skills. This could significantly increase job market access and improve labor participation in developing countries, leading to more inclusive participation in global growth. GenAI could also create personalized tutors or coaches that focus on individual learning needs.
- **Agricultural technology:** Agriculture could benefit from using the internet of things (devices such as sensors that enable tracking and monitoring of physical processes such as temperature, soil moisture, etc.), drone technology and GenAI to monitor crops, improve yields and optimize the farm-to-table food supply chain. A significant agrarian workforce could be retrained to develop skills and create new jobs such as precision agriculture analysts, drone pilots and sustainable development practitioners.
- **Healthcare:** AI is still in the early stages of its true potential. As of October 2023, the Food and Drug Administration has approved only 171 medical devices that incorporate traditional AI functionalities, and none incorporating GenAI. The technology will play an important role across the sector, from disease diagnosis and epidemic prediction and management, to drug discovery and manufacturing, to developing personalized medicines and treatments.

It is important for individuals and governments to prepare for the changes that GenAI is likely to bring. This includes [investing in education and training](#) to help workers develop the skills they need to succeed in the digital economy, where jobs will require a mix of technical skills and human creativity and judgment.

Realizing the positive potential of GenAI

Two sides of the coin

As technology related to GenAI matures, dialogue surrounding its governance, ethics and proper regulation is crucial. This is underscored by the digital divide between developed and developing economies as well as geographic, demographic, education and income-based paradigms. How these are fed into AI algorithms could propagate unwanted bias, such as overrepresenting or underrepresenting a particular segment of society. For example, some AI-based police tools used to predict where and who will commit a crime have been [criticized for generating bias](#) by targeting low-income communities and discriminating by race. In short, there is a nonnegligible risk that implementing AI in some processes could increase inequalities and digital imbalances if not carefully governed.

Significant investment is required to explore and build robust data systems and IT infrastructure, meaning larger companies are more likely to have access to discriminative AI/GenAI-based technologies or to leverage their abilities. GenAI is likely to become the provenance of large, multinational companies operating in developed economies, particularly among well-educated, high-income populations.

However, there are technologies that help small and medium-sized enterprises (SMEs), particularly those with compelling business models, to compete with their deeper-pocketed, larger peers. Namely, the growing use of open-source and proprietary technologies is facilitating the completion of a number of business use cases through technical conduits such as integrations and application programming interfaces (APIs). For example, when

Meta made a commercial version of its Llama-v2 LLM available to the public, it democratized access to this innovative technology, enabling the research community and smaller organizations to harness the potential of AI.

SMEs account for nearly 90% of businesses and 50% of worldwide employment, according to the [World Bank](#). Formal SMEs contribute up to 40% of the national income of emerging economies. If such enterprises creatively apply AI in their business models, the access channel could be expanded through more equitable means, provided there is adequate education, infrastructure investment and regulation to protect those still “outside of the system.”

Regulation's complex face

Google CEO Sundar Pichai said “AI is too important not to regulate, and too important not to regulate well.” The regulatory environment for AI is rapidly changing, with the EU releasing the AI Act — the world’s first comprehensive AI law — which, once effective, will set rules that establish obligations for providers and users, varied in risk level, as defined by the law. Similarly groundbreaking is a Chinese law aimed at regulating GenAI, effective August 2023. The US is taking a more decentralized approach. A number of elements in privacy legislation include provisions and protections through a combination of data privacy laws and algorithmic accountability and fairness standards. A call for federal privacy legislation was part of the Biden administration’s Executive Order issued Oct. 30, 2023, which also requested the developers of the most powerful models to share safety test results with the US government and to notify the federal government during the training process, among other provisions.

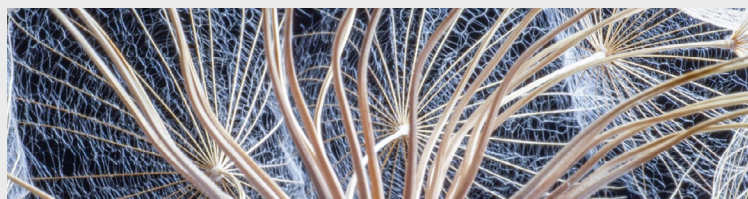
As technology related to GenAI matures, dialogue surrounding its governance, ethics and proper regulation is crucial.

GenAI brings forth additional challenges related to intellectual property, which itself, even without considering AI issues, is subject to varying laws and standards and differing definitions and protections by jurisdiction. Perception is another challenge. Much of the content generated through creative GenAI functions has a quality or “realness” because of an emulation that originates within the observers’ brain. A similar principle has led to many successful court rulings in copyright infringement cases, in which a particular likeness between two works was partially dependent on the observer’s familiarity with another work (such as [Ed Sheeran’s lawsuit win](#) in May 2023).

Perhaps most insidious is the GenAI technology surrounding so-called deepfakes, which create a digital likeness through audio or video emulation to make it look like someone has said or done something they did not, using a combination of real content and synthesized content. Such technology has been weaponized in the Ukraine-Russia war and other conflicts. For example, likenesses of both Ukrainian President Volodymyr Zelenskyy and Russian President Vladimir Putin have been shown in fake news conference videos in false acts of surrender, understandably causing confusion among their citizens as well as their combatants. This technology makes it easy to disseminate misinformation and is especially attuned to acts of cyber warfare.

How AI regulation might guardrail fairness and integrity

We anticipate that AI regulation, currently in its infancy and likely to evolve substantially over the coming months and years, will blend factors including education, protection and regulation. Education provisions will likely set standards and provisions to promote safe and fair use of AI technologies. Protection provisions will likely include information and privacy protections for those with access to AI systems, as well as protections for those who do not, as deleterious consequences stemming from misuse or malicious use of AI can have broad societal implications. Finally, regulation will likely need to balance the need for growth of technology in ways that promote equity, inclusion and fairness without constricting the ability of the technology itself to grow, the push-pull nature of which is often a byproduct of technological advancements more generally. ■



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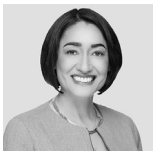
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