



PGIM

MEGATRENDS

THE TRANSFORMATION OF LABOR MARKETS

Winners and losers in a new era

FALL/WINTER 2023-2024

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INTRODUCTION

Among its many tragic human and economic consequences, the COVID-19 pandemic left labor markets in turmoil. In a matter of weeks, hundreds of millions of workers around the world saw their income reduced or disappear entirely. For example, more than 40 million Indian migrant workers returned home, 32 million workers across Europe were furloughed and 22 million Americans lost their job.^{1,2,3}

Even those that kept their job saw their working hours plunge – dropping by almost half in some countries.⁴ Globally the sharp drop-off in working hours was equivalent to 400 million full-time jobs – roughly six times the total decline experienced from peak to trough during the Global Financial Crisis.⁵

Debates continue to rage about the long-term consequences of COVID-19 on labor markets. These include the impact of massive fiscal support on labor availability, the lingering effects of long COVID on labor force participation, media accounts of a Great Resignation and so-called “quiet quitting,” as well as a desire for greater work flexibility, reflecting a rethinking by many of how work fits into their lives.^{6, 7, 8, 9}

While these issues get much media attention – and some may prove to have an enduring impact – they often obscure the profound structural changes to labor markets that were already underway prior to COVID and that will ultimately have a much greater impact on reshaping the global workforce.

Specifically, as the pandemic’s impact on workers begins to fade, four structural forces are gathering momentum:

1. **The economic drag from aging across most countries** will not be fully offset by growing working-age populations in sub-Saharan Africa and South Asia due to the significant hurdles they face – including institutional fragility, poor business environments, low human capital and climate disasters.
2. **Structural mismatches between labor demand and supply** are already evident but accelerating

given the pace of technological change, an aging workforce and the reshoring of global supply chains.

3. **The rise of new technologies**, especially AI, will lead to a new anxious phase in the complex, double-edged relationship between technology and labor.
4. **Slowing globalization**, which is disrupting the pattern of global labor demand and **potentially setting the stage for a resurgence of organized labor** and growing worker bargaining power after an era of increasing returns to capital, especially in the US.

For investors, the forces reshaping global labor markets will impact wages, productivity, unemployment, economic growth, inflation and fiscal deficits – creating a new roster of winning and losing industries and countries.

To understand the macroeconomic and investment implications, we have drawn on the insights of over 25 investment professionals across PGIM’s equity, fixed income, real estate and private alternatives managers – as well as leading policymakers, labor economists and other academics. Chapter 1 identifies the driving forces reshaping labor markets today and in the future. Chapter 2 looks at the macroeconomic implications of these new workforce dynamics. Finally, Chapter 3 identifies the potential winners and losers – by both sector and region. We also leverage new proprietary research conducted in partnership with the Brookings Institution to delve into US labor market mismatches at a granular state and city level.

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CHAPTER 1

THE FORCES TRANSFORMING GLOBAL LABOR MARKETS

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Global labor markets are at a critical turning point and will be reshaped by demographic changes, labor mismatches, technology and slowing globalization.”

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CHAPTER 1

THE FORCES TRANSFORMING GLOBAL LABOR MARKETS

The entry of China into the World Trade Organization in 2001 ushered in a “golden era” of globalization replete with outsourced manufacturing, soaring international trade and complex multinational supply chains. In many ways, the integration of China and other large emerging countries into the global economy can be considered a positive labor supply shock, initiating an era of “abundant labor.”

A little more than two decades later, this era is sunsetting. Global labor markets are at a critical turning point and will be reshaped by demographic change, potentially deepening structural mismatches, rapid technological change and a slowdown of globalization.

1. A new demographic map for labor markets

Global labor supply and demand will be transformed by powerful demographic trends in the decades ahead. But these demographic forces will impact regions very differently: (1) the “dual aging” of both workers and firms in North America and Europe is leading to declining entrepreneurship and labor mobility; (2) the transition from a demographic dividend to a demographic drag in East Asia and South America; and (3) the rise of a massive new workforce in South

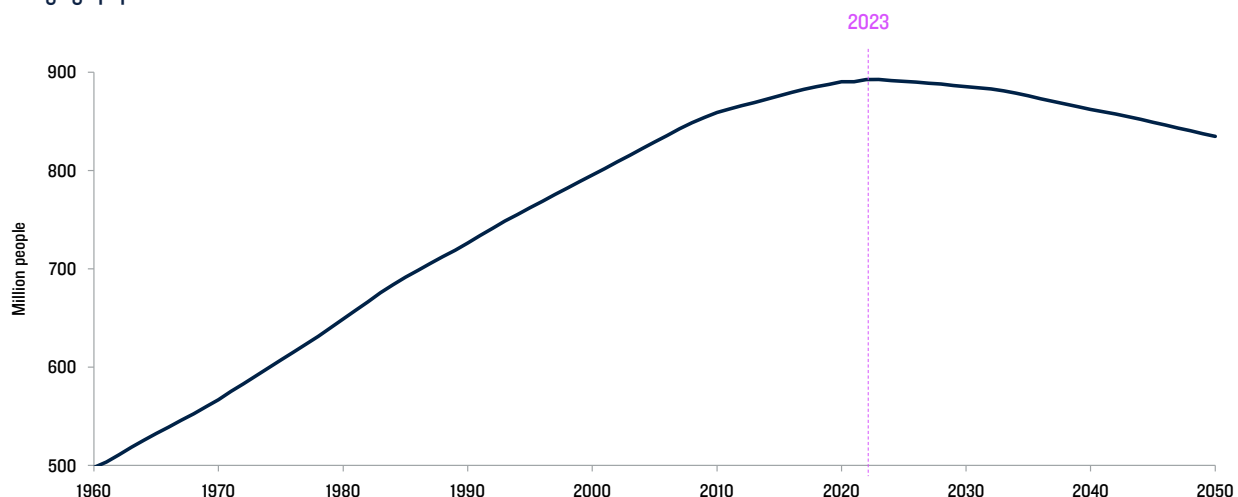
Asia and sub-Saharan Africa, but any potential demographic dividend is threatened by weak institutions, fragile economies, low human capital investments and significant climate challenges.

North America and Europe: The Dual Aging of Workers and Companies

The rapid aging of the workforce is one of the most profound issues facing advanced economies and is now at a tipping point in the OECD (Exhibit 1).¹⁰ Europe alone will see over 40 million workers exit the labor force between now and 2050 – roughly equivalent to the entire current workforce of France or Germany. In the US, the share of older workers – aged 45 and above – has risen from 27% in the 1980s to around 45% today.¹¹

Exhibit 1: A shrinking workforce across OECD countries

Working age population



Source: World Bank. Data as of August 2023.

While aging of the labor force in advanced economies is well-understood, the “dual aging” of companies in these economies is less appreciated. In fact, the US economy has experienced a striking shift towards older workers *and* older firms since the mid-1990s (Exhibit 2). Mature firms (11 years and older) used to employ about two-thirds of workers in 1987; by 2017, this had grown to over 80%.¹²

The dual aging of workers *and* companies has major implications for labor force participation, entrepreneurship, job destruction and unemployment. Older, more settled workers are less willing to switch jobs, and older companies are less likely to destroy jobs, leading to a lower unemployment, less turbulence, less new business formation as well as a growing concentration of older and bigger firms. To pick one example, there is a striking correlation between the rate of entrepreneurship and the average growth rate of the working-age population across different US states (Exhibit 3). Since the 1980s, this has led to a persistent decline in the share of startup firms in the US economy from around 14% to below 9% in 2020.¹³

East Asia and South America: From demographic dividend to demographic drag

Over the last few decades, favorable demographics – with lower fertility rates and declining dependency

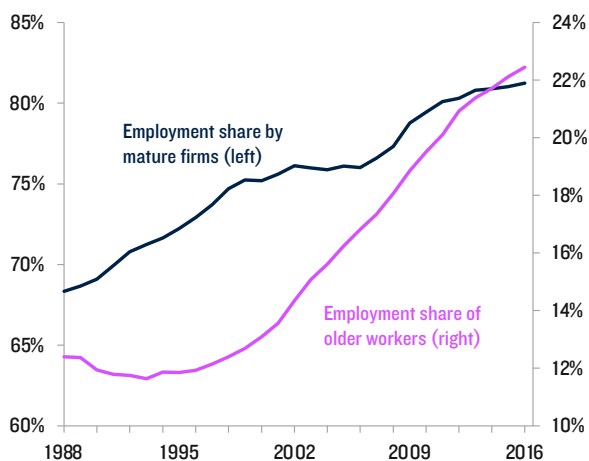
ratios – played a meaningful part in the economic success stories of Asia and Latin America.¹⁴ In countries like South Korea and Singapore, demographics are estimated to have boosted GDP by as much as three-quarters of a percent *annually* between 1960 and 2000.¹⁵

The dual aging of workers and companies has major implications for labor force participation, entrepreneurship, job destruction and unemployment.

Going forward, these supportive demographic tailwinds will become a drag on growth as dependency ratios reach an inflection point and the share of the working-age population begins to shrink. Some, like South Korea, Russia and China, have seen their dependency ratios already increase, while others, like Brazil, Mexico and Indonesia, are about to turn upwards (Exhibit 4).

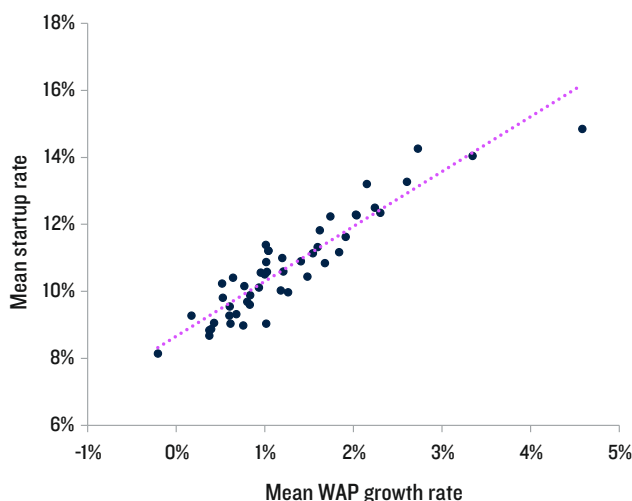
The sharpest reversal is in China where the one-child policy has accelerated the demographic transition dramatically. China now stands at a demographic cliff, with 40 million workers retiring by 2025, leading to a

Exhibit 2: The dual aging of the workforce and firms in the US



Source: Crump, Eusepi, Giannoni and Sahin (2019, 2022). Data as of August 2023. Note: Employment share of 55-and-above workers and employment share of firms 11 years and older.

Exhibit 3: An aging population diminishes entrepreneurship
Startup rate and WAP growth across US states

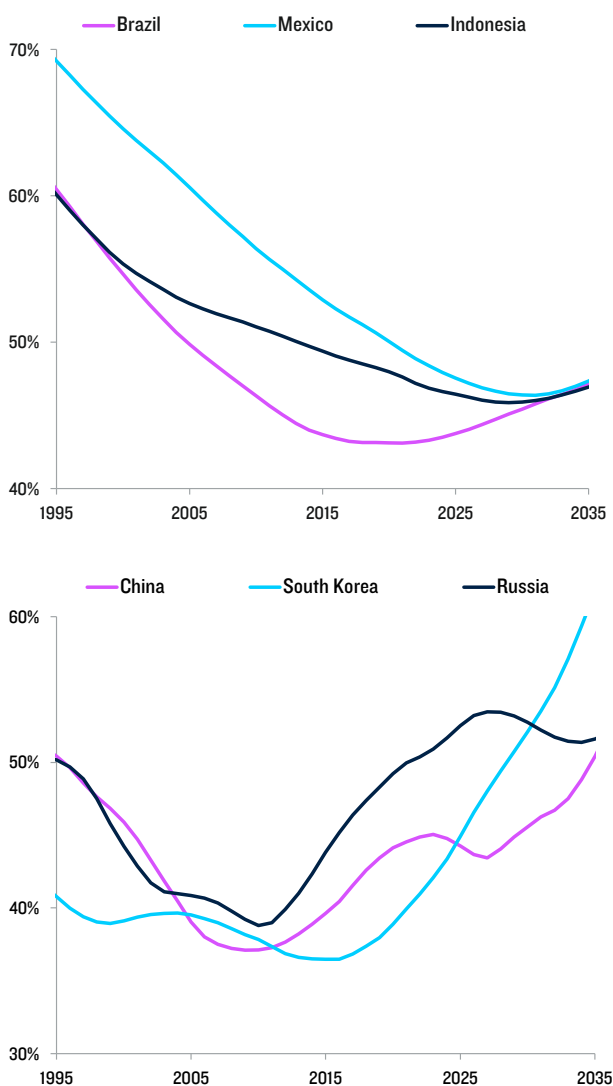


Source: Karahan, Pugsley and Sahin (2022). Data as of August 2023. Note: WAP refers to working age population.

reduction of 35 million in the working-age population over the same period. Indeed, absent a dramatic shift in migration policy, China is projected to face a contraction in its working-age population between now and 2050 of well over 200 million – a decline the size of the entire current workforce in the United States!

Aside from the direct impact on workforce size and GDP growth potential, the rapidly rising dependency ratios in East Asia and South America will also lead to growing fiscal strains via social expenditures on pension and health care systems – and to shifting

Exhibit 4: Dependency ratios are turning Dependents as a share of working-age population



Source: World Bank. Data as of August 2023.

iii South Asia refers to Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

consumer demand patterns (e.g., more health care, nursing and medicines, less schooling, restaurants and motor vehicles).¹⁶

South Asia and sub-Saharan Africa: The false promise of a demographic dividend?

By 2030, working-age populations will be declining in all but four of the 30 largest economies (measured by GDP in US dollars) around the world. In contrast, the two regions that will see a significant growth in working-age populations and lower dependency ratios, are South Asia and sub-Saharan Africa.ⁱⁱⁱ Over the next three decades, South Asia will see a 300 million net *increase* in working-age population and sub-Saharan Africa will see an increase more than twice as large. Collectively, this growth implies that – even with the demographic headwinds in the rest of the world – the global labor force will have an additional 860 million workers in 2050 relative to today.

However, demographics alone do not determine economic destiny. A growing workforce driving economic prosperity requires high levels of human capital, an environment conducive to robust foreign and domestic investment, well-functioning and trusted institutions as well as stable political and regulatory regimes. Unlike East Asia and much of Latin America, which reaped a prior demographic dividend, these foundational characteristics are weak or absent in many of the countries with the biggest net increase in workers. With some notable exceptions, such as India – projected to be one of the fastest growing economies over the next decade – many of the countries that could be the beneficiaries of the next demographic dividend are plagued by corrupt and fragile institutions, political instability, a business environment that limits the attractiveness of foreign direct investment or domestic capital formation and low levels of literacy and education. Many of these countries are also heavily reliant on agriculture – which employs around 40% of the workforce in both South Asia and sub-Saharan Africa – but face real productivity and health challenges given significant climate risk from extreme heat, droughts and other disasters.

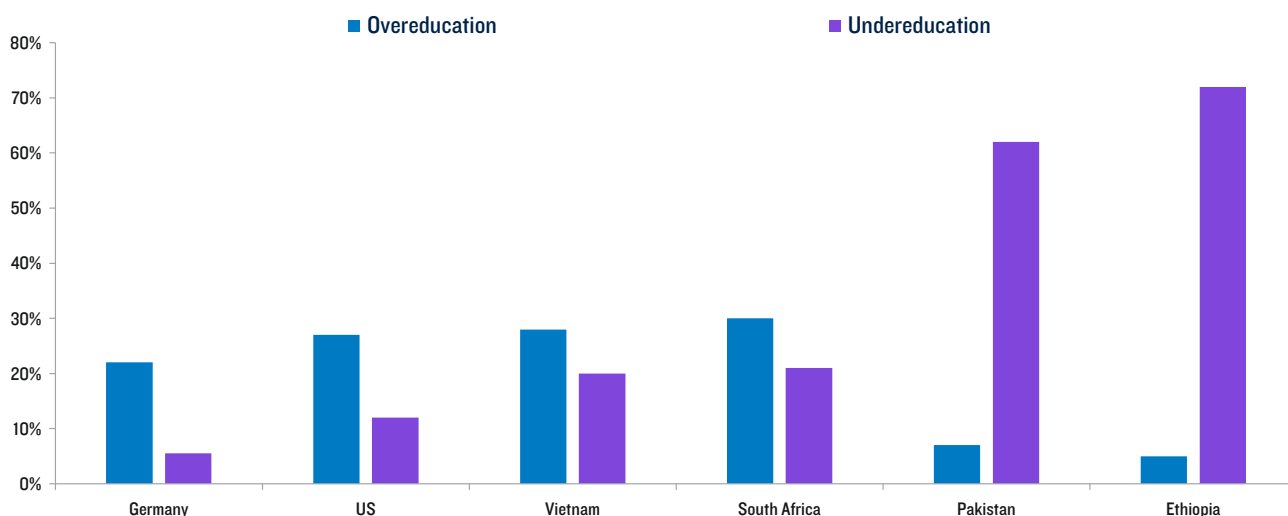
2. The growing risk of structural labor market mismatches

Examples of labor market mismatches abound. In Germany, 1 in every 6 professions is struggling with a lack of skilled workers.¹⁷ Similarly, while many focus on China’s aging population and bemoan a looming labor shortage, today the youngest Chinese workers are suffering from an unemployment rate above 20% – nearly four times the overall rate.¹⁸ This elevated youth unemployment is due in part to cyclical factors, but structural factors – namely a misalignment between the jobs recent graduates want and are qualified for and the jobs that are available – are most prominent.^{19, 20}

A third of university graduates end up in jobs that do not require their full level of education.

Looking ahead, labor market mismatches are poised to increase. Demographic changes in the global workforce, the emergence of new tech paradigms and the resurgence of nearshoring and reshoring are creating an environment where labor mismatches will be potentially increasing.

Exhibit 5: Overeducation and undereducation coexist
Percentage of overeducated vs. undereducated workers



Source: International Labor Organization. Data as of August 2023.

Education mismatches

The International Labor Organization estimates that almost one billion workers worldwide have jobs that don’t match their education levels: 675 million are undereducated (mainly in low- and middle-income countries) and 258 million are overeducated (mainly in high-income countries).²¹

Many lower- and middle-income countries are struggling with undereducation and a workforce that lacks the full qualifications for their current job. In contrast, overeducation is prevalent in both Europe and the US, where roughly a third of university graduates end up in jobs that do not require their full level of education (Exhibit 5).^{22, 23} This comes with a high cost for individuals – in the form of lower wages – but also impacts overall economic output and productivity, particularly because overeducation tends to be persistent once a worker takes a job with lower requirements.²⁴ This has also led to sizable mismatches in vocational jobs – such as electricians and plumbers as well as specialized manufacturing and technicians – that are deemed “undesirable” by many young workers.

Cross-country geographic mismatches

There are also significant geographic mismatches between available jobs and qualified labor across the world. There are over 300,000 unfilled nursing jobs

Taxonomy of labor market mismatches

Cyclical mismatches arise when (a) in a recession, the number of unemployed exceeds the number of job vacancies and, as a result, labor demand cannot match labor supply, (b) conversely, in an overheated economy, job vacancies exceed labor supply either across the economy or in specific sectors such as the crypto bubble of the early 2020s or delivery and warehouse workers during the pandemic.

Structural mismatches, our focus in this report, occur when aggregate imbalances arise from persistent shifts in the supply and demand for workers. For example, a structural mismatch could result if the unemployed mostly search for work in shrinking industries – because of their skills, qualifications or location – while vacancies in growing sectors remained unfilled. Examples of structural mismatches would include coal mining in the U.K. (shrinking demand), chip manufacturing in the US (rising demand), nurses in Germany (shrinking supply), or agricultural workers in China (overqualified labor pool).

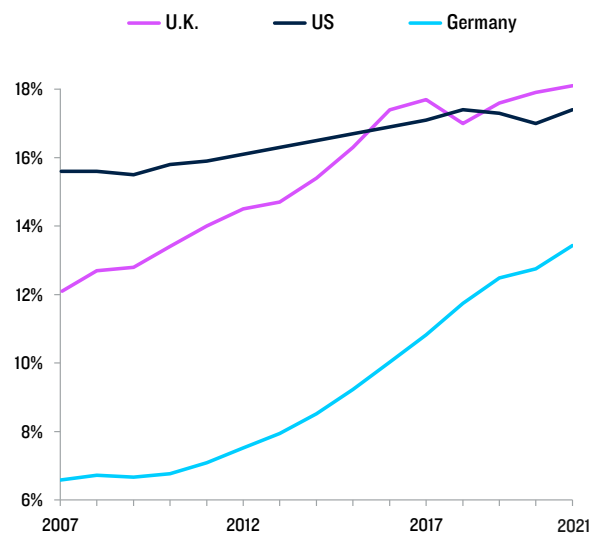
We use **education mismatch** to refer to both skill and qualification mismatches. These mismatches can exist in both directions. For example, some workers possess skills which are underutilized in their current job, while others struggle because, through lack of training and experience, they don't possess the necessary skills.

Geographic mismatches happen when both demand and supply for labor are available but in distant locations. That is, a match would be possible if either labor or jobs would move. When it comes to labor moving, there are two aspects – *migration*, which is people moving from one country to another for work, and *mobility*, which is moving within a country from one location to another for a job.

in Germany, for example, while 1 out of 10 nurses in Brazil is unemployed.²⁵ Targeted immigration of workers that fill a particular skill gap is an obvious solution to matching the need for workers in one place with the available and unemployed labor pool in another region.

While fact and fiction around immigration are persistently confused, the long-term trend is clear. Over the past two decades the share of the workforce in developed countries that is foreign-born has increased consistently (Exhibit 6).^{26, 27, 28} In Canada, for example, immigrant workers accounted for 84% of the total labor force growth in the 2010s.²⁹ Immigrants are also employed at a higher rate than native-born workers and take on low- and high-skilled jobs in the service industry and other sectors.³⁰ In the US, the surge of nearly 5 million foreign-born workers entering the labor force over the past two years has equaled the total net increase from the entire pre-COVID decade.

Exhibit 6: International talent has become crucial
Share of foreign-born workforce



Source: U.K. Office of National Statistics, US Bureau of Labor Statistics and Germany's Federal Statistical Office. Data as of August 2023.

It is striking to note that of the 550 U.S. unicorns – startups valued at over \$1 billion – 79% were founded by an immigrant or a first-generation American or are currently operated by an immigrant.

Policies for targeted work visas to mitigate specific mismatches range from short-term, seasonal work permission to longer-term visas for workers with especially desired skills. In Europe where the workforce is likely to contract most rapidly, Germany has a special partnership with Brazil as part of an effort to attract skilled workers – like nurses.³¹ Even Italy’s far-right government – which campaigned on a nativist platform that labeled asylum seekers as a threat to Italian people and their culture – plans to issue 425,000 work visas to non-EU nationals by 2025 after ongoing complaints from various industries including tourism, health care and construction about difficulty finding workers.³²

Labor mobility within a country

Geographic mismatches *within* a country should be easier to resolve than those *across* countries. However, over the past few decades many countries have seen a decline in labor mobility. China had an elevated mobility rate of almost 40% through the 1970s and 1980s due to government policies that encouraged movement – in the 2000s the mobility rate there has dropped below 30%.³³ The labor mobility story in the

US is similar albeit at a lower level. Almost one-third of US workers relocated for a job in the 1980s; that number has fallen to around 5% (Exhibit 7). And a recent study indicated that 80% of young American adults live less than 100 miles from where they grew up, limiting the radius of economic opportunity that is accessible.³⁴ Looking ahead, higher mortgage rates and lower home affordability will only contribute to a further decline in labor mobility.

3. Technology: The weightless economy shifts demand for workers

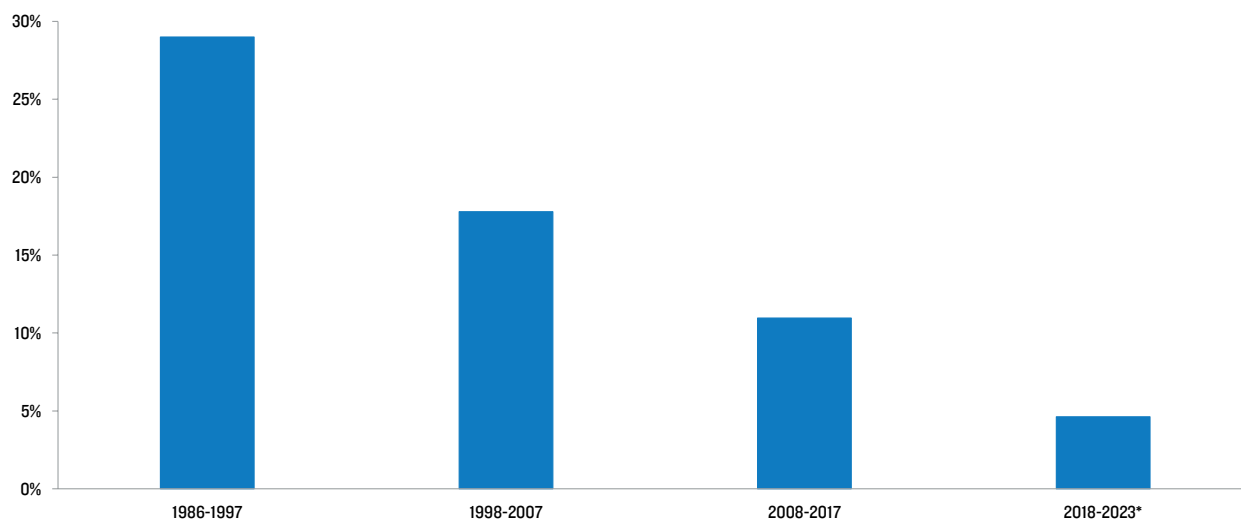
Technology has a long and complex relationship with labor – at times displacing it (e.g., horse carriage drivers and typists), at times enhancing worker productivity (e.g., tractors and canning machines), at times creating new jobs (e.g., data scientists and software engineers) and at times reducing wages (e.g., London cabbies after Uber). For investors, it is critical to look past hero-villain narratives and focus on three key aspects of the interplay between technology and jobs.

Modern weightless firms recast labor demand

Physical capital and massive payrolls are less critical to modern firms. Instead, investment in intellectual property and other intangible capital has become a critical driver of growth in the knowledge economy.

Exhibit 7: US labor mobility has been declining since the 1980s

Share of working population relocating for a job



Source: Challenger and Gray. Data as of August 2023.
Note: *Available data through first quarter 2023.

Indeed, over 70% of the value of the S&P Euro 350 and 90% of the value of the S&P 500 now comprises intangible assets.³⁵

The rise of “weightless” firms has also led to a polarization of jobs – and wages.³⁶ That is, high-paying jobs in sophisticated fields like technology, finance and science are being created along with low-skilled, low-paying jobs in food processing, logistics and personal care.³⁷ This has contributed to a hollowing out of jobs in the middle of the skill and income distribution.³⁸ For those benefiting, mainly workers with sophisticated cognitive skills, improving technology has been complementary to their efforts, expanding the impact or technical precision of their work. For those who have been harmed, technology has provided lower-cost substitutes for the output they were producing and because of global integration, they have faced increased wage competition from abroad. Consequently, many of these workers have moved to relatively low-paying jobs.³⁹

Investment in intellectual property and other intangible capital has become a critical driver of growth in the knowledge economy.

Despite the anxiety, technology tends to complement rather than replace labor

While media headlines about the alarming job displacement power of new technologies abound, the historical evidence suggests the risks are somewhat overblown. For instance, in 1900, 41% of the US workforce was employed in agriculture. A century later that share had fallen to just 2%, largely due to a range of automated machinery. Yet despite automation and technology decimating employment, there was no decades-long surge in unemployment. Why is that?

First, technology – from the cotton gin and the steam engine to the internet – has replaced tasks for centuries, changing labor more than displacing it.⁴⁰ Technology tends to automate the repetitive and manual tasks of work – from plowing fields to typing

memos. Importantly, this replacement of simple tasks provides a tangible productivity boost for labor over the long term.⁴¹ However, in the short-term, technology adoption can also displace workers in a concentrated and disruptive manner.

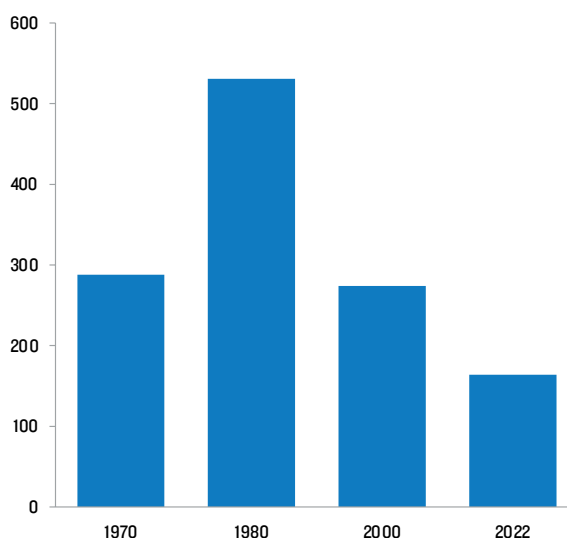
Second, technology alters the set of skills in demand and creates new industries, roles, tasks and opportunities that did not exist before.^{42, 43} More than 60% of the jobs done in 2018, for example, had not yet been invented in 1940.⁴⁴ And even when technology does replace jobs, it does not happen overnight. For example, the ATM debuted in the US in 1969, but the number of bank tellers continued to rise and peaked in the early 1980s. And three decades after the ATM’s launch there were just as many bank tellers as before (Exhibit 8).

Third, while there are many realms where technology can enhance productivity and replace tasks, there are equally many non-standardized activities that cannot be replaced easily by automation and technology – from unclogging a drain to changing a fuse to caring for the elderly or very young.

Technology enters a new phase

Critically, the latest wave of technological change is moving from automating mechanical and physical tasks to cognitive and service tasks. Technology is

Exhibit 8: It took decades for ATMs to displace bank tellers
Number of bank tellers in the US (thousands)



Source: US Bureau of Labor Statistics. Data as of August 2023.

going well beyond the physical realm of manufacturing and now disrupting service industries like legal, health care and education.⁴⁵

So, what is different about today’s technology? First, the scope of what can be automated is expanding into new industries and jobs. Prior waves of technology primarily replaced repetitive and predictable physical tasks in areas like farming, construction and manufacturing. Today’s technology has the potential to automate creative and professional tasks in industries like health care, software development, education and financial services – in many cases for the first time. Second, today’s tools can be commanded using spoken language rather than computer code. Consequently, these tools are much more accessible and allow for a broader range of use cases in new areas.

4. Downshifting globalization and new labor demand patterns

It is well understood that heightened Great Power rivalries (US-China, India-China, US-Russia), growing nativist and protectionist moves (Brexit, the US exit from the Trans-Pacific Partnership), and the nearshoring and onshoring of post-COVID supply chains have slowed down globalization. As a result, growth in global trade has cooled off since the Global Financial Crisis (Exhibit 9).⁴⁶ What are the emerging implications of this downshift in globalization for workers and labor markets? We believe three labor market trends are not widely appreciated and particularly important for investors to track.

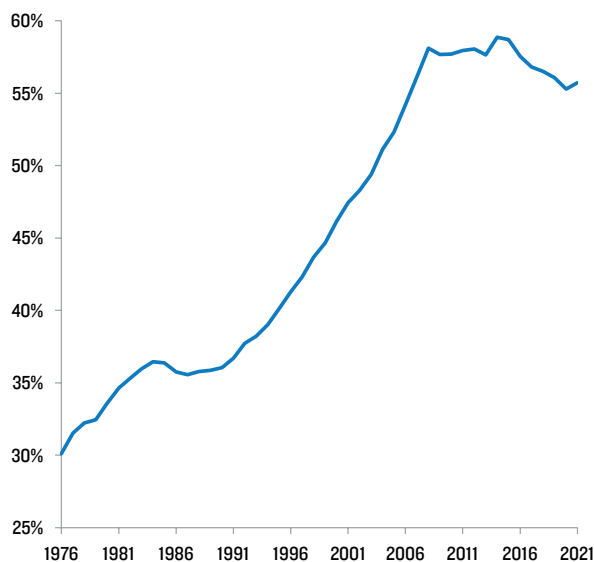
Slowing globalization has impacted trade but not migration – despite all the political rhetoric

While the growth of global trade has stagnated, the cross-country movement of workers has been far less impacted (Exhibit 10).

Even more recently, while the pandemic lockdowns disrupted the migration of workers, faster growth in the U.K., Australia, Canada and the US is being driven by an unexpectedly large post-COVID influx of immigrants. Their decisions to enter the labor force will determine their impact on labor supply, though in the US it appears they already are. In any case, the presence of immigrants will undoubtedly

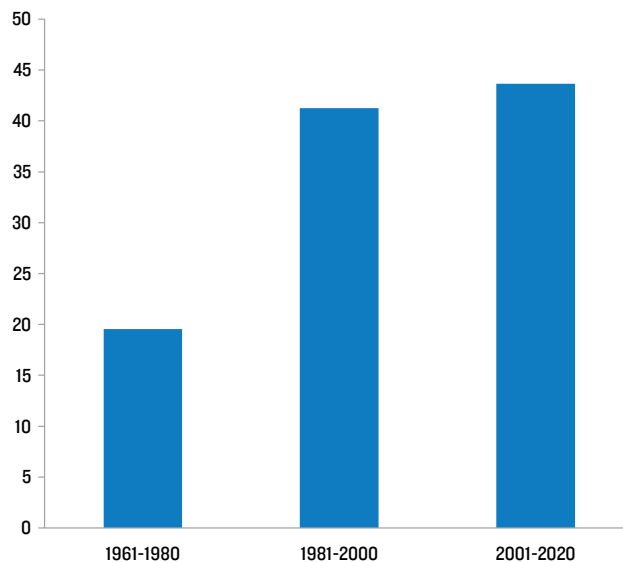
boost consumption as well as the demand for shelter. The numbers are substantial. For example, temporary work permits for agricultural workers have increased more than sixfold over the past 10 years and the total

Exhibit 9: Growth in global trade has stagnated
World trade as a share of global GDP



Source: World Bank. Data as of August 2023.
Note: Five-year moving average.

Exhibit 10: Global migration remains elevated
Net migration of top five countries (millions)



Source: World Bank. Data as of August 2023.
Note: Aggregate of the five countries (US, Russia, Canada, Germany and Australia) with highest average net migration 1960 to 2020.

number of skilled worker visas reached a new high last year (Exhibit 11).^{iv}

The same trend is playing out in other developed markets as well. Australia’s 2023 net overseas immigration level of 400,000 is running nearly two times pre-COVID levels. Canada’s influx of over one million workers in 2022 was the highest on record. And the U.K., even post-Brexit, had more than 600,000 immigrants in 2022, representing a high watermark and a 24% increase over the prior year.⁴⁷

Post-COVID supply chains will lead to new labor demand patterns, potentially exacerbating labor market mismatches

As we predicted in *After the Great Lockdown*, the COVID-19 pandemic has led to a barbell of global supply chains into (a) more resilient, diversified, multiregional supply chains, and (b) “reshored” supply chains returning to their home markets, either because of economic logic or government intervention. Each of these trends has significant labor market implications.

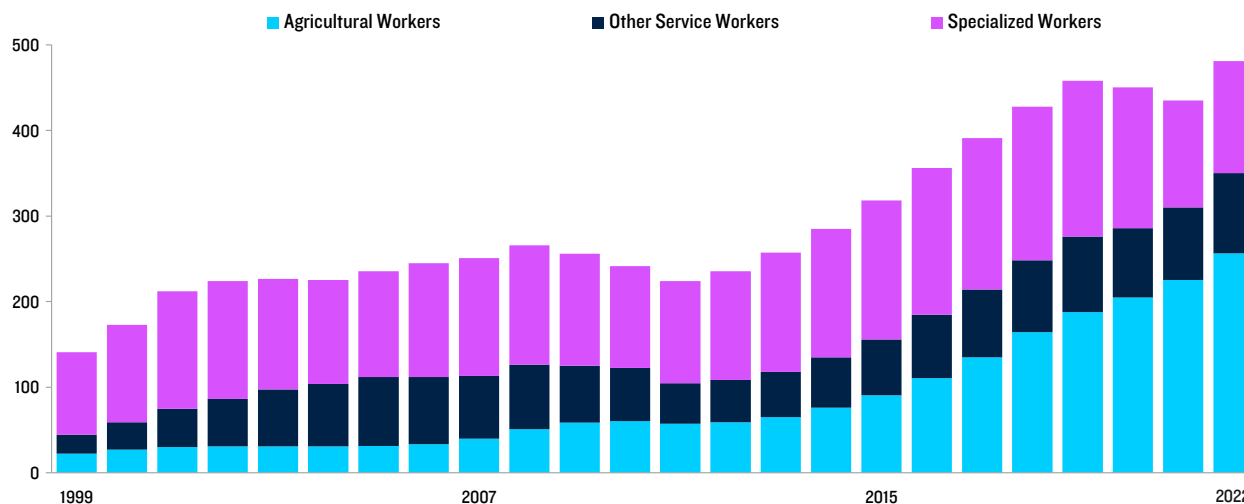
Before COVID, nearly all manufacturing supply chains passed through China, though rising labor costs and pressures from the US-China trade war

were already beginning to reverse this trend. Many international firms have now ring-fenced their China operations and are moving to geographically dispersed, more flexible and sometimes intentionally redundant sources of supply to increase resilience. Countries like Vietnam – which has seen Apple, Nike, Adidas and Samsung move production there – have already benefited from supply chains diversifying away from China – and will continue to do so. Indian firms are also trying to fill the void in high-end manufacturing. For example Apple has moved some of its iPhone production to the Indian states of Tamil Nadu and Karnataka.⁴⁸ Similarly, Malaysia and Thailand are also aiming to move up the value chain as a production hub for car parts, vehicles, solar panels and electronics with multinationals such as Sony, Sharp and Micron.⁴⁹

On the other end of the barbell, governments and firms are reshoring goods and services that are deemed of strategic or national security importance. Industrial policies to spur domestic production in sectors with national security implications – like pharmaceuticals, leading-edge semiconductors, clean energy and EV batteries – have become the norm across many countries.⁵⁰ These efforts may run into labor supply constraints and exacerbate labor market

Exhibit 11: Targeted migration has been key in closing labor market mismatches

Number of issued temporary work visas in the US (thousands)



Source: US Bureau of Labor Statistics. Data as of August 2023.

Note: Agricultural Workers, Other Service Workers and Specialized Workers refer to H2A, H2B and HIB visas, respectively.

^{iv} Despite the growth in visas, the persistent growth demand for agriculture workers is still outstripping supply in the US, costing the industry billions in lost revenue.

mismatches. Though over time there will likely be an increased reliance on automation and robotics to allow companies to offset higher costs in their home market by replacing labor costs with up-front capital costs.

A potential resurgence of labor bargaining power, after an era of increasing returns to capital

The labor share of income has been falling in some countries, most notably the US. This is driven by a combination of factors including new technologies, increased employer monopoly power in a “winner take all” market structure as well as the offshoring of labor-intensive activities (Exhibit 12). The result is a growing share of productivity gains has been going to capital – and since capital is far more concentrated than labor, this has also led to rising US income inequality. While still somewhat speculative, there is a case to be made that the interplay of the structural forces we have described may underpin a resurgence of labor.

First, reduced working-age populations in many economies will likely lift the bargaining power of labor broadly. Of course, the next wave of technological change, especially generative AI, may mitigate the impact of fewer workers. But if history is any indication, our hunch, admittedly with wide

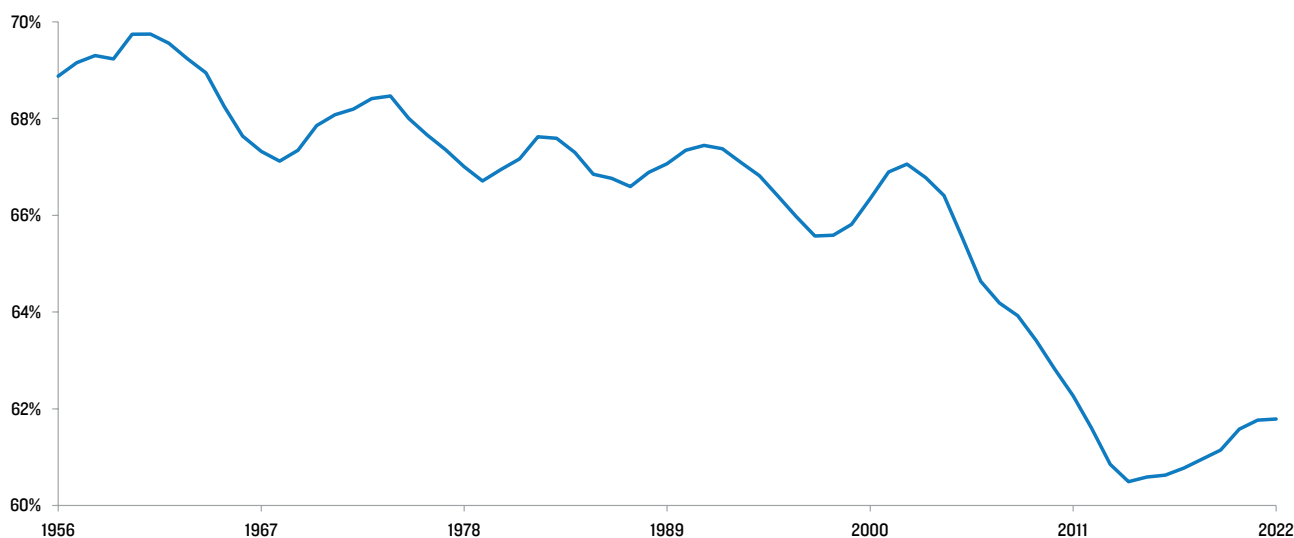
uncertainty bands, is that – at least initially – generative AI may have a positive productivity impact for white-collar workers, potentially enhancing their real wages.

Second, the reshoring or “friendshoring” of manufacturing capacity, R&D and technologically sophisticated sectors comes with labor requirements in several G7 countries. US legislation, for example, includes specific requirements to hire unionized labor or at least draw from the local labor force. While some may consider this unionization trend to be short-lived and tied to electoral cycles, the political strategy behind this industrial policy in the US has been to spread the benefits of the associated subsidies and funding broadly across red and blue states – for example, battery plants are being built in Tennessee and Georgia – increasing the probability that it survives across different political regimes. Furthermore, some major central banks have made changes to their operating frameworks to introduce more

The latest wave of technological change is moving from automating mechanical and physical tasks to cognitive and service tasks.

Exhibit 12: Labor’s share of total income in the US has declined

Labor share of total output, nonfarm business sector

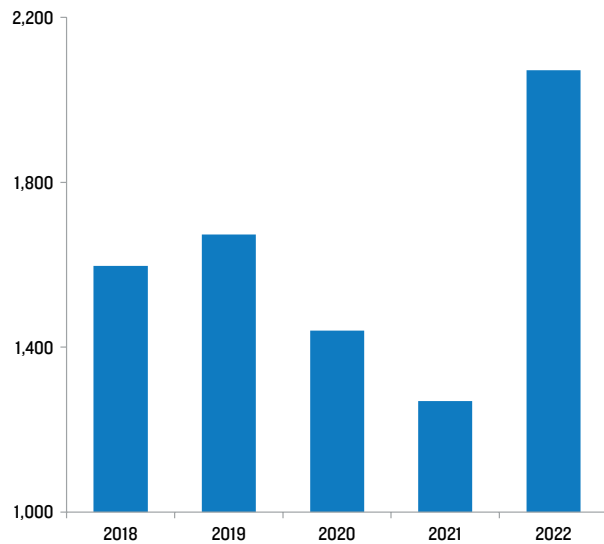


Source: Bureau of Labor Statistics and PGIM Thematic Research. Data as of August 2023.

Note: Five-year moving average used for the labor share of income.

flexibility on achieving the inflation mandate while placing sufficient emphasis on “broad and inclusive” employment, affording more flexibility to allow labor markets to run hot in future cycles.

Exhibit 13: Petitions for unions in the US have bounced back
Number of petitions for union representation election



Source: US National Labor Relations Board. Data as of August 2023.

Indeed, there are a few nascent examples from the US that suggest it may be worth keeping a close eye on union and labor bargaining power. For instance, the number of work stoppages or strikes in the US rose by more than 50% in 2022 in a potential sign of labor’s increasing bargaining power. Similarly, looking ahead, there are compelling signs unionization activity will continue to accelerate: The number of petitions to form a union surged by 63% in 2022 compared to the prior year (Exhibit 13).⁵¹

A new demographic map of the global workforce, an increasing probability of labor market mismatches, the pace and direction of technological change, and shifting labor demand patterns in the post-COVID global order clearly have the potential to reshape growth, inflation, and fiscal and monetary policy around the world. It is to these macroeconomic implications of this new era in labor markets that we turn to in Chapter 2.



CHAPTER 2

**RESHAPING THE MACRO
LANDSCAPE**

“

The new dynamics of labor markets will transform the macroeconomic underpinnings of the global economy.”

02

CHAPTER 2

RESHAPING THE MACRO LANDSCAPE

The new dynamics of labor markets will not just change workforce participation, unemployment and the future of work – but also the macroeconomic underpinnings of the global economy. What kind of impact should investors expect on future inflation, economic growth and fiscal spending patterns?



The new dynamics of labor markets will likely be inflationary



The new dynamics of labor markets will dampen growth and growth potential



Rising dependency ratios will strain fiscal budgets, especially in emerging markets

The new dynamics of labor markets will likely be inflationary

The relationship between demographics and price inflation is multifaceted, complex and sometimes even contradictory. In our view, the inflationary impulses will dominate and most economies will experience inflation as a result of their aging demographics. A shrinking domestic labor pool in graying economies should push wages up and create inflationary pressure. Another inflationary impulse can arise from a higher dependency ratio as a larger proportion of the population – i.e., retirees – are consuming without producing. Research by the IMF and others finds a strong link between trend inflation and the age structure of populations. Specifically, the larger the share of the very young and old in a population, the higher the inflation trend.^{52, 53} In addition, the burden of social expenditures on pensions and health care for the elderly can increase aggregate cost pressures.

Of course, aging demographics can provide some disinflationary impulses as well. Namely, the combination of low fertility rates and aging populations can – if left unaddressed for a prolonged

period – lead to a shrinking population. Declining populations generate less aggregate demand and provide a strong disinflationary pull.⁵⁴

While there are arguments for both scenarios, we believe inflationary pressures will prevail in most cases. The combined forces of upward pressure on wages from a shrinking labor pool and increased fiscal expenditures will offset any declining aggregate demand in most countries.

A shrinking domestic labor pool in graying economies should push wages up and create inflationary pressure.

The Japan experience since the 1980s is taken as the proof of a causal link between aging demographics and disinflation. In our view, this experience is unique and should not be thought of as a blueprint of what is to come, for a variety of reasons.

Japan's disinflationary experience may not be representative or easily repeatable

On the surface, Japan's persistent disinflation during a time of aging demographics and low fertility rates seems like a perfect example of what may await other aging economies. However, the Japanese example may prove to be a global outlier.

First, the choices made by Japan's government and society *maximized* the disinflationary impulse from a declining population. Decades of below-replacement fertility rates led to a sustained decline in native-born Japanese nationals, which has fallen for 14 consecutive years.⁵⁵ The choice to forego migration and allow the population to contract is a critical one (Exhibit 14).

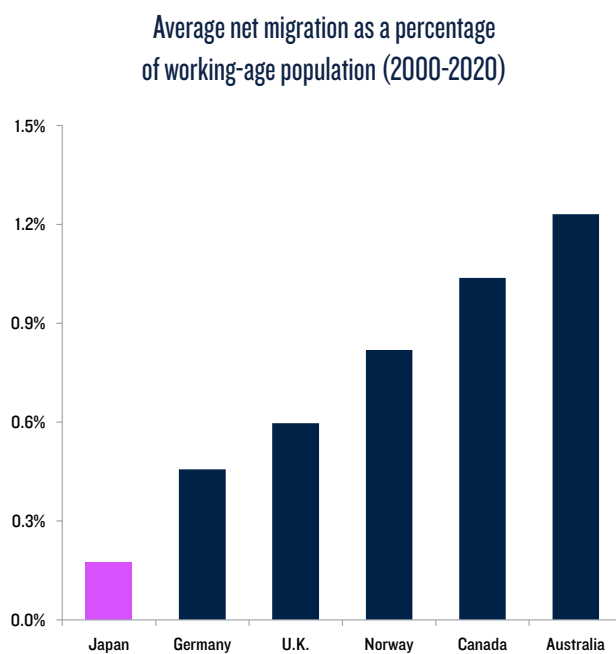
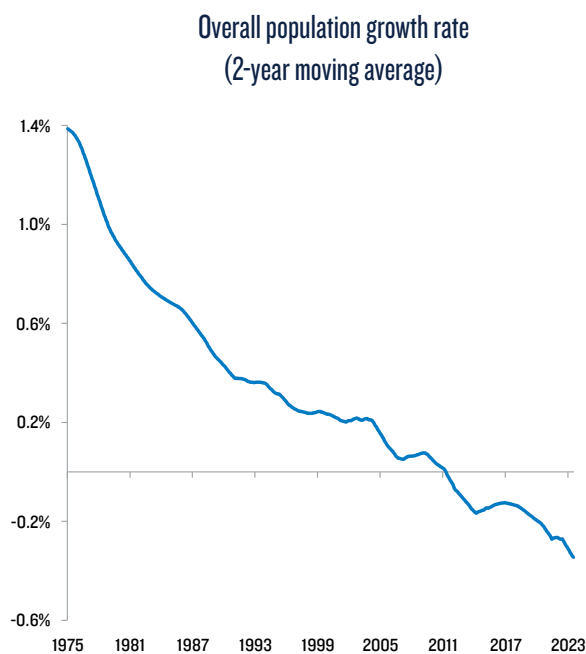
Second, Japan was able to limit the inflationary impulse from the anticipated wage increases in a shrinking labor pool by finding new sources of labor – both at home and abroad. While Japan was reluctant to bring in workers from abroad, Japanese firms were active in moving their production overseas. This

reduced the demand for domestic labor while tapping new pools of labor in China, Southeast Asia and other parts of the world. The timing of Japan's sharp demographic aging also happened to coincide with the golden era of globalization: Japanese outbound foreign direct investment (FDI) began to accelerate in the early 2000s and remained strong into the 2020s (Exhibit 15).⁵⁶

Japan was able to limit the inflationary impulse from a shrinking labor pool by finding new sources of labor.

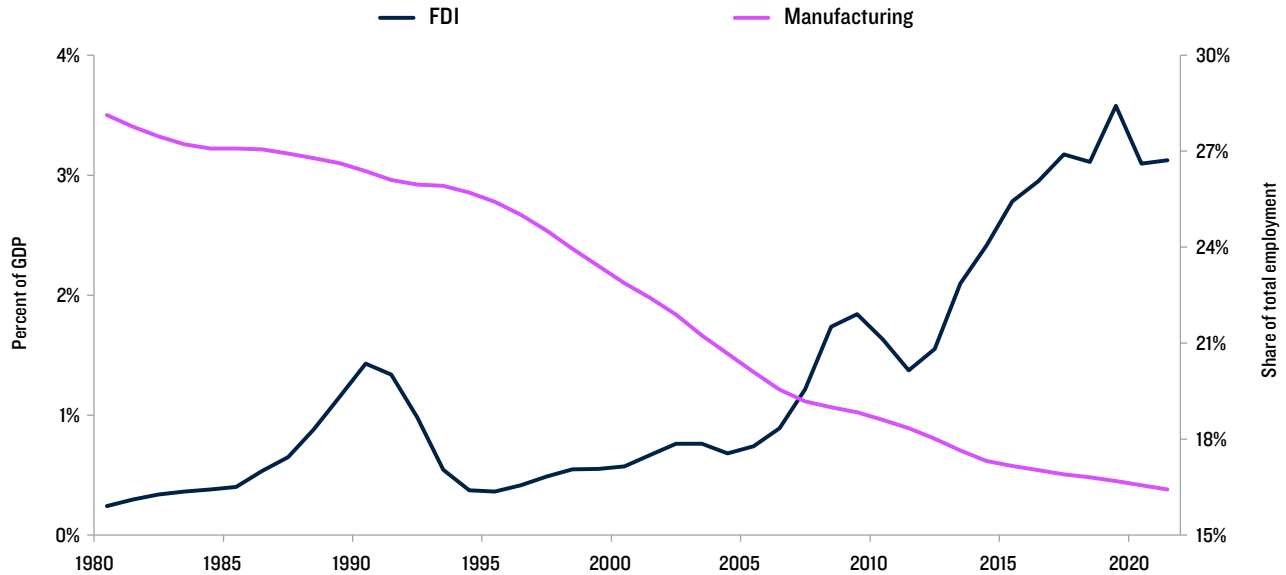
In addition, the Japanese economy found new sources of labor domestically – namely, Japanese women. From 2003 to 2022 the participation rate of Japanese women soared from less than 60% to 74% (Exhibit 16).

Exhibit 14: Population growth in Japan has been declining for decades



Source: PGIM Thematic Research, ILO and World Bank. Data as of August 2023.

Exhibit 15: Japan increased global production to mitigate a shrinking population
 Japan's outbound FDI (left) and manufacturing employment (right)

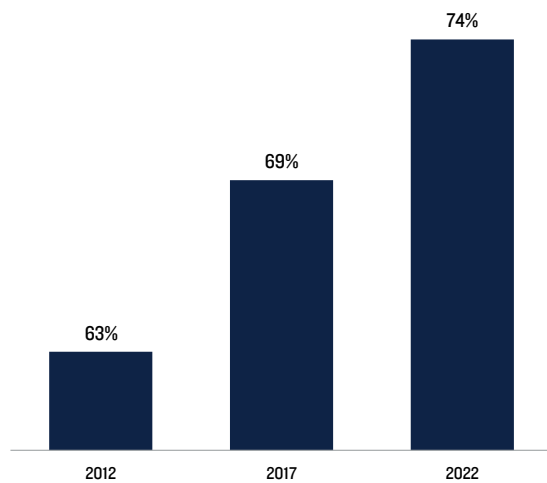


Source: United Nations Conference on Trade and Development and Japanese Statistics Bureau. Data as of August 2023.
 Note: Three-year moving average used for both FDI and share of manufacturing.

The Japanese experience of persistent disinflation may be difficult to repeat going forward.

Exhibit 16: Japan's female participation grew markedly within a decade

Labor force participation rate of Japanese women



Source: Japanese Statistics Bureau. Data as of August 2023.

In short, the Japanese experience of persistent disinflation as their population aged may be difficult for others to repeat going forward. For example, some countries may not opt for an extreme closed-migration policy and tolerate the disinflationary forces as populations decline. Furthermore, countries with shrinking labor forces today will be *less* able to offset inflationary wage pressures by outsourcing production the way Japan did given the current slowdown in globalization. In fact, rather than opting for outsourcing production to distant nations, more countries and companies today are committing to reshoring critical industries and taking control of supply chains where possible.

Ultimately, this results in our stance on the new era of global labor being inflationary for most. Japan, for better or worse, was the first advanced country to observe a shrinking workforce, allowing it to respond in ways that are not feasible today. Countries that are just entering a demographic drag will therefore have to find new ways and responses to shifting global and domestic labor markets.

The new dynamics of labor markets will dampen growth and growth potential

The relationship between the dynamics of the global labor pool and economic growth is clear and intuitive. If left unaddressed, countries suffering from shrinking working-age populations will see a decline in both their potential and actual growth rates for three reasons.⁵⁷ First, total factor productivity tends to decline with aging populations. An aging workforce negatively impacts areas that influence growth potential such as investment, innovation and technological progress. For example, it may lead to a decline in per capita patent applications of up to 30% in some countries.⁵⁸ Second, the total hours worked will likely decline and – unless productivity rises to compensate – this would adversely impact overall growth.⁵⁹ Third, and more indirectly, fewer workers and higher dependency ratios slow aggregate demand and dampen growth.

These labor force dynamics are already impacting economic growth forecasts. Since 2015, growth in China’s population has dwindled from 10 million people annually to roughly flat.⁶⁰ Indeed, the IMF recently dropped its five-year forecast for Chinese

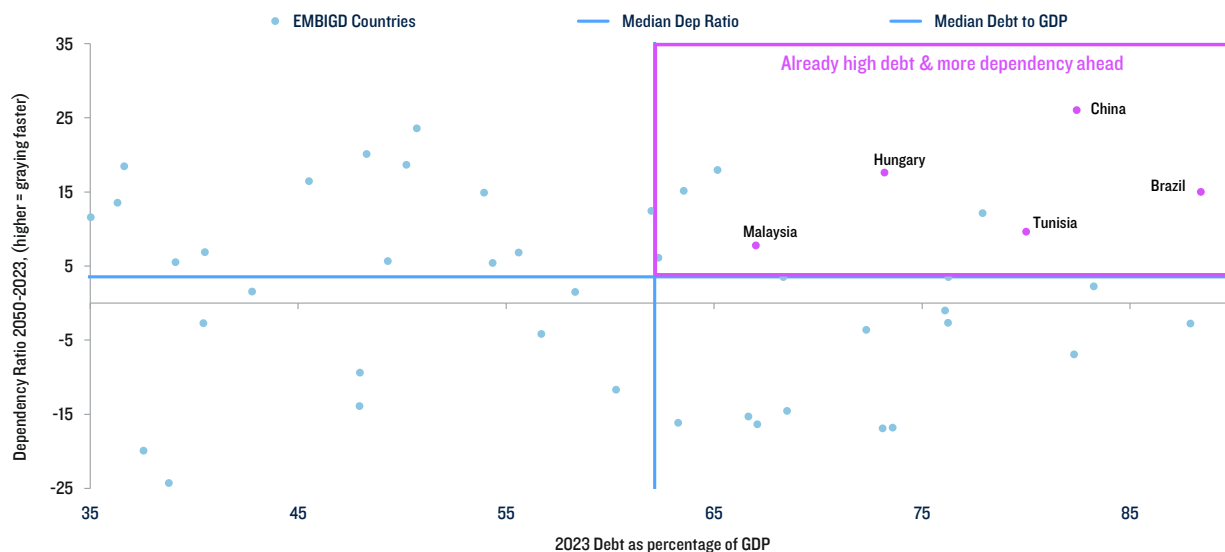
growth from 4.6% to 3.8%, citing a shrinking population and declining productivity growth as prominent factors.⁶¹ Similarly, the US Congressional Budget Office projects an annual growth rate of 1.6% in the 30-year period beginning 2020 vs. a growth rate of 2.5% in the prior 30-year period.⁶² Over this period, the slowdown in growth of the US labor force is cited as a material factor in the slowing of overall economic growth through 2040.⁶³

Countries with shrinking labor forces today will be less able to offset inflationary wage pressures the way Japan did.

Rising dependency ratios will strain fiscal budgets, especially in emerging markets

Many emerging markets are set to experience rapid aging and from lower levels of wealth and fiscal strength than many developed countries that went through a similar demographic transition. Those

Exhibit 17: Countries challenged by high fiscal debt and a rapidly aging population



Source: Adapted from Perasso and Doppelt, “Greying and Greening Across Emerging Markets,” PGIM. Data as of August 2023.
 Note: EMBIGD refers to J.P. Morgan’s Emerging Markets Bond Index Global Diversified.

emerging markets that face the sharpest rise in dependency ratios *and* currently have challenging fiscal situations will face the most acute strain. Their sovereign finances are most at risk going forward. Our analysis suggests that countries most at risk include Brazil, Hungary, China, Tunisia and Malaysia (Exhibit 17).⁶⁴

It is critical to recognize that the responses and actions of governments and firms will ultimately determine the dividing line between winners and losers.

This demographic dynamic has important fiscal consequences. A smaller population in their prime working age and more dependents to support implies lower tax revenues from workers as well as greater spending on health care, pensions and other retirement services – ultimately straining state and national budgets.

Aging populations will strain fiscal resources in other ways as well. For example, child care subsidies to attract more women into the workforce will be a larger component of the social safety net going forward. And attracting foreign labor means providing social services and benefits to them and their families – sometimes before they can participate in the workforce.

It has become cliché to say “demographics are destiny.” If this is indeed true, it follows that an aging and shrinking workforce combined with significant labor market mismatches will inevitably lead to slower economic growth and higher inflation for most countries as well as rising labor costs and shrinking margins for companies. For investors, it is critical to recognize that the responses and actions of governments and firms will ultimately determine the dividing line between winners and losers. Chapter 3 examines what measures they can take and which industries and countries will emerge as leaders.



CHAPTER 3

WINNERS AND LOSERS IN THE NEW ERA OF LABOR

“

Winners and losers in the new era of labor are not predetermined – actions of governments and firms will matter greatly.”

03

CHAPTER 3

WINNERS AND LOSERS IN THE NEW ERA OF LABOR

The structural forces reshaping labor markets will determine the next generation of leaders and laggards across industries, regions and countries. These winners and losers are not predetermined – and will depend heavily on the quality of responses and actions by governments and firms.

We take both a sector lens – which industries are most vulnerable, and which are most likely to thrive – as well as a geographic lens – which countries, states or cities will be best and worst positioned – to understand the ultimate impact of the structural labor market changes discussed in Chapter 1 and the resulting macroeconomic implications raised in Chapter 2.^v

Winners and losers by sectors

We believe two factors are particularly helpful in understanding the impact of labor market changes on different sectors. First, those sectors with a high share of labor costs, will be hit hardest. Second, forward-leaning industries – like renewable energy and cybersecurity – will have a very different experience than lagging industries.

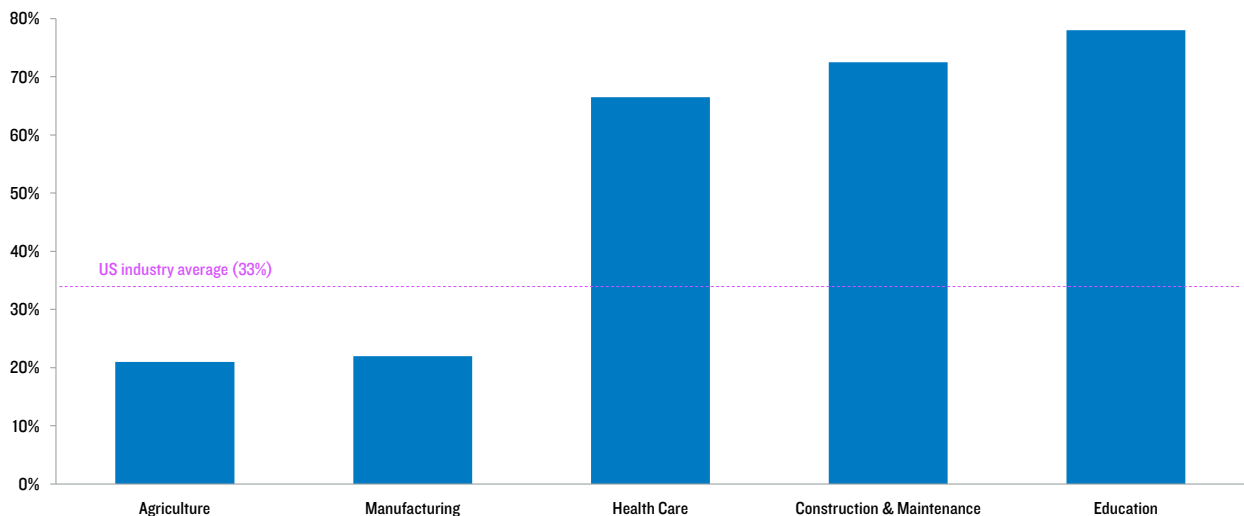
Wage pressures will hit some industries harder than others

Many industries are likely to face upward wage pressure from the decline in working-age populations across most advanced economies. Those industries where labor is 65% or more of input costs – for example, education, building construction and maintenance, as well as some parts of the health care sector – will face the greatest pressure on margins (Exhibit 18).

For investors looking to discern between winning and losing firms in these industries, technology will be a key factor. Specifically, those firms able to leverage technology to enhance productivity will be leaders. By contrast, the laggards will have to address higher wage costs by either shrinking margins or raising prices.

Exhibit 18: Some industries' margins are highly dependent on labor cost

Labor cost as a percentage of input costs, United States



Source: PGIM Thematic Research and Bureau of Economic Analysis. Data as of August 2023.

Note: The five industries refer to a representative set of the North American Industry Classification System (NAICS); for each of the five sectors.

^v For more details on the methodology see Appendix on page 33.

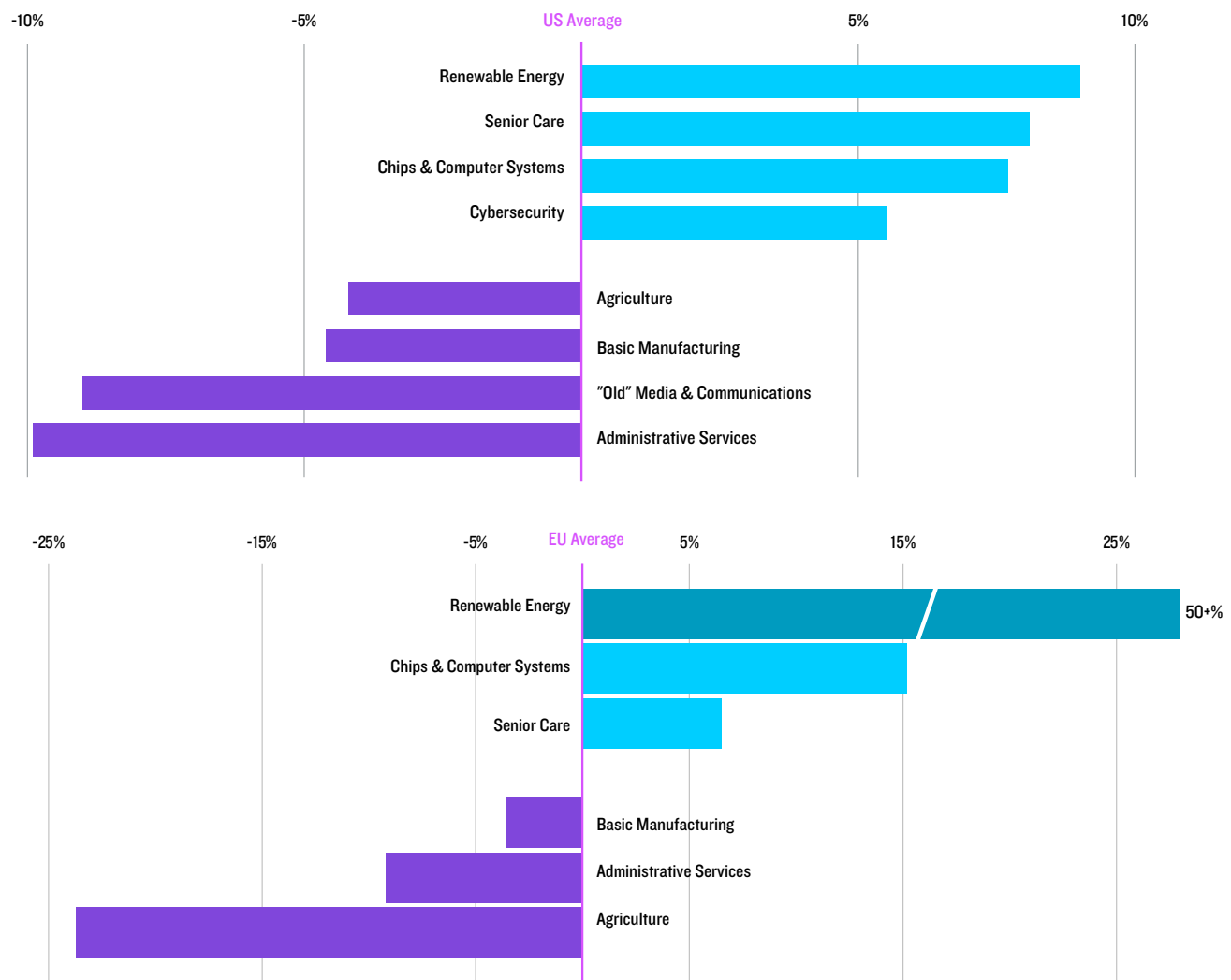
The advent of generative AI may be especially promising for industries where technology adoption has been challenging. For example, in the education sector, while robots will not be replacing human instruction in classrooms anytime soon, AI may assist in grading abstract assignments like essays, provide feedback on students' work, or provide differentiated and individualized learning for students who require special attention outside of a classroom environment. Construction, too, has stubbornly remained in the analog realm, but high-precision 3-D renderings

can increasingly be used for large-scale complex architectural projects. Similarly in health care, AI-enabled tools can accelerate drug development and increase precision in the operating room (e.g., biopsies and tissue removal).

New technology and demographics will drive employment in four leading sectors

We believe four industries will exhibit strong growth and have the highest demand for labor going forward (Exhibit 19). The high demand for labor in these

Exhibit 19: Employment outlook of future leading and lagging industries in the US and Europe
Employment growth rates above/below national average (2022-2031)



Source: PGIM Thematic Research, Brookings Institution, European Centre for the Development of Vocational Training, European Commission and US Bureau of Labor Statistics. Data as of August 2023.

Note: Numbers are based on occupation forecasts by the BLS, the European Centre for the Development of Vocational Training and direct forecast of renewable job growth from the European Commission; see Appendix for further details.

industries will be reflected in the number of new openings and the growth rates of employment in these industries. Employment in these sectors will add 13 million jobs by 2031 across Europe and the US alone.⁶⁵ However, the strong demand in these fields – many in new locations – will amplify existing dislocations between supply and demand for workers with specialized skills.

Programs to promote key industries like semiconductors and EV batteries are a major thrust of industrial policy in India, South Korea, Canada, Israel and Japan.

In senior health care, for example, the demand for nurse practitioners in the US alone is expected to increase by nearly 50% between 2022 and 2031. Similarly, the energy transition – and industrial policy designed to support renewables – will continue to

drive demand for solar panel and hydrogen fuel cell technicians in nearly every region of the world. In Europe, for example, the biggest challenge will come from the REPowerEU initiative that is set to reduce the union’s dependence on fossil fuels.⁶⁶ On top of large infrastructure investments, the most challenging part may be to fill 3.5 million new job openings in the renewable sector by 2030 – a projected 270% growth from current levels.⁶⁷

Industrial policy will not only impact job creation in the renewable sector but will also play a large role in generating opportunities in chips, semiconductor manufacturing and advanced computer systems. The EU’s Chips Act and the CHIPS and Science Act in the US are two recent examples that each provide tens of billions of dollars to companies to build plants and train workers for the specific technical skills needed. Programs to promote key industries like semiconductors and EV batteries are also a major thrust of industrial policy in India, South Korea, Canada, Israel and Japan (Exhibit 20).⁶⁸

The competition among governments to attract leading companies can be especially fierce. Through the first half of 2023 alone, government subsidies

Exhibit 20: The paradigm shift to onshoring creates skill shortages across the globe

Worker shortages in the semiconductor sector, select regions and countries



Source: Kearney. Data as of August 2023.

around the world are estimated to total over \$100 billion to attract chip manufacturers. For example, Germany agreed to a subsidy package with semiconductor manufacturer Intel worth roughly €10 billion to build a cutting-edge wafer fabrication site. The project is estimated to generate 7,000 construction jobs as well as 3,000 permanent high-tech jobs and will mark the single largest foreign direct investment in German history.⁶⁹

Industrial policy will not only impact job creation in renewables but will also generate opportunities in semiconductor manufacturing and advanced computer systems.

Future labor shortages will not be among workers with the most advanced skills

The industrial policies around renewables, chip manufacturing and advanced computer systems are creating demand for millions of workers with specific technical skills in new locations. These policies may also have the unintended consequence of aggravating existing mismatches. In the European semiconductor industry, for example, reshoring efforts will add to the over 60,000 unfilled positions in Germany today.⁷⁰ Meanwhile in the US, chip manufacturers are struggling to fill openings in a timely manner, and unfilled jobs are estimated to reach over 58% by 2030.^{71, 72}

The areas likely to face the greatest misalignment between labor supply and demand are not at the high end of the skills range. Rather, the biggest shortfall is likely to be in roles where specific technical skills and training are needed – rather than advanced degrees – namely, technicians to manufacture, install and maintain wind turbines, hydrogen fuel cells and energy storage devices. A similar picture emerges in semiconductor manufacturing as well. The largest gaps between supply and demand for labor are not at the advanced chip design or architecture phase but rather in the technical roles around manufacturing

chips, which do not require physics degrees but rather specialized training and experience.⁷³

The trend towards advanced university education will also amplify mismatches in middle-skilled, technical roles. In the future we can expect more shortages not just in home health aides, dental hygienists and physical therapists, but also in wind turbine and semiconductor technicians – all roles which require specific job-related skills rather than advanced degrees. These are the kinds of roles leading industries will struggle to fill over the next 10 years.

Tech is most likely to displace labor in four lagging sectors

The combination of generative AI and robotics will open up new realms of cognitive and complex tasks that had been resistant to earlier waves of tech disruption. Specifically, four areas – (i) agriculture, (ii) “old” media and communications, (iii) basic manufacturing, and (iv) administrative services – stand out as being most vulnerable to the new wave of technology disruption. In the US and Europe alone, over 30 million workers are expected to be displaced by 2031 as technological advancement will increase productivity and also reduce the need for labor.⁷⁴

In agriculture, for example, GPS-enabled tractors can roam large-scale industrial farms autonomously, and – equipped with sensors to detect levels of moisture and nutrients in the ground – perform multiple tasks. Cameras and sprayers mounted on the tractor also leverage AI to discern between weeds and crops and deliver herbicide only where it is needed.^{75, 76}

Generative AI is also impacting more cognitive tasks that had not been disrupted by previous waves of technology. Old media and administrative services are good examples of this. Content creation and scriptwriting for TV shows and movies are an example of new realms for technology to disrupt. Indeed, the use of AI to supplant writers was a central issue in a recent labor strike by US screenwriters.⁷⁷

Additionally, more customer engagement, sales and call center functions can be handled by AI.⁷⁸ Large natural language models will not only be able to screen calls and respond to customers, but they will increasingly be able to take action on issues and resolve them. Office

managers and executive assistants are another area where smart applications of AI can displace workers. For example, Microsoft is leveraging AI to create features in popular software like Word and Excel that will automate simple business tasks like taking notes at meetings, editing and drafting documents and responding to emails.^{79, 80}

One reason for a falling male labor force participation rate is the lack of reskilling opportunities.

Enabling smoother transitions of displaced workers

The reskilling and retraining of workers who will be displaced by technology in these industries is critical for cities and regions where these industries are prominent. Research suggests that one reason for a falling male labor force participation rate is difficulty in finding ways to reskill.⁸¹ If displaced workers cannot transition to new work smoothly, their economic vitality and productivity may be lost for an extended period.

When it comes to displaced workers who find themselves undereducated for job openings, reskilling programs that take an integrated approach to workforce development, like Year Up in the US, have met with some success.⁸²

Winners and losers by region

Labor is a key input to every country's economic growth and competitiveness. It is therefore crucial for investors to understand which countries are well-positioned and which are challenged by the transformation of labor markets. To this end, we have examined all countries that are part of the typical institutional investment universe, i.e., either part of

the MSCI All World or J.P. Morgan Emerging Market Bond Index. We propose a set of indicators that when combined can serve as a framework to help investors gauge winners and losers across regions.

A framework for assessing labor dynamics by country

To understand how countries are positioned to manage the deep structural changes in labor markets, we have undertaken a multidimensional assessment of each country, focused on:

- (1) **Labor supply:** the stock and flow of the working-age population, including the net impact of current migration policies,
- (2) **Labor quality:** the set of skills and education of a country's workforce and ability to tap global talent, and
- (3) **Policy environment:** the extent to which policies encourage well-functioning labor and capital markets.

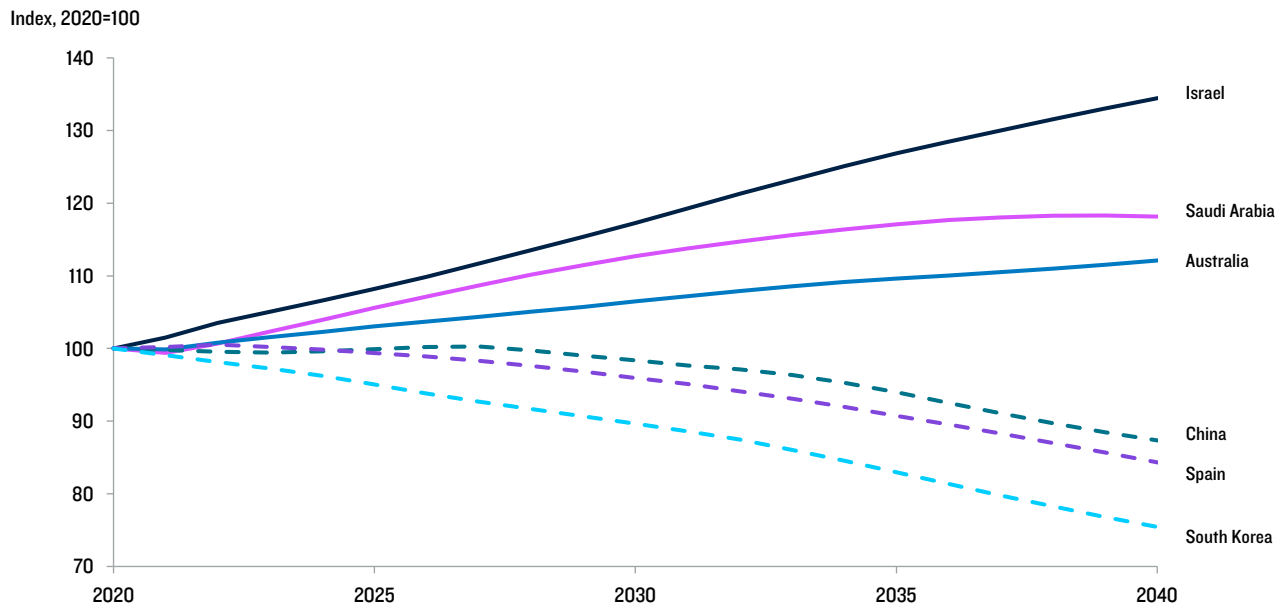
1. Labor supply

We look at several metrics including the current stock of the working-age population; the net decrease (or increase) in future workers between 2023 and 2050 as a percentage of total population; and the actual 10-year trend in migration (as a share of the working-age population).

The forward-looking indicators reflect how critical it is for investors to understand not only the current starting point of each country, but also how steep the decline in workforce may be for them given current demographic trends (Exhibit 21). Net migration is another lever to enhance domestic labor supply. It is not surprising that countries with small populations tend to lean into immigration as a means of boosting labor supply (Exhibit 22).

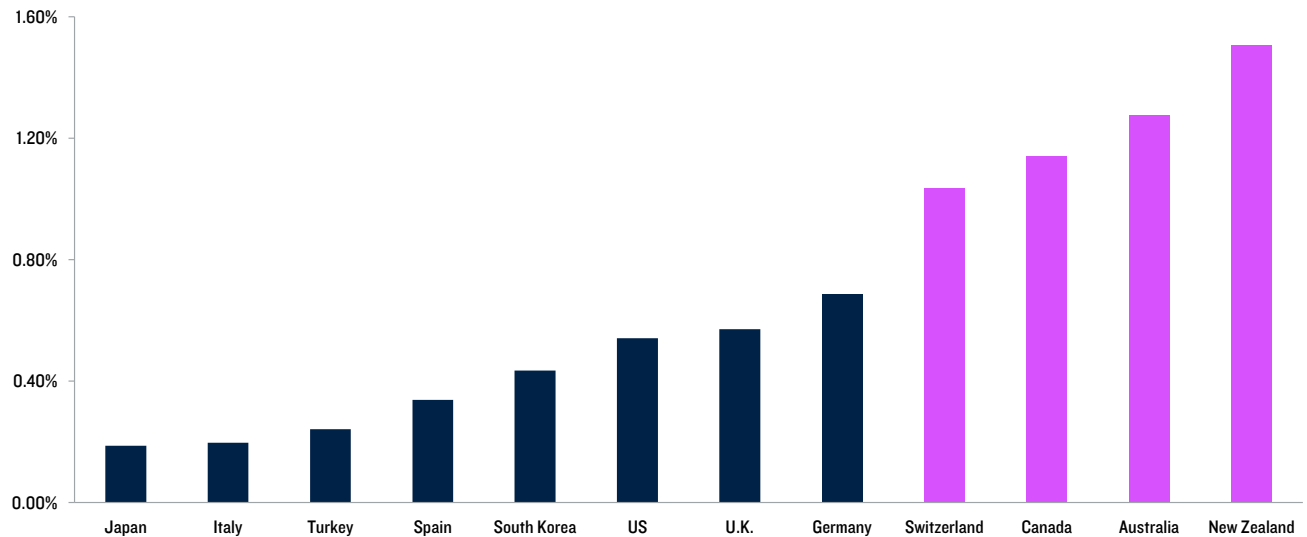
Countries with a steep decline in working-age population and low migration rates can also increase labor supply by adopting policies to boost female participation rates. This may be an especially large

Exhibit 21: Divergence in workforce supply going forward
 Forecast of working-age population (2020-2040)



Source: World Bank. Data as of August 2023.

Exhibit 22: Countries with small populations tend to lean into migration
 Average net migration (2012-2019)



Source: PGIM Thematic Research and International Labour Organization. Data as of August 2023.
 Note: Average net migration as a share of working-age population.

opportunity for countries like Italy, Argentina and South Korea – where female participation rates lag their male counterparts significantly. China, on the other hand, already has a high female participation rate and may not get much of a boost from such policies (Exhibit 23).

Importantly, this is an area where government can make a material impact and targeted public policies have been highly effective in increasing women’s participation rate in the workforce. For example, Japan undertook a series of policies called “Womenomics” designed to bring more women back into the workforce.⁸³ These policies have been instrumental in raising female participation by about 10% between 2010 and 2020, and Japan is now one of the leaders among OECD countries.⁸⁴

2. Labor quality

Given the pace of technological disruption, labor quality is at least as relevant as labor quantity. The global competition for skilled workers will place a premium on a country’s ability to develop, attract and retain talent with the technical skill sets required to compete in the next era for labor. To evaluate labor quality, we draw upon the World Bank’s Human Capital Index – which measures the educational and health outlook for a child born today through age 18 –

and INSEAD’s Talent Competitiveness Index – which measures the set of policies and actions that enable a country to develop, attract and empower their workforce.

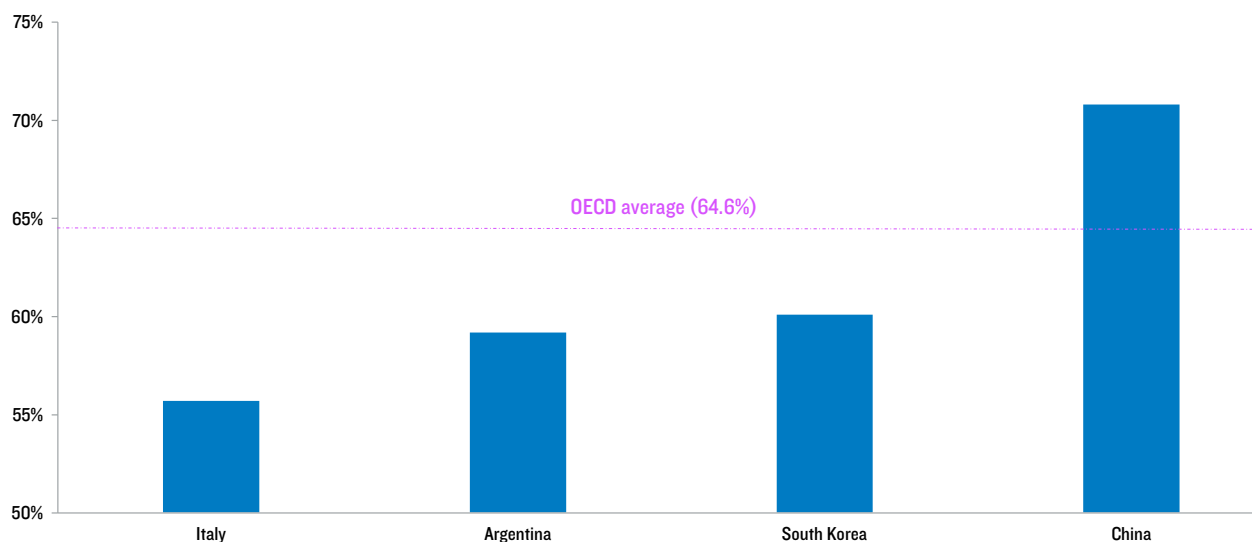
3. Policy environment

Labor quantity and quality will only attract investors and opportunity if it is supported by the right kind of policies, institutions and existing productive capacity. An environment that attracts domestic and foreign capital provides the necessary infrastructure and has a stable and transparent regulatory regime backed by robust institutions can unleash the productivity of a qualified workforce. To assess the policy environment in each country, we have used two indicators. First, the Harvard University Growth Lab’s Complexity of Export Index, which measures the sophistication and productive capacity of countries. Second, the World Bank’s Ease of Doing Business Index, provides a useful directional indicator of key elements of the policy and investment environment across the globe.⁸⁵

We use these three sets of indicators and apply a regional lens to understand which countries are well-positioned and which might face a challenging environment given the ongoing transformation of global labor dynamics.

Exhibit 23: Female labor participation offers opportunities for select countries

Female labor force participation rate (2022)



Source: World Bank. Data as of August 2023.

Asia

The list of leading countries veers towards advanced countries with smaller populations (Exhibit 24). Malaysia emerges as well-positioned not by a huge advantage in many indicators but by having a well-balanced if roughly average set of strengths across all our indicators. Interestingly, neither India nor China were among the leaders (or the most challenged) in our framework and were “stuck in the middle.” China’s combination of steep demographic drop-off and net negative migration left it scoring very poorly on labor supply. In India, while its demographics will be better, it fell short on broad measures of human capital and retaining talent.

Europe, Middle East and Africa (EMEA)

The list of European leaders skews towards smaller countries as well (Exhibit 25). Some of Europe’s largest economies were not among the leaders for several reasons. The region’s largest countries by GDP and population, such as Germany, Italy or Spain, for example, face steep demographic drop-offs that are not likely to be resolved by current trends of immigration. In Africa and the Middle East while regional leaders like South Africa, Egypt or Nigeria face favorable demographics relative to other nations, they scored poorly on labor quality, productive capacity as well as their overall attractiveness for foreign investors.

Exhibit 24: Select leading and lagging Asian countries

Country		Labor Supply			Labor Quality		Policy Environment	
		WAP	WAP Change	Migration	Human Capital Index	Talent Competitiveness	Productive Capacity	Doing Business
Well Positioned	Singapore	●	●	●	●	●	●	●
	South Korea	●	●	●	●	●	●	●
	New Zealand	●	●	●	●	●	●	●
	Australia	●	●	●	●	●	●	●
	Malaysia	●	●	●	●	●	●	●
Potentially Challenged	Indonesia	●	●	●	●	●	●	●
	Philippines	●	●	●	●	●	●	●
	Pakistan	●	●	●	●	●	●	●

Source: PGIM Thematic Research, World Bank, INSEAD and Harvard Growth Lab. Data as of August 2023.
Note: WAP refers to current working age population; for all other definitions see Appendix.

Exhibit 25: Select leading and lagging EMEA countries

Country		Labor Supply			Labor Quality		Policy Environment	
		WAP	WAP Change	Migration	Human Capital Index	Talent Competitiveness	Productive Capacity	Doing Business
Well Positioned	Sweden	●	●	●	●	●	●	●
	Switzerland	●	●	●	●	●	●	●
	United Kingdom	●	●	●	●	●	●	●
	Israel	●	●	●	●	●	●	●
	United Arab Emirates	●	●	●	●	●	●	●
	Saudi Arabia	●	●	●	●	●	●	●
Potentially Challenged	Italy	●	●	●	●	●	●	●
	Greece	●	●	●	●	●	●	●
	Nigeria	●	●	●	●	●	●	●

Source: PGIM Thematic Research, World Bank, INSEAD and Harvard Growth Lab. Data as of August 2023.
Note: WAP refers to current working age population; for all other definitions see Appendix.

Exhibit 26: Select leading and lagging countries in the Americas

Country		Labor Supply			Labor Quality		Policy Environment	
		WAP	WAP Change	Migration	Human Capital Index	Talent Competitiveness	Productive Capacity	Doing Business
Well Positioned	Canada	●	●	●	●	●	●	●
	United States	●	●	●	●	●	●	●
	Chile	●	●	●	●	●	●	●
	Costa Rica	●	●	●	●	●	●	●
	Colombia	●	●	●	●	●	●	●
Potentially Challenged	Brazil	●	●	●	●	●	●	●
	Peru	●	●	●	●	●	●	●
	Argentina	●	●	●	●	●	●	●
	Paraguay	●	●	●	●	●	●	●

Source: PGIM Thematic Research, World Bank, INSEAD and Harvard Growth Lab. Data as of August 2023.
 Note: WAP refers to current working age population; for all other definitions see Appendix.

Americas

Interestingly, regional leaders like Mexico and Brazil were not among the leaders in the Americas (Exhibit 26). While both have favorable demographic starting points, they both face steep demographic challenges that are unlikely to be mitigated by current trends in migration or female labor force participation.

Investors in emerging and frontier markets should be especially cautious around a handful of countries that appear to be quite significantly challenged from a structural labor market lens. This includes countries such as Nigeria, Argentina, Egypt, Pakistan, the Philippines, Ethiopia and Morocco. While many of these countries have the potential for a demographic dividend in coming years, they currently lack educational infrastructure and human capital, have a hard time drawing foreign capital and can be difficult places to do business in.

Looking beyond countries: A state- and city-level perspective

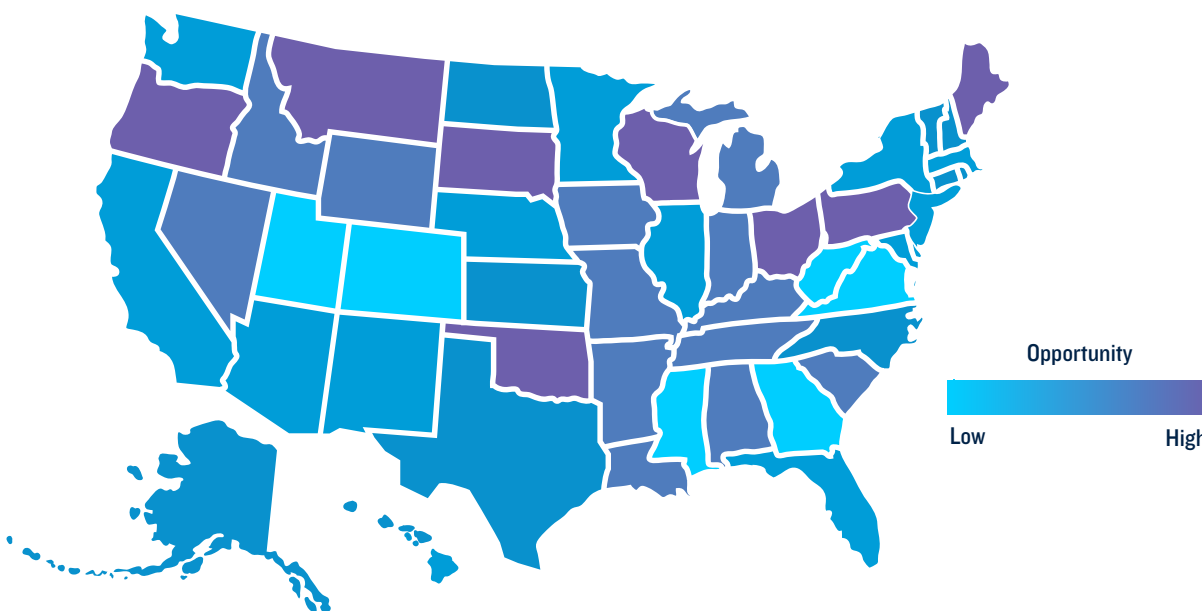
For some investors, a national perspective may not be sufficient. For example, investors in infrastructure and real estate would benefit from a more granular view – especially in the case of large countries with diversified economies where winners and losers might vary significantly by region. Similarly, investors

looking to understand the competitive dynamics of companies with a significant labor force in a particular region or city may want to understand the local market dynamics, which can at times deviate from national trends.

Many countries have the potential for a demographic dividend but lack educational infrastructure and human capital.

To shed further light on the trajectory and evolution of labor mismatches over the coming decade, we collaborated with the Brookings Institution’s Workforce of the Future Initiative. We carried out a case study of leading and lagging industries at the US state and city level to identify the skills and technologies that will reshape the economy over the coming decade. Our research took a comprehensive look across 384 metropolitan areas in the US and analyzed their current industries as well as the proficiency of their workforce across an array of individual skills. Our study then identified which skills would be most critical for future leading industries,

Exhibit 27: The rise of new industries offers varying opportunities across US states



Source: PGIM Thematic Research and Brookings Institution. Data as of August 2023.

such as chip manufacturing or computer system design, and identified which cities had a workforce with the greatest share of those skills but currently applied in an adjacent industry. By matching states and areas with future critical skills already in place, our research was able to identify which metropolitan areas are best aligned with leading industries of the future. That is, which states and cities had workforces with skills that best matched renewable energy and chip manufacturing and could most easily step into these industries.

US states and cities best-positioned to capitalize on leading industries

Silicon Valley in California or Cambridge in Massachusetts are well-known hubs of cutting-edge technology. They have workforces in place with advanced skills and talent as well as highly developed startup ecosystems. But which other cities and states offer a workforces and tech ecosystems that are suitably adjacent to future industries – namely, renewable energy and chip manufacturing.

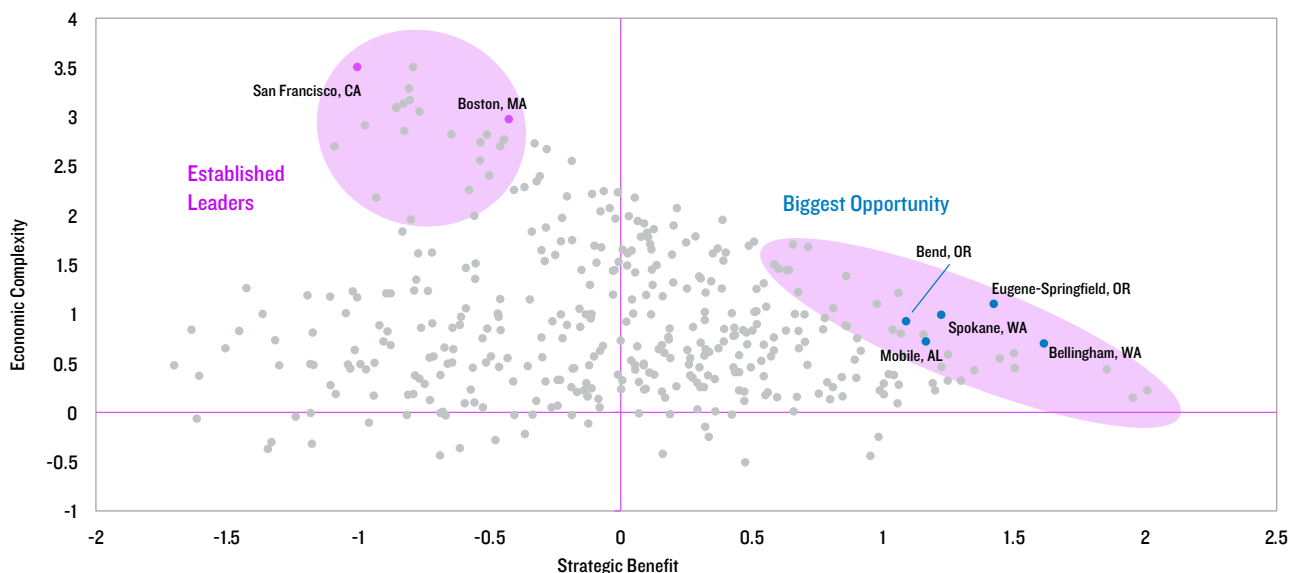
At the state level, our research identified states – such as South Dakota, Oregon and Wisconsin – that have the highest potential to boost local productivity and growth in this new era. Unlike states such as

California, whose future growth will come from their existing dominant industries, these states can benefit from increasing their economic complexity by embracing industries of the future.

Matching areas with future critical skills already in place, our research identifies metropolitan areas that are best aligned with future leading industries.

These states already have a workforce that has many of the needed skills for industries such as renewables or the IT sector but also statewide industrial networks that would amplify the incremental value these new industries would add.⁸⁶ As labor markets shift and industrial policy regains momentum through onshoring and nearshoring, our analysis provides a prediction on the rise and decline of industries across states and their local impact (Exhibit 27).

Exhibit 28: The rise of new industries offers opportunities for cities across the US



Source: PGIM Thematic Research and Brookings Institution. Data as of August 2023.
Note: See Methodology regarding details and calculations.

At a more granular city level, our research goes one step further by identifying metropolitan areas that could most easily step into these leading industries. One set of cities was in the Pacific Northwest, specifically Oregon (cities like Eugene and Bend) and Washington (Bellingham and Spokane), which are states with high potential (Exhibit 28). But even cities located in states that are more challenged can offer opportunity, such as Mobile, Alabama.

Global labor markets are now facing powerful, dynamic forces that will transform them in the years and decades to come.

Notably, most of these cities have major universities which can supply a steady stream of scientific and research talent. Eugene, Oregon already has some simple chip manufacturing facilities that can be easily scaled up. Bellingham, Washington has industries adjacent to renewables like power systems as well as

chemical and petroleum refining. Mobile, Alabama, is a hub for skill-adjacent industries like aviation and aerospace, as well as chemical and heavy machinery.

Ultimately, we believe a multidimensional analysis of how countries, states and cities are navigating a changing labor market will be critical to understanding the full range of investment opportunities.

Global labor markets are now facing powerful, dynamic forces that will transform them in the years and decades to come. The macroeconomic and geopolitical consequences of these changes will be profound. There will be significant sectoral and geographic shifts between those well-positioned and those deeply challenged by this new era for the global workforce. At PGIM, we believe long-term investors will want to ensure their portfolios are positioned based on a deep understanding of the structural forces unleashed in this new era of labor.

APPENDIX

WINNERS AND LOSERS IN THE NEW ERA OF LABOR, METHODOLOGY

Leading and lagging industries

The growth rates for leading and lagging industries of the future are based on forecasts of employment using detailed occupation data from the Bureau of Labor Statistics and the European Union Labour Force Survey.^{vi, vii} To create the sector categories from the list of occupations, we have picked a subset of occupations for each of our five categories that best fits their workforce needs. This allows us to aggregate the current level of employment in each of our sectors and create growth rates using the ten-year forecast from the two institutions. The lone exception to this approach is the renewable sector in the European Union, which is based on assumptions from the European Commission's "Pact for Skills."^{viii}

Winners and losers by region

For the analysis around countries in the MSCI All World or J.P. Morgan Emerging Market Bond Index we have picked the following indicators to address each country's outlook regarding labor supply, labor quality and policy environment. All countries are ranked for each variable into quartiles, which are reflected by the colored dots (going from green to orange) in Exhibit 24 to 26.

VARIABLE	DESCRIPTION	SOURCE
Working age population, percentage	Working age population as a share of total population	World Bank
Working age population change, 2023-2050	Change in the share of working age population between 2023 and 2050	World Bank
Migration	Average net migration as a share of working age population from 2010 to 2019.	World Bank
Human Capital Index	Amount of human capital that a child born today can expect to attain by age 18.	World Bank
Talent Competitiveness Index	The talent competitiveness refers to the set of policies and practices that enable a country to develop, attract, and empower the human capital that contributes to productivity and prosperity	INSEAD
Productive Capacity	Assessment of the current state of a country's productive knowledge	Harvard Growth Lab
Doing Business Index	The Doing Business project provided a set of measures of country's business regulations and their enforcement.	World Bank

vi Employment by detailed occupation : U.S. Bureau of Labor Statistics

vii European Union Labour Force Survey, detailed employment by occupation.

viii Pact for Skills: Launch of large-scale renewable energy skills partnership – Employment, Social Affairs & Inclusion – European Commission.

Winners and losers by US cities

The analysis of the opportunity of cities and states' capabilities to grow industries of the future given their current workforce and industrial network, is based on updated work of "Growing Cities that Work for All."⁸⁷ In this work each metropolitan area's industry space is assessed for its overall complexity as well as a strategic index and gain. The economic complexity is an assessment of cities' capabilities to develop a more diversified set of high-value products and services, whereas the strategix index measures cities' overall potential to add attractive industries and therefore growth – for further detail, see the "Economic complexity" chapter in "Growing Cities that Work for All."

While Exhibit 28 directly uses economic complexity and the strategic index to map cities across the US, the state map (Exhibit 27) is based on an aggregation of each city's strategic index within a given state weighted by the share of overall jobs the city represents of the state total.

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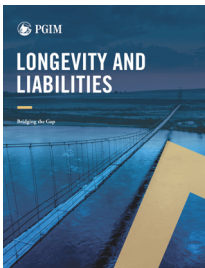
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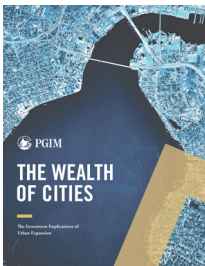
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